

# **REPORT 2008**



INTERNATIONAL UNION OF THEORETICAL AND  
APPLIED MECHANICS

# REPORT 2008



Ecole Normale Supérieure de Cachan  
FRANCE

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## Bureau: Officers and Members

The following members of the Bureau of IUTAM have been elected for the period 1 November 2008 to 31 October 2012:

### Officers

Professor T.J. Pedley (UK)	President
Professor L.B. Freund (USA)	Vice-President
Professor N. Olhoff (Denmark)	Treasurer
Professor F. Dias (France)	Secretary-General

### Members

Professor F.L. Chernousko (Russia)	(elected 2008)
Professor I. Goldhirsch (Israel)	(elected 2008)
Professor N.K. Gupta (India)	(elected 2008)
Professor A. Thess (Germany)	(elected 2008)

## Secretariat

IUTAM-Secretariat, Centre de Mathématiques et de Leurs Applications,  
Ecole Normale Supérieure de Cachan, 94235 Cachan, France  
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E-mail: frederic.dias@cmla.ens-cachan.fr  
Internet: <http://www.iutam.net>

## 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
22	2008	Adelaide, Australia	E. Tuck



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**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. J.P. (Jim) Denier  
Contact: Dr. J.P. (Jim) Denier  
Representatives in IUTAM: Dr. J.P. (Jim) Denier

**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 rue Ducale, B-1000 Brussels  
Secretary: Prof. Roland Decuypere  
President/Chair: Prof. J. (Joris) Degrieck  
Contact: Prof. Y. (Yvan) Baudoin

**Brazil (1982)**

Associação Brasileira de Engenharia e Ciências Mecânicas – ABCM  
Avenida Rio Branco 124/18º andar, 20040-001 Rio de Janeiro  
President/Chair: Prof. V. (Valder) Steffen Jr.  
Contact: Prof. L. (Luiz) Bevilacqua  
Representatives in IUTAM: Prof. J.A.P. (José) Aranha, 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.M. (Maciej) Floryan, 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. J (Jiachun) Li  
Secretary: Prof. J.-X. (Jianxiang) Wang  
Contact: Prof. J.-X. (Jianxiang) Wang  
Representatives in IUTAM: Prof. Y. (Yi-long) Bai, Prof. J (Jiachun) Li,  
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, The University of Hong Kong, Pokfulam Road,  
HK  
President/Chair: Prof. A.K. Soh  
Secretary: Dr. C.O. Ng  
Contact: Dr. C.O. Ng  
Representatives in IUTAM: Prof. T.X. (Tongxi) Yu

**China-Taipei (1980)**

The Society of Theoretical and Applied Mechanics  
Institute of Aeronautics and Astronautics, National Cheng Kung University,  
Tainan 70101, Taiwan (R.O.C.)  
President/Chair: Prof. C.-B. (Chyanbin) Hwu  
Secretary: Prof. C.-H. (Chin-Hsiang) Cheng  
Contact: Prof. C.-H. (Chin-Hsiang) Cheng  
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: Prof. M. (Miloslav) Okrouhlik  
Secretary: Dr. J. (Jiri) Naprstek  
Contact: Prof. M. (Miloslav) Okrouhlik  
Representatives in IUTAM: Prof. M. (Miloslav) Okrouhlik

**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. A. (Andrus) Salupere  
Contact: Prof. A. (Andrus) Salupere  
Representatives in IUTAM: Prof. A. (Andrus) Salupere

**Finland (1952)**

The Finnish National Committee on Mechanics  
Helsinki University of Technology, Attent. Prof. Rolf Stenberg, P.O.Box 1100, FIN-02015 TKK, Finland  
President/Chair: Prof. J. (Juha) Paavola  
Secretary: Prof. R. (Rolf) Stenberg  
Contact: Prof. R. (Rolf) Stenberg  
Representatives in IUTAM: Prof. J. (Juha) Paavola, Prof. R. (Rolf) Stenberg

**France (1949)**

Comité National Français de Mécanique, Académie des Sciences  
23, quai Conti, F-75006 Paris  
President/Chair: Prof. S. (Sébastien) Candel  
Secretary: Prof. F. (Frédéric) Dias  
Contact: Prof. S. (Sébastien) Candel  
Representatives in IUTAM: Prof. A. (Ahmed) Benallal, Prof. S. (Sébastien) Candel,  
Prof. F. (François) Charru, Prof. A. (Alain) Molinari

**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-Chairmen: Prof. G. (George) Jaiani, Prof. D. (Demuri) Danelia  
Secretary-General: Prof. G. (Gela) Kipiani  
President/Chair: Prof. G. (George) Jaiani  
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: Dr. R. Kienzler  
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, Mechanics Division, Zographou, GR-15773,  
Greece

President/Chair: Prof. J.T. (John) Katsikadelis  
Secretary: Prof. H.G. (Haralambos) Georgiadis  
Contact: Prof. H.G. (Haralambos) Georgiadis  
Representatives in IUTAM: Prof. J.T. (John) Katsikadelis

**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. D.V. Singh  
Contact: Dr. B. (Brotati) Chattopadhyay  
Representatives in IUTAM: Prof. G. (Gautam) Biswas, Prof. V. Ramamurti, Prof. G.  
(Gangan) Prathap, Prof. T. (Tarun) Kant

**Ireland (1984)**

Irish National Committee for Mathematical Sciences  
Royal Irish Academy, 19 Dawson Street, Dublin 2

President/Chair: Dr. R. (Richard) Watson  
Secretary: Dr. A. (Ann) O-Shea  
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. G. (Giulio) Maier, Prof. A. (Angelo) Morro,

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. (Toshio) Kobayashi

Representatives in IUTAM: 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

**Mexico (2008)**

Mexican Academy of Sciences

Km 23.5 Carretera Federal México-Cuernavaca, "Casa Tlalpan", Av. Cipreses s/n Col.

San Andrés Totoltepec, Tlalpan, 14400 Mexico

Representatives in IUTAM: Prof. E. (Eduardo) Ramos

**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 Neville Jordan

Chief Executive Officer: Dr Di McCarthy

Contact: Dr. J. (Jez) Weston

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. J. (John) Grue

Contact: Prof. J. (John) Grue

Representatives in IUTAM: Prof. J. (John) Grue

**Poland (1952)**

Committee for Mechanics of the Polish Academy of Sciences

ul. Swietokrzyska 21, PL-00 049 Warszawa

President/Chair: Prof. W. (Witold) Gutkowski

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. C.A.B. (Carlos) Pina

Representatives in IUTAM: Prof. D.R.Z. (Dinar) Camotim

**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. (Nicolaie) Cristescu  
Secretary: Dr. G. (Gabriela) Marinoschi  
Contact: Prof. N.D. (Nicolaie) Cristescu  
Representatives in IUTAM: Prof. N.D. (Nicolaie) 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. M.I. (Mohammed ibn Ibrahim) Al-Suwaiyel  
Contact: Mr. F.S. (Fahad) Huraib  
Representatives in IUTAM: Dr. M.I. (Mohammed ibn Ibrahim) Al-Suwaiyel

**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. (Jan) Sladek  
Contact: Prof. J. (Jan) Sladek  
Representatives in IUTAM: Prof. J. (Jan) Sladek



**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: Prof. C.G. (Charl) du Toit  
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  
President/Chair: Prof. L. (Laszlo) Fuchs  
Secretary: Dr. M. (Mathias) Wallin  
Contact: Prof. S. (Staffan) Lundström  
Representatives in IUTAM: Prof. D. (Dan) Henningson, Prof. B. (Bengt) Lundberg, Prof. S. (Staffan) Lundström

**Switzerland (1950)**

Board of the Federal Institutes of Technology  
(Rat der Eidgenössischen Technischen Hochschulen)  
ETH-Zentrum, CH-8092 Zürich  
President/Chair: Dr. F. (Fritz) Schiesser  
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. N.A. (Norman) Fleck, 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. T. J. R. (Thomas) Hughes  
Secretary: Prof. C.T. (Carl) Herakovich  
Contact: Prof. C.T. (Carl) Herakovich  
Representatives in IUTAM: Prof. H. (Hassan) Aref, Prof. N. (Nadine) Aubry, Prof. C.T.  
(Carl) Herakovich, Prof. L.G. (Gary) Leal, Prof. Z. (Zhigang) Suo

**Viet Nam (1990)**

Vietnamese Association of Mechanics (VAM)  
Hoi Co Hoc Vietnam, 264 Doi Can, Hanoi  
President/Chair: Prof. N. (Nguyen) Hoa Thinh  
Secretary: Prof. D. (Dinh) Van Phong  
Contact: Prof. D. (Dinh) Van Phong  
Representatives in IUTAM: Prof. N. (Nguyen) Hoa Thinh

**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: 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. G.G. Fuller  
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. M. (Mats) Berg  
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. L. (Lev) Truskinovsky

Secretary: Prof. D. (Davide) Bigoni

Contact: Prof. A. (Adriano) Montanaro

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

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

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. S.W. (Soo Woo) Nam

Secretary: Prof. T. (Toshihiko) Hoshide

Contact: Prof. S.W. (Soo Woo) Nam

Representative of ICM in IUTAM: Prof. S.W. (Soo Woo) Nam

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 Mécanique 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. K.K. (Kyung) Choi  
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

**IIAV (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 IIAV in IUTAM: Prof. M.J. (Malcolm) Crocker  
Representative of IUTAM in IIAV: Prof. J.D. (Jan) Achenbach

**ICA (1998)**

International Commission for Acoustics  
President/Chair: Prof. S.N.Y. (Samir) Gerges  
Secretary: Mrs. M. (Marion) Burgess  
Contact: Mrs. M. (Marion) Burgess  
Representative of ICA in IUTAM: Prof. S.N.Y. (Samir) Gerges  
Representative of IUTAM in ICA: Prof. A. (Andrew) Norris

**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. M.I. (Mohammed ibn Ibrahim) Al-Suwaiyel	Saudi Arabia	
Prof. J.A.P. (José) Aranha	Brazil	
Prof. H. (Hassan) Aref	USA	Chair WP-9
Prof. N. (Nadine) Aubry	USA	
Prof. Y. (Yi-long) Bai	China	
Prof. A. (Anguel) Baltov	Bulgaria	
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. P. (Philippe) Boulanger	Belgium	
Prof. D.H. (Dick) van Campen	Netherlands	
Prof. F.L. (Felix) Chernousko	Russia	Bureau member
Prof. G.G. (Gorimir) Chernyi	Russia	
Prof. N.D. (Nicolaie) Cristescu	Romania	
Dr. J.P. (Jim) Denier	Australia	
Prof. S.M. (Suresh) Deshpande	India	
Prof. F. (Frederic) Dias	France	Bureau member
Prof. E. (Erik) Dick	Belgium	
Prof. J. (Jürg) Dual	Switzerland	
Prof. P. (Peter) Eberhard	Germany	
Prof. J. (Juri) Engelbrecht	Estonia	
Prof. N.A. (Norman) Fleck	UK	
Prof. L.B. (Ben) Freund		Bureau member
Prof. P. (Paul) Germain		<i>passed away on 26-02-09</i>
Prof. I. (Isaac) Goldhirsch	Israel	Bureau member
Prof. J. (John) Grue	Norway	
Prof. N.K. (Narinder) Gupta	India	Bureau member
Prof. W. (Witold) Gutkowski	Poland	
Prof. A.N. (Alexandr) Guz	Ukraine	
Prof. J. (Jorn) Hansen	Canada	
Prof. M.A. (Michael) Hayes		Member-at-Large Representative of ISIMM
Prof. D. (Dan) Henningson	Sweden	



<i>Member</i>	<i>Representative of</i>	<i>Remarks</i>
Prof. C.T. (Carl) Herakovich	USA	Chair WP-3
Prof. P.G. (Philip) Hodge		Member-at-Large
Prof. J. (Jan) Hult		Member-at-Large
Dr. S.R. (Sergio) Idelsohn	Argentina	
Prof. M.K. (Mohamed) Ismail	Egypt	
Prof. G. (George) Jaiani	Georgia	
Prof. S. (Sandor) Kaliszky	Hungary	
Prof. T. (Tsutomu) Kambe	Japan	
Prof. B.L. (Bhushan) Karihaloo	UK	
Prof. J.T. (John) Katsikadelis	Greece	
Prof. A. (Alfred) Kluwick	Austria	
Prof. T. (Toshio) Kobayashi	Japan	
Prof. L.G. (Gary) Leal	USA	Representative of ICR Chair WP-1
Prof. J. (Jiachun) Li	China	Representative of AFMC
Prof. F. (Fernando) Lund	Chile	
Prof. B. (Bengt) Lundberg	Sweden	
Prof. C.-C. Ma	China-Taipei	
Prof. G. (Giulio) Maier	Italy	
Prof. J.A.C. (João) Martins	Portugal	
Prof. C. (Christian) Miehe	Germany	
Prof. G.K. (Gleb) Mikhailov	Russia	
Prof. H.K. (Keith) Moffatt		Bureau member Representative in HYDROMAG and CISM
Prof. P.A. (Peter) Monkewitz	Switzerland	
Mr. A. (Angel) Moratilla	Spain	
Prof. N.F. (Nikita) Morozov	Russia	
Prof. A. (Angelo) Morro	Italy	
Prof. M. (Mauri) Määttänen	Finland	
Prof. F. (Frithiof) Niordson		Member-at-Large Representative in ICR
Prof. A. (Andrew) Norris	USA	Representative in ICA
Prof. P.E. (Padraic) O'Donoghue	Ireland	
Prof. M. (Miloslav) Okrouhlik	Czech Republic	
Prof. N. (Niels) Olhoff	Denmark	Bureau member Representative in ISSMO
Prof. J. (Juha) Paavola	Finland	
Prof. N. (Nigel) Peake	UK	
Prof. T.J. (Timothy) Pedley	UK	Representative in EUROMECH
Prof. P. (Paolo) Podio-Guidugli	Italy	

<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. J. (Jan) Sladek	Slovakia	
Prof. Z. (Zhigang) Suo	USA	
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	Bureau member
Prof. E.O. (Ernie) Tuck	Australia	<i>Passed away on 11-03-09</i>
Prof. G. (Goran) Turkalj	Croatia	
Prof. K. (Koji) Uetani	Japan	
Prof. D.V.H. (Dirk) Vandepitte	Belgium	
Prof. N. (Nguyen) Van Diep	Viet Nam	
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. (Zhemin) Zheng	China	
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. M. (Marc) Bonnet	France	IABEM
Prof. M.J. (Malcolm) Crocker	USA	IIAV
Prof. S.N.Y. (Samir) Gerges	Brazil	ICA
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. 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. S.W. (Soo Woo) Nam	Canada	ICM
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	2012	Secretary of XCCC
Prof. N. (Nadine) Aubry	USA	2012	
Prof. L. (Leslie) Banks-Sills	Israel	2012	
Prof. D. (Dominique) Barthès-Biesel	France	2012	
Prof. M.P. (Martin) Bendsøe	Denmark	2012	Member of XCCC Representative of ISSMO
Prof. D.E. (Dimitri) Beskos	Greece	2010	
Prof. D.H. (Dick) van Campen	Netherlands	2012	Member of XCCC
Prof. A. (Alberto) Carpinteri	Italy	2012	
Prof. G.-D. (Gengdong) Cheng	China	2012	
Prof. F. (Frédéric) Dias	France	2012	
Prof. F. (Fernand) Ellyin	Canada	2010	Representative of ICM
Prof. I.G. (Irina) Goryacheva	Russia	2012	
Prof. N.K. (Narinder) Gupta	India	2012	
Prof. M.A. (Michael) Hayes	Ireland	2010	Representative of ISIMM
Prof. C.T. (Carl) Herakovich	USA	2010	
Prof. Y. (Yukio) Kaneda	Japan	2012	
Prof. A. (Alfred) Kluwick	Austria	2010	
Prof. T.A. (Tomasz) Kowalewski	Poland	2012	Member of XCCC
Prof. E.J. (Edwin) Kreuzer	Germany	2010	
Prof. S. (Stelios) Kyriakides	USA	2012	
Prof. P. (Pierre) Ladevèze	France	2012	
Prof. L.G. (Gary) Leal	USA	2012	Representative of ICR
Prof. J.B. (Jean-Baptiste) Leblond	France	2010	
Prof. J. (Jacques) Magnaudet	France	2012	
Prof. R.M. (Robert) McMeeking	USA	2012	
Prof. N.F. (Nikita) Morozov	Russia	2010	
Prof. R.W. (Ray) Ogden	UK	2012	
Prof. N. (Nigel) Peake	UK	2010	
Prof. T.J. (Timothy) Pedley	UK	2012	Member of XCCC
Prof. B.A. (Bernhard) Schrefler	Italy	2010	Member of XCCC Representative of CISM
Prof. A. (André) Thess	Germany	2012	
Prof. V. (Viggo) Tvergaard	Denmark	2012	
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. D. (Dan) Henningson	Sweden	2012	
Prof. L.G. (Gary) Leal	USA	2012	Chair
Prof. N. (Nigel) Peake	UK	2012	
Prof. K. R. (Katepalli) Sreenivasan	Italy	2010	
Prof. M.A. (Michael) Stiasnie	Israel	2010	
<b>Symposia Panel for Solid Mechanics</b>			
<i>Member</i>	<i>Country</i>	<i>Year*</i>	<i>Remarks</i>
Prof. W. (Wolfgang) Ehlers	Germany	2012	
Prof. N.A. (Norman) Fleck	UK	2012	
Prof. H. (Huajian) Gao	USA	2012	
Prof. G. (Gábor) Stépan	Hungary	2010	
Prof. V. (Viggo) Tvergaard	Denmark	2012	Chair

\*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 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. A.N. (Antony) Beris;  
Prof. J. R. A. (Anthony) Pearson, UK; Prof. T. (Tam) Sridhar, Australia;  
Prof. D. (Dimitri) Vlassopoulos, Greece; Prof. H. (Hiroshi) Watanabe, Japan

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

**WP-4: Materials Processing**

Members: Prof. R.M. (Robert) McMeeking, USA (chair); Prof. S. (Shigeo) Asai, Japan; Prof. Y. (Yves) Brechet, France; Prof. R. (René) Moreau, France; Prof. A. (André) Thess, Germany; Prof. C.L. (Charles) Tucker III, USA

**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. J. (Jacob) Fish, USA; Dr. S. R. (Sergio) Idelsohn, Argentina; Prof. J. T. (Tinsley) Oden, USA; Prof. M.W. (Mingwu) Yuan, China

**WP-6: Biomechanics**

Members: Dr. G.A. (Gerhard) Holzzapfel, 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. H.K. (Keith) Moffatt; Prof. K.R. (Katepalli) Sreenivasan, Italy

## Donations in 2008

Donations given to IUTAM Symposia are recorded under the heading “Financial Support” of the Reports of Symposia and Summer Schools held in 2008.

The following events were accepted for co-sponsorship:

- LACCOTAM – First Latin American and Caribbean Congress of Theoretical and Applied Mechanics (Trinidad and Tobago, West Indies)
- First Joint International Conference on Multibody System Dynamics (Finland)

## 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. T. J. Pedley
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	Prof. M. Stiassnie

## Reports of IUTAM Symposia held in 2008

### 08-1 IUTAM Symposium on Theoretical, Modelling and Computational Aspects of Inelastic Media

Cape Town, South Africa, January 14 - January 18, 2008

The proposal to host a IUTAM Symposium on Theoretical, Modelling and Computational Aspects of Inelastic Media was accepted at the IUTAM General Assembly in August 2006. The following individuals were invited to serve as members of the Scientific Committee of the Symposium, and accepted the invitation:

R de Borst (Delft University of Technology)  
 G Maier (Politecnico di Milano) IUTAM representative  
 C Miehe (Universität Stuttgart)  
 A Needleman (Brown University)  
 M Ortiz (California Institute of Technology)  
 DRJ Owen (University of Swansea)  
 BD Reddy (University of Cape Town) Chairman

The local organizing committee comprised BD Reddy (convenor), AT McBride and O Goodhind (administrator).

A webpage <http://www.cerecam.uct.ac.za/iutam08> was constructed and used as the chief means of communication with potential and actual delegates.

There were 59 delegates from 15 countries, the breakdown by country being as follows:

South Africa	15
Germany	15
USA	8
Italy	5
United Kingdom	4
France	3
Nine countries*	1

\*Australia, Netherlands, Norway, Bulgaria, Spain, Ghana, Russia, Canada, Denmark

Of the delegates, 2 were postdoctoral researchers and 6 were graduate students.

All-day technical sessions were arranged on 14, 15 and 17 January, and half-day sessions on 16 and 18 January.

A total of 46 talks were presented. Speakers were allocated 30 minutes for presentation and discussion. The list of delegates and the programme are attached to this report.



The Symposium was dedicated to the memory of JB Martin, a major figure in theoretical and applied mechanics in South Africa and internationally. At the opening session of the symposium BD Reddy spoke on the legacy of John Martin. Also at the opening session, G Maier made a welcome presentation to delegates on behalf of IUTAM.

The registration fee for the Symposium was set at R3 200 (approximately \$450 at the time). The fee included all refreshments at coffee breaks, two lunches, the conference dinner, a copy of the abstracts and programme, and a copy of the proceedings, when these are published.

The fee for students and postdoctoral researchers was set at R1 500.

### **Financial support**

The IUTAM grant of \$5 000 converted to R31 000 (South African Rand), after bank fees had been deducted. In accordance with IUTAM guidelines this funding was used to assist delegates who would otherwise not have been able to cover all of their travel and subsistence costs for attendance. The following delegates were assisted in this manner:

Delegate Support (SA Rand)	
Prof S Kwofie (Kumasi, Ghana)	9 000
Prof M Kaunda (Bloemfontein, South Africa)	2 000
Prof A Benzerga (Texas, USA)	4 000
Ms E Muravleva (Moscow, Russia)	2 000
Dr P Cleary (Melbourne, Australia)	3 000
Prof F Armero (Berkeley, USA)	3 000
Dr M Hjjaj (Rennes, France)	2 000
Prof D Karagiozova (Sofia, Bulgaria)	2 000
Mr R Mohr (Kaiserslautern, Germany)	2 000
Prof S Shrivastava (Montreal, Canada)	2 000
Total IUTAM support	31 000

Financial support was also received from the following organisations: University of Cape Town, National Research Foundation (South Africa), South African Department of Science and Technology, and Springer-Verlag. This support made it possible to keep the registration fee to a minimum and to provide further travel or accommodation support to delegates.

### **Proceedings**

A contract has been signed with Springer to publish the Proceedings in a dedicated book series. The process of soliciting papers from speakers is complete, and manuscripts are

currently in the review and revision stage. It is anticipated that some 37 papers will be published.

### **Scientific progress**

The main aim of the Symposium was to bring together researchers in theoretical, modelling and computational aspects of inelastic material behaviour. There was a good mix of presentations, as can be seen from the technical programme. The main success of the Symposium was its ability to bring together researchers from diverse research backgrounds, but with a common interest in inelastic media; those who attended had backgrounds in mathematics, engineering or physics, and were experimentalists, theoreticians, or computational experts.

A further feature of the Symposium was that it provided a forum for the exchange of ideas among researchers working at all scales: the micro- or meso scales, and the macroscopic and structural levels.

Overall the Symposium provided a fertile arena for cross-pollination of ideas, and this was apparent in the lively discussions that followed every talk, as well as the many informal discussions that took place. The proceedings, when these are published, will provide testimony of the high quality of the contributions.

The majority of the speakers are experts with strong international reputations. From a developmental point of view it was pleasing also to have as participants postgraduate students and postdoctoral researchers.

The event was a significant one for South Africa as it gave researchers in the region the opportunity to interact at a high level with international experts in the field. It has given a huge boost to activities in mechanics, broadly speaking, in the country. On the other hand it was disappointing that only one delegate from Africa and outside South Africa was able to attend the Symposium. This was in spite of serious efforts aimed at attracting greater numbers of delegates from across the African continent.

### **Acknowledgements**

The support and encouragement of IUTAM, through the General Assembly and its Executive, are acknowledged with thanks. The South African Association for Theoretical and Applied Mechanics and the South African National Committee for IUTAM lent strong support to the Symposium, particularly during the proposal stage, and subsequently.

The members of the Scientific Committee contributed greatly to the quality and success of the event through their proposals for participants, and their general guidance on organizational and other matters. These contributions are acknowledged with thanks.

The Local Organising Committee members and the Centre for Professional Development at the University of Cape Town ensured through their work that the organization ran smoothly. The group of eight graduate student assistants provided enthusiastic support to delegates, whether during technical sessions, providing general support, or in responding to queries about local conditions.

The sponsors made it possible to mount a Symposium in which financial support could be provided to a large number of delegates, while maintaining a high quality of facilities and additional events. The South African Department of Science and Technology, the National Research Foundation, the University of Cape Town, Springer, and not least, IUTAM, are thanked for their valuable support.

The Symposium would not have been the success that it was without the lively participation of the delegates, who ensured that the technical sessions were stimulating and enjoyable, and who collectively created a memorable atmosphere. It is a pleasure to thank all delegates for their participation.

**Report composed by Daya Reddy**

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**08-2 IUTAM Symposium on Modelling Nanomaterials and Nanosystems**  
Aalborg, Denmark, May 19 – May 22, 2008

**a) Scientific Committee**

A. Argon (USA), L.B. Freund (USA, IUTAM representative), M. Griebel (Germany), E. Hernandez (Spain), J.B. Leblond (France), R. Pyrz (Denmark, Chairman), J. Wang (China), B.I. Yakobson (USA).

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

Modelling and simulation on various length and time scales have become a major field of Materials Science and Engineering in academia as well as in industrial research and development. Multiscale materials modelling encompasses all the tools which physicists, chemists, mechanical engineers and materials scientists have been developing to describe materials and their behaviour. The goal of the Symposium was namely to bring together scientists from different disciplines who are striving for an improvement and enhancement of virtual design and development of nanomaterials, and of virtual development and testing of components.

A special emphasis has been placed on transitional frameworks that are essential to link and to complement continuum and atomistic methods. Different upscaling methodologies using results from a lower-scale calculation to obtain parameters for a higher-scale have been presented. Extensions of continuum approaches that incorporate atomistic/molecular phenomena not observable in classical continuum settings were discussed as well. Several contributions presented appropriate validation experiments which are crucial to verify that the models predict the correct behaviour at each length scale, ensuring that the linkages are directly enforced.

All lectures were followed by lively and interesting discussions. Many participants expressed the opinion that the Symposium was very informative and challenging since problem formulations, methods of solution and applications contained a high degree of multidisciplinary comprising physics, chemistry, materials science and solid mechanics aspects of nanomaterials and nanosystems.

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

The total number of participants was 53 from 19 countries: Australia (2), Austria (1), Canada (2), China (2), Czech Republic (1), Denmark (10), France (2), Germany (3), Greece (1), Hong Kong (1), Italy (2), Israel (3), Poland (5), Russia (2), Singapore (3), Spain (1), Sweden (4), UK (5) and USA (3).

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

The Proceedings of the Symposium will be published by Springer Science and Business Media.

**e) Financial supports**

The Scientific Committee is indebted to IUTAM for the financial support to some of the invitees. Additional sponsorship was provided by Det Obelske Familiefond, Spar Nord Fonden and Springer Science.

**f) Scientific program****Monday 19 May**

K.Y. Volokh – Multiscale failure modeling: from atomic bonds to hyperelasticity with softening

R.K. Kalia, A. Nakano & P. Vashishta – Multimillion-to-billion atom molecular dynamics simulations of deformation, fracture and nanoductility in silica glass

M. Müser – Concurrent and sequential multi-scale simulations of friction and contact mechanics

M. Griebel – Molecular dynamics simulations of the mechanical properties of nanotube-reinforced composite materials

H.D. Wagner – Nanotube and nanocomposite mechanics

Ł. Figiel, F.P.E. Dunne & C.P. Buckley – Multiscale modelling of layered silicate/PET nanocomposites during solid-state processing

R. Talreja – On issues in multi-scale modeling of damage in heterogeneous solids

K. Jolley & S.P.A. Gill – Modelling transient heat conduction at multiple length and time scales: a coupled non-equilibrium molecular dynamics/continuum approach

V.B.C. Tan, M. Deng, T.E. Tay & K.M. Lim – Multiscale modeling of amorphous materials with adaptivity

P.K. Valavala & G.M. Odegard – Thermodynamically-consistent multiscale constitutive modeling of glassy polymer materials

L.C. Zhang – Effective wall thickness of single-walled carbon nanotubes for multiscale analysis: the problems and a possible solution

T-Y. Zhang, M. Luo & W.K. Chan – Surface/edge induced intrinsic size-dependent properties of nanowires

R. Pyrz & B. Bochenek – Discrete-continuum transition in modelling nanomaterials

**Tuesday 20 May**

B. Palosz – Looking beyond limitations of diffraction methods of structural analysis of nanocrystalline materials

G. Winther – Multiscale modeling of mechanical anisotropy in deformed metals

G. Geandier, O. Castelnau, E. Le Bourhis, P.-O. Renault & Ph. Goudeau – Micromechanical modelling of the size-dependent elastic behavior of multilayer thin films: comparison with in situ data from X-ray diffraction

J.M. Hill – Geometry and mechanics of carbon nanotubes and gigahertz nano-oscillators

IV.A. Eremeyev & H. Altenbach – On the eigenfrequencies of an ordered system of nano-objects  
H.L. Duan, J. Weissmuller, Y. Wang & X. Yi – Monitoring of molecule absorption and stress evolutions by in situ microcantilever systems  
Y-P. Zhao, Z. Yang & J. Yin – QM/MM hybrid simulation of bio-nanosystem immobilization on various substrates  
E.R. Hernandez – Using thermal gradients for actuation at the nanoscale  
O. Sigmund – Systematic design of nano-phonic crystals and meta-materials  
J. Chen & S.J. Bull – Modelling of indentation and scratch damage in multilayer coatings and bulk materials  
F.D. Fischer & D. Vollath – Transforming nanoparticles – experiments and modelling  
L. Diekhöner, N.N. Negulyaev, V.S. Stepanyuk, P. Bruno, P. Wahl & K. Kern – Atomistic description of nanoisland growth: Co on single crystal Cu surfaces

### **Wednesday 21 May**

L. Colombo – Understanding brittle fracture in nanostructured silicon carbide by atomistic simulations  
I.N. Remediakis – Atomistic models for the mechanical response of nanomaterials  
C.T. Lim – Deformation and failure modes of a single nanofiber  
H.J. Chu, H.L. Duan, J. Wang & B.L. Karihaloo – Elastic fields in quantum dot structures with arbitrary shapes and interface effects  
J. Yvonnet, H. Le Quang & Q.-C. He – Thermo-mechanical numerical modelling of nano-inclusions with arbitrary shapes  
H.L. Duan, B.L. Karihaloo & J. Wang – Thermo-elastic size-dependent properties of nanocomposites with imperfect interfaces  
R.J. Young, S. Cui, I. Kinloch, Ch.C. Kao, S. Eichhorn & P. Kannan – Modelling the stress transfer between carbon nanotubes and a polymer matrix  
A. Siddiq & S. Schmauder – Multiscale modeling of interface fracture  
P. Olsson, C. Persson & S. Melin-Petersson – A study of the elastic properties of iron nanowires  
T. Burczynski, W. Kus & A. Mrozek – Advanced continuum-atomistic model of materials based on coupled boundary element and molecular approaches  
I.J.Y.H. Chia – Finite element modeling nanocomposites and interface effects on mechanical properties  
I. Goldhirsch – Small scale and/or high resolution elasticity  
M. Fermeglia – Enthalpic and entropic effects of nanoparticles in polymer matrices: industrial applications

### **Thursday 22 May**

O.B. Naimark – Structural-scaling transitions in mesodefekt ensembles and properties of bulk nanostructural materials – modeling and experimental study  
J. Rottler – Molecular simulations of deformation, flow and physical aging in glassy solids

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T.A. Kowalewski, S. Barral & T. Kowalczyk – Modeling electrospinning of nanofibres  
J. Jancar – Use of reptation dynamics in modeling molecular interphase in polymer nanocomposite  
A. Rozanski, A. Galeski & J. Golebiewski – Low density polyethylene-montmorillonite nanocomposites for film blowing

**Report composed by Ryszard Pyrz**

**08-3 IUTAM Symposium on Cellular, Molecular and Tissue Mechanics**  
Woods Hole, Cape Cod, Massachusetts, USA, June 18 - June 21, 2008

The IUTAM Symposium on Cellular, Molecular and Tissue Mechanics was held at the J. Erik Jonsson Woods Hole Center of the National Academy of Sciences, Woods Hole, Massachusetts, on June 18 - 21, 2008. Sixty two investigators from primarily the USA and Europe attended the symposium. The meeting was quite unique in its active participation of biologists and biophysicists. At least one third of the attendees had never previously been to a mechanics meeting of any kind. The symposium featured 40 podium presentations and 20 posters. Co-organizers Krishna Garikipati and Ellen Arruda thank the IUTAM for their generous support. We also wish to acknowledge the support of the US National Science Foundation; this enabled the subsidy of twelve young investigators (Post Doctoral Associates and PhD students). Springer Publications is also gratefully acknowledged. A proceedings publication will soon be available through Springer Publications with 22 peer-reviewed papers from the symposium.

**a) Scientific Committee**

Ellen M. Arruda, University of Michigan, USA  
Krishna Garikipati, University of Michigan, USA  
Huajian Gao, Brown University, USA  
Erik van der Giessen, Universiteit Groningen, The Netherlands  
Gerhard A. Holzapfel, Graz University of Technology, Austria  
Ellen Kuhl, Stanford University, USA  
Ray Ogden, University of Glasgow, UK  
Ulrich Schwarz, Universitat Heidelberg, Germany

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

The unifying theme of the meeting is a focus on explaining biological states, both normal and pathological, through mechanics, rather than merely viewing biology as a fertile playing ground for mechanicians. It was our intent, as organizers, to build upon the success of the IUTAM Symposium on Mechanics of Biological Tissue held in Graz, Austria, in 2004. The IUTAM Symposium on Cellular, Molecular and Tissue Mechanics, as the title suggests, shifted the emphasis somewhat to include the cellular and molecular scales at which the success or failure of a biological organism seems to be largely decided. A forum was initiated for mechanicians venturing into biology to interact with biologists and biophysicists who study mechanical influences on biological systems. We believe that these steps will highlight and add momentum to the emergent concept that, while considerations of chemistry have hitherto dominated the explanations of causality in biology, mechanics often plays a role of at least equal importance.



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

Australia, France, Germany, Israel, Italy, The Netherlands, Switzerland, The United Kingdom and The United States

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

Proceedings of the IUTAM Symposium on Cellular, Molecular and Tissue Mechanics, K. Garikipati and E. M. Arruda Eds, Springer, in press, 2009.

**e) Financial support**

IUTAM; US National Science Foundation; Springer Publications; The University of Michigan

**f) Scientific program****Wednesday, June 18**

8:45 Opening remarks  
Tissue Mechanics (Chair: E. Kuhl)

9:00 Ellen M. Arruda: Experimental and Computational Investigation of Poroviscoelasticity in Native and Engineered Connective Tissue  
9:30 T. D. Nguyen : A Microstructure-Based Anisotropic, Nonlinear Viscoelastic Model for Irregular Fibrous Tissues  
10:00 P. Ciarletta, A.N. Natali, P.G. Pavan & E.L. Carniel: Hysteretic Behavior of Soft collagenous Tissues: Analysis of Energy Dissipation and Non-recoverable Strain

Cell-substrate Interactions (Chair: E.M. Arruda)

11:00 J.A. Stella, J. Liao, Y. Hong, W.D. Merryman, W.R. Wagner & M.S. Sacks: Tissue-Cellular Deformation Coupling in Cell Microintegrated Elastomeric Scaffolds  
11:30 D.E. Discher: Matrix Elasticity Directs Stem Cell Lineage: Experiments & Computational Insights  
12:00 R. De, A. Zemel & S.A. Safran: Dynamics of Stress Response of Biological Cells

Mechanotransduction in Proteins (Chair: D.E. Discher)

13:30 V. Vogel: Tuning the Structure-function Relationship of Extra-and Intracellular Proteins: stretching fibronectin fibers and talin  
14:00 M.P. Sheetz: Shaping Cells by Force and Rigidity Through Protein Stretching

Mechanics of DNA (Chair: D.E. Discher)

14:30 S. Goyal, T. Lillian, N.C. Perkins, E. Meyhöfer: Mechanics of DNA Looping by the Lac Repressor Protein: How Stress-free Shape Influences Loop Energetics and Topology

Mechanics of DNA(continued) (Chair: S. Goyal)

15:30 N. Clauvelin, B. Audoly & S. Neukirch: Magnetic Tweezer Experiments as a Benchmark for Models of DNA-DNA Electrostatic Interaction

16:00 P. Purohit: Torsional Buckling and Plectoneme Formation in Fluctuating DNA

16:30 Y.Y. Biton & B.D. Coleman: On the Theory of the Sequence-dependent Mechanics of DNA Supercoiling with Electrostatic Forces Taken into Account

### Thursday, June 19

Morphogenesis (Chair: L. Taber)

8:30 M. Krieg, Y. Arboleda, P.H. Puech, J. Käfer F. Graner, C.P. Heisenberg & D.J. Müller: Deciphering Molecular Forces that Govern Germ layer Organization during Gastrulation

9:00 J. Dervaux & M. Ben Amar: Morphogenesis of Growing Soft Tissues

9:30 S.R. Lubkin: Mechanics in Epithelio-Mesenchymal Interactions

Morphogenesis(continued) (Chair: S.A. Safran)

10:30 L.A. Taber: On a Fundamental Principle for Morphomechanics

Cell-substrate Interactions (continued) (Chair: S.A. Safran)

11:00 B. Geiger, S. Winograd-Katz, C. Luxenburg, I. Patela, T. Volberg, J. Spatz, O. Medalia, L. Addadi: The Molecular Organization of Adhesion-signaling Complexes of the Integrin Adhesome

11:30 S. Jungbauer, H. Gao, J.P. Spatz & R. Kemkemer: Universal Frequency-Dependent Response of Cells Under Cyclical Strain

12:00 J.P. Spatz: Chemo-Mechanical Stimulation of Cells by Nano-Digital Environments

Posters

M. Arslan, S. Cantournet & M. Boyce: Micromechanical Modeling of Microtubules

S. Calve & H.G. Simon: Extracellular Control of Limb Regeneration

C. Castro, A. Hu, H. Pleogh, M. Boyce & M. Lang: B Lymphocyte Membrane Reservoir Mechanics

R. De, A. Zemel & S.A. Safran: Dynamics of Active Cellular Response Under Stress

A.E. Ehret, M. Itskov: A Viscoelastic Anisotropic Model for Soft Collageneous Tissues Based on Distributed Fiber-Matrix Units

- R. P. Hoo, W.R. Walsh & M.J. Hoffman: Analysis of Elastic-Viscous-Plastic Deformation Behavior of Cortical Bone Determined by Nanoindentation and Analytical Modelling
- S. Jungbauer, H. Gao, J.P. Spatz & R. Kemkemer: Dynamics of Cell Responses to Mechanical Stretching
- Alexander Kohlmaier, Parthive Patel, Huaqi Jiang & Bruce Edgar: Tissue Homeostasis by Mechanical Feedback on the Stem Cell Cycle in Vivo?
- R.Y. Kwon, A.J. Lew & C.R. Jacobs: A Microstructurally Informed Model for the Mechanical Response of Three-dimensional Actin Networks
- J. Ma, K. Goble, T. Kostrominova, L. Larkin, E. Arruda: Morphological and Mechanical Characteristics of Three-Dimensional Engineered Bone-Ligament-Bone Constructs from Rat and Human BMSCs
- K.L. Mills, X. Zhu, D. Huh, T. Uchida, S. Takayama & M.D. Thouless: Nanocracking of Plasma-oxidized Polydimethylsiloxane and some Applications in Nano- and Biotechnology
- T. Mueller, G. Behme, H. Haschke, W. Dobler & R. Owen: Quantifying Protein-mediated Cell Adhesion by Single Cell Force Spectroscopy
- S. Murtada, M. Kroon & G.A. Holzapfel: Mechanical Modelling of Calcium Activated Contraction of Smooth Muscle Cells
- J.E. Olberding, M.D. Thouless, E.M. Arruda & K. Garikipati: The Reaction-Limited Regime of Focal Adhesion Dynamics
- J.S. Palmer & M. Boyce: Poroviscoelastic Modeling of Cross-linked Actin Filament Networks
- R. Paul & U. Schwarz: Pattern Formation and Force Generation by Cell Assembly
- R. Vandiver & A. Goriely: Tissue Tension and Axial Growth in Cylindrical Elastic Structures
- Y. Wei: Entropic-elasticity-controlled Dissociation and Energetic-elasticity-Controlled Rupture induce catch to slip bonds in Cell-adhesion Molecules
- A. Zemel & A. Mogilner: Active Dynamics of Polar Filament Bundles

**Friday, June 20**

Mechanics of Biopolymer Networks (Chair: E. Van der Giessen)

- 8:30 M.C. Boyce, J.S. Palmer, C.E. Castro & M. Arslan: Microstructurally-Informed Constitutive Modeling of the Stress-Strain Behavior of Biological Macromolecular Networks
- 9:00 F.C. MacKintosh: Non-equilibrium Mechanics and Dynamics of Cytoskeletal Networks
- 9:30 P.R. Onck, E.M. Huisman, T. van Dillen, E. van der Giessen: The Effect of Network Architecture on the Mechanics of Three-dimensional Cross-linked Actin Networks

Cell Adhesion (Chair: H. Gao)

10:30 L.B. Freund: A Model of the Forced Separation of a Molecular Bond  
11:00 J.E. Olberding, M.D. Thouless, E.M. Arruda & K. Garikipati: A Theoretical Study of the Thermodynamics and Kinetics of Focal Adhesion Dynamics  
11:30 D. Ambrosi: Cellular Traction on Flat Surfaces: An Inverse Problem in Linear Elasticity

Growth (Chair: K. Garikipati)

13:00 R. Bernal, E.R. Rojas & J. Dumais: The Mechanics of Tip Growth Morphogenesis: Comparing Experiments and Theory  
13:30 E. Kuhl, S. Göktepe, O. Abilez & C.K. Zarins: Dilation and Hypertrophy – A Cell-based Continuum Mechanics Approach Towards Ventricular Growth and Remodeling  
14:00 A. Goriely & R. Vandiver: On the Notions of Mechanical Stability and Bifurcation for Growing Elastic Soft Tissues

Mechanics of Biopolymer Networks (Continued) (Chair: M.C. Boyce)

15:00 M. Upmanyu, H.L. Wang & L. Mahadevan: Bends and Twists: Stability and Elasticity of Twisted Biopolymers and their Networks  
15:30 G. Zagar, P.R. Onck & E. van der Giessen: Effect of Cross-links on the Mechanical Response of Cross-linked Networks  
16:00 A.P. Liu, D.L. Richmond, L. Maibaum, P.G. Geissler & D.A. Fletcher: Dynamic Self Assembly of Protrusive Actin Networks on Giant Vesicles

16:45 T. Kim, H. Lee, W. Hwang & R.D. Kamm: Computational and Experimental Modeling of cytoskeletal rheology

Passive Mechanical Response of Proteins (Chair: M.C. Boyce)

17:15 R. Ballarini, Z.L. Shen, M.R. Dodge, S.J. Eppell & H. Kahn: Stress-strain Experiments on Individual Collagen Fibrils

### **Saturday, June 21**

Cell Adhesion (Continued) (Chair: L.B. Freund)

8:30 J. Qian, J. Wang & H. Gao: Nanomechanics of Biological Systems – From Single Molecular Bonds to Continuum Mechanics Descriptions of Cell Adhesion  
9:00 V.S. Deshpande, A. Pathak, R.M. McMeeking & A.G. Evans: Simulation of the Coupling of Cell Contractility and Focal Adhesion Formation  
9:30 U. Schwarz, A. Besser, J. Colombelli & E. Stelzer: Modeling the Coupling between Biochemistry and Mechanics in Cell Adhesion

Cell Adhesion (Continued) (Chair: U. Schwarz)

10:30 R.M. Springman & J.L. Bassani: Mechano-chemical Coupling in the Adhesion of Thin Structures to Surfaces with Topography

11:00 D. Ingber: Mechanobiology and Developmental Control

Poroelectricity of Bone (Chair: U. Schwarz)

11:30 M.L. Oyen: Bone Composite Mechanics Related to Collagen Hydration State

12:00 G.B. Gailani & S.C. Cowin: Russian Doll Poroelectricity; A Model for Fluid Transport in Tissues

**Report composed by Ellen Arruda**

**08-4 IUTAM Symposium on Variational Concepts with Applications to the Mechanics of Materials**

Bochum, Germany, September 22 - 26, 2008

**a) Scientific Committee**

Hackl, K. (Bochum, Chair), Ponte Castaneda, P. (Palaiseau), Ortiz, M. (Pasadena), Ball, J. (Oxford), Conti, S. (Bonn), Sigmund, O. (Lyngby), Bhattacharya, K. (Pasadena), Francfort, G. (Paris), Bendsøe, M. P. (IUTAM Representative)

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

This symposium focused on novel applications of methods from the calculus of variations to the mechanics of materials. This included the development of new material models as well as the advancement of the corresponding computational techniques. Specific emphasis is put on the treatment of materials possessing an inherent microstructure and thus exhibiting a behavior which fundamentally involves multiple scales. Among the topics addressed by the symposium were:

1. Energy-based modeling of material microstructures via envelopes of non-quasiconvex potentials and applications to plastic behavior and phase-transformations.
2. Modeling of the evolution of material microstructures in time and the associated thermodynamics using suitable variational principles.
3. Variational homogenization and its application to the calculation of effective properties of inhomogeneous materials.
4. Micromechanical modeling of shape-memory alloys and the evolution of martensitic microstructures.
5. Variational multiscale methods and associated numerical procedures.
6. Micromechanics of multifield and multiphysics.

The symposium brought together some of the leading and most influential researches working in the fields mentioned above. It succeeded in giving a good overview in the current state-of-the-art. A variety of novel results and methods were presented, especially in the realm of applying energy-based concepts to complex materials and structures. It was shown that the topic of the symposium is undergoing a rapid development boosted by the advancement of mathematical techniques in conjunction with new experimental findings concerning material microstructures.

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

Austria (1), Czech Republic (1), France (5), Germany (36), Israel (1), Italy (2), Netherlands (1), Switzerland (1), United Kingdom (3), USA (5)

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

The proceedings will be published in the IUTAM book series in summer 2009.

**e) Financial supports**

The IUTAM grant for this symposium is gratefully acknowledged.

**f) Scientific program****Monday, September 22**

**Graeme W. Milton;** Pierre Seppecher; Guy Bouchitté, *Minimization variational principles for acoustics, elastodynamics, and electromagnetism in lossy inhomogeneous bodies at fixed frequency*

**Gal deBotton,** *The macroscopic coupled energy – density function of dielectric composites*

**Bernard Dacorogna,** *Rigid maps and origami: an analytical approach*

**Florian Theil,** *On the behaviour of dissipative systems in contact with a heat bath: Application to Andrade creep*

**Christopher J. Larsen,** *Models for Dynamic Fracture Based on Griffith's Criterion*

**Jean-Francois Babadjian,** *Stability of quasi-static crack evolution through dimensional reduction*

**Blaise Bourdin;** Christopher J. Larsen, Casey Richardson, *Numerical investigations around a variational approach to dynamic fracture*

John M. Ball; **Yasemin Sengul,** *Well-posedness of Dynamics Microstructure in Solids*

**Tuesday, September 23**

**Carsten Carstensen,** *On Adaptive Finite Element Methods in the Calculus of Variations*

**Jörn Mosler;** Otto T. Bruhns, *On the implementation of variational constitutive updates at finite strains*

**Paul Steinmann;** H. A. Meier; E. Kuhl, *Multiscale Computational Granular Media*

**Sandra Ilic;** Klaus Hackl, *Modeling of solution-precipitation creep – microscopic and macroscopic aspects*

**Vikranth Racherla;** P. Ponte Castaneda, *Thermoplastic elastomers: Homogenization, microstructure evolution and loss of ellipticity*

**Adriana Garroni,** *A multiscale analysis for planar dislocations*

**Franz-Dieter Fischer;** Jiri Svoboda; Klaus Hackl, *Variational Concepts with Applications to Microstructural Evolution*

**Jörg Schröder;** Patrizio Neff; Vera Ebbing, *Recent Results on the Construction of Anisotropic Polyconvex Energies*

**Wednesday, September 24**

**Andrej Cherkaev**, *Bounds for effective properties of multimaterial two-dimensional conducting composites and optimal microstructures*

**Miroslav Silhavy**, *Phase transitions with interfacial energy: interface null lagrangians and interface quasi- and poly-convexity*

**Erwin Stein**; Gautam Sagar, *A Unified Variational Setting and Algorithmic Framework for Mono- and Polycrystalline Martensitic Phase Transformations*

Alexander Mielke; Laetia Paoli; **Adrien Petrov**; Ulisse Stefanelli, *Error estimates for space-time discretizations of a 3D model for shape-memory materials*

**Yves-Patrick Pellegrini**; Christophe Denoual; Lev Truskinovsky, *Variational principle for phase-field models with multi-well potentials*

**Reiner Heinen**; Klaus Hackl, *A lamination upper bound to the free energy of n-variant polycrystalline shape memory alloys*

**Antonio DeSimone**, *Excellent Swimmers*

**Thursday, September 25**

**Georg Dolzmann**, *Application of relaxing methods in materials science: from the macroscopic response of elastomers to crystal plasticity*

**Dennis Kochmann**; Klaus Hackl, *Time-continuous evolution of microstructures in finite plasticity*

D. D. Tjahjanto; **Sergio R. Turteltaub**; A.S.J. Suiker; S. van der Zwaag, *Transformation-induced plasticity in multiphase steels subjected to thermomechanical loading*

**Daniel Balzani**; J. Schröder, *FE<sup>2</sup>-Simulation of Microheterogeneous Steels based on Statistically Similar RVE's*

**Friday, September 26**

**Quoc Son Nguyen**, *On Gradient-Models: Thermodynamical Analysis and General Results*

**Alexander Mielke**, *Construction of solutions for finite-strain plasticity with gradient regularization*

**Olga Dmitrieva**; Dierk Raabe, *Investigation of microstructures in single Crystals: orientation patterning phenomena*

**Khanh Chau Le**; Dennis Kochmann, *A continuum model for initiation and evolution of deformation twinning*

**Report composed by Klaus Hackl**



**08-5 IUTAM Symposium on “150 Years of Vortex Dynamics”**

Lyngby and Copenhagen, Denmark, October 12-16, 2008

**a) Scientific Committee**

H. Aref (Denmark and USA, Chair), M. Brøns (Denmark), G. J. F. van Heijst (Netherlands), S. Kida (Japan), V. V. Meleshko (Ukraine), H. K. Moffatt (UK, IUTAM representative), P. K. Newton (USA)

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

The motivation for the Symposium was to survey advances in vortex dynamics since the publication in 1858 of Helmholtz’s seminal paper “Über Integrale der hydrodynamischen Gleichungen, welche den Wirbelbewegungen entsprechen”. IUTAM symposia in the past have followed the evolution of the field, e.g., “Dynamics of Slender Vortices” (Aachen, 1997), “Tubes, Sheets and Singularities in Fluid Dynamics” (Zakopane, 2001), “Elementary Vortices and Coherent Structures: Significance in Turbulence Dynamics” (Kyoto, 2004) and “Hamiltonian Dynamics, Vortex Structures and Turbulence” (Moscow, 2006). The present Symposium concerned vortices and vortex dynamics in all manner of flows, from laminar to turbulent, cosmic to terrestrial, geophysical to biological, addressed through analysis, experiment and computation. Classical themes and theories are still of interest, e.g., relative equilibria of point vortices now applied to Bose-Einstein condensates, or kinetic theory applied to systems of vortices as a prototype of turbulence. The variety of topics will be evident from the program. The role of vortices in the drag and propulsion of swimming and flying animals, and of falling objects, was explored by a number of attendees and would, undoubtedly, have pleased Helmholtz whose contributions to physiology are well known.

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

The symposium was attended by 108 registered participants and 10 accompanying persons. The scientific participants were from 20 nations: Algeria (1), Belgium (1), Brazil (2), Canada (1), Czech Republic (2), Denmark (14), France (11), Germany (1), Greece (1), Israel (1), Italy (4), Japan (14), Lithuania (3), Mexico (2), The Netherlands (2), Poland (4), Russia (8), UK (6), Ukraine (4) and USA (26). A participant from Bangladesh was unable to secure a visa on time and so did not attend. His seminar/poster presentation was given by the Chair assisted by one of the participants.

**d) Publication of the proceedings**

The proceedings will be published as a special issue of Theoretical and Computational Fluid Dynamics, a Springer journal, and also as a book in the Springer IUTAM proceedings series.

**e) Financial support**

Financial support was provided by: The Center for Fluid Dynamics, Fluid•DTU, at the Technical University of Denmark, Florida State University, Virginia Tech Foundation, and IUTAM.

All funds received from IUTAM were used for the support of younger participants in the Symposium.

**g) Scientific program****Sunday, October 12**

Meet and greet attendees at Kastrup airport; Get-together party at Hotel Strand

**Monday, October 13**

*Opening:* 09:00 - 09:30: Hassan Aref, Keith Moffatt, Vice President of IUTAM, Kristian Stubkjær, Dean of Research, DTU

*Keynote lecture 1:* 09:30 - 10:20 (Hassan Aref, chair)

Darren Crowdy, A new calculus for two-dimensional vortex dynamics

*Lecture session 1:* 10:20 - 11:20 (Slava Meleshko, chair)

Mark Stremler, On the statics and dynamics of point vortices in periodic domains

Kevin O'Neil, Collapse and concentration of vortex sheets in two-dimensional flow

Scott Kelly, Self-propulsion of a free hydrofoil with localized discrete vortex shedding: analytical modeling and simulation

*Seminar session and poster viewing 1:* 11:45 - 12:45 (Keith Moffatt, chair)

1. Vaclav Kolar, On the relationship between a vortex and vorticity
2. Elena Meshcheryakova, New exact solutions in vortex dynamics
3. Milton Lopes Filho, Vortex dynamics in a two-dimensional domain with holes
4. Hassan Aref, Relative equilibria of point vortices
5. Peter Clarkson, Polynomials and soliton equations
6. Laust Tophøj, Chaotic scattering of two identical point vortex pairs
7. Yuko Matsumoto, A moment model for the motion of a dipole in two-dimensional incompressible fluid
8. Irene Gned, The self-induced dynamics of vortex patches
9. Eugene Wayne, A generalization of the Helmholtz-Kirchhoff model
10. Alexey Borisov, Chaotic vibration of the liquid ellipsoid filled with vortical fluid

*Seminar session and poster viewing II: 13:45 - 14:45 (GertJan van Heijst, chair)*

1. Eduardo Ramos, Vortices generated by fixed and free-moving magnets in shallow electrolyte layers
2. Pavlos Vlachos, Kelvin-Helmholtz and Rayleigh-Taylor instabilities during accumulation and dispersion of ferrofluid aggregates
3. Clara Velte, Local helical symmetry of vortices by vortex generators in a low Reynolds number wall bounded flow
4. Georgi Sutyrin, Dynamics of coherent vortices in rotation-dominated flows
5. Philip duToit, Visualizing mixing in geophysical vortices
6. Konstantin Koshel, Background current concept and chaotic advection in an oceanic vortex flow
7. Gregory Reznik, Quasi-geostrophic singular vortices embedded in a regular flow
8. Oleg Derzho, Rotating dipole and tripole vortices in polar regions
9. Tatyana Krasnopolskaya, Modelling of Gulf Stream by the von Kármán vortex street
10. Dmytro Cherniy, The vortex model of circulation flow in sea channel

*Lecture session 2: 14:45 - 15:45 (Mikhail Sokolovskiy, chair)*

Ed Spiegel, Cosmic vortices

Xavier Perrot, Baroclinic vortex interaction in a time-varying flow

Ziv Kizner, Localized shallow-water dipoles

*Lecture session 3: 16:15 - 17:15 (Gregory Reznik, chair)*

Ruben Trieling, Elliptical barotropic f-plane dipoles in a rotating fluid

Mikhail Sokolovskiy, On the instability of elliptic hetons

Xavier Carton, Explosive instability of geostrophic vortices

## **Tuesday, October 14**

*Keynote lecture 2: 09:30 - 10:20 (Alexey Borisov, chair)*

Paul Newton, The  $N$ -vortex problem on a sphere

*Lecture session 4: 10:20 - 11:20 (Ziv Kizner, chair)*

Takashi Sakajo, Motion of a ring structure of coherent vortices on a sphere with pole vortices

Rhodri Nelson, Finite area vortex motion on a sphere with impenetrable boundaries

Keiko Nomura, Asymmetric vortex merger: mechanism and criterion

*Seminar session and poster viewing III: 11:45 - 12:45 (Paul Newton, chair)*

1. Stefanella Boatto, Vortices on closed surfaces
2. Vitalii Ostrovskiy, Platonic and Archimedean solid based point vortex equilibria on the sphere
3. George Chamoun, Von Kármán streets on the sphere

4. Ivan Mamaev, New integrable problem of motion of point vortices on a sphere
5. Adas Jakubauskas (for A. J. V. Milyus), On a question of definition of potential by the vortex motion of a liquid
6. Xinyu He, An example of finite-time singularities in the 3d Euler equations
7. Valery Klyatskin, Sound radiation by vortex motions
8. E. Milyute, A dynamics of a substance in an isolated spherical vortex and its relationship with radiation
9. Sergio Pirozzoli, Vortical structures in turbulence growth
10. Osamu Sano, Collision of a vortex ring on granular layer

*Seminar session and poster viewing IV: 13:45 - 14:45 (Mark Stremler, chair)*

1. Anders Andersen, The vortices in the wake of a falling paper card
2. Kai Schneider, Numerical simulation of falling leaves using a pseudo-spectral method with volume penalization
3. Makoto Iima, Robustness of insect's free-flight in terms of flapping motion and vortex patterns
4. Vasileios Vlachakis, Vortex dynamics of wakes: analysis of the "Domm system"
5. Takeshi Watanabe, Study of vortex flows behind the circular cylinder
6. Hamid Oualli, Vortex flow eddy street behind a circular cylinder superimposed to simultaneous rotation and cross-section variation in uniform flow
7. Grégoire Winckelmans, Redistribution on hierarchically refined grids for Lagrangian vortex element methods
8. Tarun Kumar Sheel, High performance computing technique for vortex method calculations
9. Monika Nitsche, High order quadratures for the boundary integrals governing axisymmetric interface motion
10. Robert Krasny, Lagrangian panel method for vortex sheet motion in 3D Flow

*Lecture session 5: 14:45 - 15:45 (Charles Williamson, chair)*

- Ian Eames, Ghost vortices and disappearing bodies: the concept of momentum and impulse
- Paolo Luzzatto-Fegiz, Determining the stability of steady inviscid flows through preferred bifurcation diagrams
- Oscar Velasco Fuentes, Chaotic streamlines in the flow of knotted and unknotted vortices

*Lecture session 6: 16:15 - 17:15 (Anders Andersen, chair)*

- Sebastian Michelin, Falling, flying, swimming, flapping: understanding fluid-solid interactions using a vortex shedding model

Eva Kanso, Low-order models of swimming in an inviscid fluid

Dmitry Kolomenskiy, Vorticity generation during the clap-fling-sweep of hovering insects

### Wednesday, October 15

*Keynote lecture 3:* 09:30 - 10:20 (Ed Spiegel, chair)

Pierre-Henri Chavanis, Kinetic theory of two dimensional point vortices from a BBGKY-like hierarchy

*Lecture session 7:* 10:20 - 11:20 (Anthony Leonard, chair)

Nicholas Kevlahan, Vortices for computing: the engines of turbulence simulation

Paolo Orlandi, Vorticity dynamics in turbulence growth

Jens Juul Rasmussen, Sharp vorticity gradients in two-dimensional turbulence and the energy spectrum

*Lecture session 8:* 11:45 - 12:45 (Jens Nørkær Sørensen, chair)

Roman Lagrange, Dynamics of a fluid inside a precessing cylinder

Shigeo Kida, Super-rotation flow in a precessing sphere

Fazle Hussain, Mechanisms of core perturbation growth in vortex-turbulence interaction

*Seminar session and poster viewing V:* 13:45 - 14:45 (Morten Brøns, chair)

1. Charles Williamson, Stability of classical flows and new vortical solutions from preferred bifurcation diagrams
2. Leonid Shirkov, Statistical mechanics of shear layers
3. Keita Iga, Statistical theory applied to a vortex street generated from meander of a jet
4. Jens Nørkær Sørensen, Onset of three-dimensional flow structures in rotating flows
5. Bo Hoffmann Jørgensen, Control of vortex breakdown in a closed cylinder with a rotating lid
6. Ziemowit Malecha, Bursting phenomena of boundary layer induced by 2D vortex patch
7. Paul Krueger, Vortex ring velocity and minimum separation in an infinite train of vortex rings generated by a fully-pulsed jet
8. Pawel Regucki, Investigation of vortex ring with finite-amplitude Kelvin waves using 3D VIC method
9. Chris Weiland, The role of vortex ring formation on the development of impulsively induced supercavitation
10. V. Milyuvne, A new look at a vortical dynamics of a substance in the Universe

*Lecture session 9:* 14:45 - 15:45 (Fazle Hussain, chair)

Morten Brøns, Topology of vortex creation in the wake of a circular cylinder

David Fabre, Bifurcations in the wake of axisymmetric objects

Luca Zannetti, About finite area wakes past bluff bodies and growing vortex patches

*Lecture session 10:* 16:15 - 17:15 (Oscar Velasco Fuentes, chair)

GertJan van Heijst, Behavior of a vortex in a time-periodic shear flow

Hiroshi Niino, Structure of a bathtub vortex: importance of the bottom boundary layer

Tomas Bohr, Separation vortices and surface shapes

#### **Thursday, October 16**

*Keynote lecture 4:* 09:30 - 10:20 (Shigeo Kida, chair)

Yasuhide Fukumoto, Global time evolution of viscous vortex rings

*Lecture session 11:* 10:20 - 11:20 (Russell Donnelly, chair)

Stéphane Le Dizès, Viscous ring modes in vortices with jet

Yuji Hattori, Short-wave stability of a helical vortex tube: The effect of torsion on the curvature instability

Anthony Leonard, On the motion of thin vortex tubes

*Lecture session 12:* 11:45 - 12:45 (Yasuhide Fukumoto, chair)

Vladimir Zakharov, Dynamics of vortex line in presence of stationary vortex

Makoto Umeki, A locally induced homoclinic motion of the vortex filament

Yoshifumi Kimura, Self-similar collapse of 2D and 3D vortex filament models

*Lecture session 13:* 13:45 - 14:45 (Yoshifumi Kimura, chair)

Valery Okulov, Applications of 2D helical vortex dynamics

Slava Meleshko, Coaxial axisymmetric vortex rings – 150 years after Helmholtz

Russell Donnelly, Dynamics of vortex rings in viscous fluids

*Keynote lecture 5:* 14:45 - 15:35 (Tomas Bohr, chair)

Thomas Leweke, Vortex pairs

For photos from the Symposium see

<http://picasaweb.google.dk/Hassan.Aref.email/IUTAMSymposium150YearsOfVortexDynamics#>

**Report composed by Hassan Aref**

**08-6 IUTAM Symposium on Progress in the Theory and Numerics of Configurational Mechanics**

Erlangen, Germany, October 20 - October 24, 2008

**a) Scientific Committee**

Paul Steinmann, Marcelo Epstein, Sanjay Govindjee, Vassilios Kalpakides, Reinhold Kienzler, Gerard A. Maugin, Michael Ortiz, Paolo Podio-Guidugli, Miroslav Shilhavy, Ben Freund

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

Configurational mechanics promises high potential in various areas of theoretical and numerical mechanics. Typical applications range from new perspectives in material modelling, optimization of structures at various length scales to impacts in numerical methods like, e.g., mesh adaption or ALE-methods. Moreover, configurational mechanics often offers new and deep insights and interpretations of a variety of aspects related to defect mechanics.

Conceptually speaking common (deformational) continuum mechanics, which gives rise to the familiar notion of (spatial) forces, considers the response to variations of spatial placements of "physical particles" with respect to the ambient space, whereas configurational mechanics, which gives rise to the notion of configurational (material) forces, is concerned with the response to variations of material placements of "physical particles" with respect to the ambient material.

Well-known examples of configurational forces are driving forces on defects like the Peach-Koehler force, the J-Integral in fracture mechanics, energy release and the like. The consideration of configurational forces goes back to the works by Eshelby who investigated forces on defects, therefore this area of continuum mechanics is sometimes also denoted as Eshelbian mechanics.

The symposium was intended to cover recent progress in theoretical and numerical developments and bring together some of the leading researchers in the fields related to configurational mechanics; the computational mechanics as well as the continuum mechanics community. It gave the opportunity to discuss and compare different approaches and stimulated future work.

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

Austria (3), Estonia (3), France (6), Germany (21), Greece (1), Italy (5), Romania (2), Russia (1), Sweden (5), USA (2)

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

Twenty four papers have been submitted for publication in the Proceedings.

**e) Financial supports**

The IUTAM grant for this symposium is gratefully acknowledged. Furthermore Springer, Siemens and the Cluster of Excellence Engineering of Advanced Materials (CEAM) at the University of Erlangen-Nuremberg generously sponsored the Symposium.

**f) Scientific program****Monday, October 20, 2008**

- Maugin, G.A. *On space-time inhomogeneities and dynamic materials*  
Braun, M. *On discontinuities of material momentum and Eshelby stress in hyperelasticity and thermoelasticity*  
Francfort, G. *Material conservation laws for energetic minimizers in elasticity*  
Verron, E. *Some new properties of the Eshelby stress tensor*  
Menzel, A. *On configurational aspects of continuum dislocation*  
Runesson, K. *On the formulation and computation of configurational forces based on the rate of global dissipation*  
Mahnken, R. *On the analysis of stationary and instationary cracks for functionally graded materials with the material forces*  
Scherer, M. *On constraint-based regularization techniques in configurational r-adaptivity and shape optimization*

**Tuesday, October 21, 2008**

- Trimarco, C. *Momentum and material momentum in superconductors*  
Vainchtein, A. *Dynamics of martensitic phase boundaries: Discreteness, dissipation and inertia*  
Cleja-Tigoiu, S. *Dislocation and material forces in second order finite elasto-plasticity*  
Markenscoff, X. *Radiated fields and driving forces on a spherical and a plane moving phase boundary in general motion*  
Materna, D. *A variational framework for dual solutions in the physical and material space*  
Ganghoffer, J.F. *Dynamical solutions of nonlinear compressible elasticity from nonlocal symmetries*  
Eremyev, V.A. *Configurational forces in the theory of two-phase plates*  
Irschik, H. *On configurational formulations in the director theory of rods*

**Wednesday, October 22, 2008**

- Di Carlo, A. *Cauchy's stress as a "configurational" construct*  
Kolednik, O. *J-integrals and driving forces in elastic-plastic materials*  
Danescu, A. *Macroscopic elasticity of nanoporous silicon accounting for bulk and surface effects*



Müller, R.            *Configurational forces associated with defect and microstructure evolution in ferroelectric materials*

**Thursday, October 23, 2008**

Podio-Guidugli, P. *The thermal displacements, from Helmholtz's to the present days*  
Kienzler, R.        *Reciprocity relations in Newtonian and Eshelbian mechanics*  
Berezovski, A.     *Internal variables and generalized continuum theories*  
Mariano, P.M.      *Stratified energies: ground states with cracks*  
Schütte, H.        *Crack curving based on configurational forces and their gradients*  
Agiasofitu, E.     *Conservation and balance laws in higher order gradient elasticity*  
Larsson, R.        *Approaches to dynamic fracture modelling at finite deformations*  
Morgner, C.        *Evaluation of crack driving forces at finite viscoelasticity: Theory and experiments*  
Bargmann, S.      *On configurational forces within Green-Naghdi thermo-hyperelasticity*

**Friday, October 24, 2008**

Hackl, K.            *On various principles for inelastic evolution*  
Lazar, M.            *Conservation and balance laws in the gauge theory of dislocations*  
Kalpakides, V.     *Configurational forces in the macroscopic behavior of ferroelectric materials*  
Mosler, J.           *A variationally consistent approach for crack propagation based on configurational forces*  
Ricker, S.           *Computational homogenization of defect driving forces*

**Report composed by Ingrid Welsing**

**08-7 IUTAM Symposium on Rotating Stratified Turbulence and  
Turbulence in the Atmosphere and Oceans**  
Cambridge, UK, December 8 – December 12, 2008

This workshop/symposium, jointly supported by the Isaac Newton Institute (INI) and the International Union of Theoretical and Applied Mechanics, focused on the fundamental structure of atmospheric, oceanic and planetary circulations, and in particular on the way in which small-scale turbulence collectively organises such flows on large scales. Themes included the emergence of 'jets' or currents and 'eddies' or spinning coherent masses of fluid (vortices), the 'equilibration' of turbulence through the saturation of fluid dynamical instabilities, possible routes to turbulence via natural instability processes (barotropic, baroclinic, inertial, zig-zag, etc), the effect of rotation and stratification on scale cascades (e.g. upscale or downscale energy transfers), the importance or not of gravity-wave emission in turbulent flows, 'balance' or the proximity of geophysical flows to a gravity-wave-free state, state-of-the-art numerical methods for the simulation of turbulent geophysical flows, statistical properties of turbulent mixing and the role of mixing in the formation of coherent vortices, the energetics of ocean dynamics (the role of tides, gravity waves, vortices, surface buoyancy forcing, etc), as well as turbulence in magnetised fluids.

The workshop demonstrated that there is a very rich diversity of ways in which turbulence plays a major part in naturally-occurring fluid flows, and in which researchers seek to understand it. Rotation and stratification clearly complicate matters, by introducing a number of new parametric dependencies, but they also simplify some aspects, by exhibiting an astonishing degree of organisation, consisting of long-lived vortices, fronts, and global-scale circulation patterns like the zonal bands on Jupiter. This is scientifically fascinating, and deeply challenging - it is clear that we are only at the beginning of piecing together the puzzle. The huge interest generated by this workshop is encouraging.

Speakers included many world-leading experts such as Peter Rhines (University of Washington), Jim McWilliams (UCLA), Gregory Falkovich (Weizmann Institute), Fritz Busse (University of Bayreuth), Michael McIntyre (Cambridge), Geoff Vallis (Princeton University), Jack Herring (National Center for Atmospheric Research), James Riley (University of Washington), Jean-Marc Chomaz (Ecole Polytechnique, Paris), and Lord Julian Hunt (Imperial College and former Director of the UK Meteorological Office), who introduced the workshop.

Altogether, there were 60 presentations (40 talks and 20 posters), and the meeting was attended by more than 100 people, of which 86 were official participants in the INI programme. A list of participants is attached together with a copy of the programme of talks. Ample time in breaks and after sessions permitted in-depth discussions, and social occasions like the guided tour and the conference dinner at St John's College allowed participants to relax and get to know each other personally.

The workshop was principally organised by David Dritschel (St Andrews), but with much additional help from Peter Bartello (McGill University), Peter Davidson (Cambridge), Ross Griffiths (ANU, Canberra), Keith Moffatt (Cambridge), Joel Sommeria (LEGI, Grenoble), Kraig Winters (UCSD), Shigeo Yoden (Kyoto University), and - not least - the Isaac Newton Institute staff.

**Monday 08 December**

09:15-09:20 Ben Mestel – Welcome  
09:20-09:30 Hunt, J (UCL)

## Introduction

09:30-10:00 Rhines, P (Washington)  
Eddies and circulation: lessons from oceans, atmospheres and the GFD lab  
10:00-10:30 Thompson, AF (Cambridge)  
Jet formation and transport in baroclinic turbulence with simple topography  
10:30-11:00 Esler, G (UCL)  
The turbulent equilibration of an unstable baroclinic jet  
11:30-12:00 Carnevale, GF (UC, San Diego)  
Inertial instability in rotating and stratified flow  
12:00-12:30 Billant, P (École Polytechnique)  
Zigzag instability of vortex arrays in stratified and rotating fluids  
14:00-14:30 Meunier, P (CNRS)  
Instabilities of a columnar vortex in a stratified fluid  
14:30-15:00 Davidson, P (Cambridge)  
Structure formation in rotating turbulence  
16:00-16:30 Tran, CV (St Andrews)  
Local transfer and spectra of a diffusive field advected by large-scale incompressible flows  
16:30-17:00 Shrira, V (Keele)  
Singular focusing of sub-inertial internal waves on the 'non-traditional' beta-plane  
17:00-17:45 Gong Show

**Tuesday 09 December**

09:30-10:00 McWilliams, JC (UC, Los Angeles)  
Turbulent fluid dynamics at the margins of rotational and stratified control  
10:00-10:30 Bartello, P (McGill)  
Quasigeostrophic and stratified boussinesq turbulence  
10:30-11:00 Scott, R (St Andrews)  
Effects of large-scale energy dissipation in geostrophic turbulence  
11:30-12:00 Falkovich, G (Weizmann Institute of Science)  
Two-dimensional turbulence inside a strong vortex  
12:00-12:30 Sugimoto, N (Keio)

Spontaneous gravity wave radiation from nearly balanced rotational flows in a shallow water system

14:00-14:30 Busse, FH (Bayreuth)

Unusual properties of turbulent convection and dynamos in spherical shells

14:30-15:00 Tobias, S (Leeds)

Angular momentum transport and dynamos in magnetised rotating stratified systems

16:00-16:30 Yoden, S (Kyoto)

Jet formation in decaying two-dimensional turbulence on a rotating sphere

16:30-17:00 Cho, JYK (QMUL)

Magnetohydrodynamic shallow-water turbulence on the sphere

17:00-18:30 Parellel discussion sessions

18:45-19:30 Dinner at Wolfson Court (Residents Only)

### Wednesday 10 December

09:30-10:00 McIntyre, ME (Cambridge)

Beyond Lighthill: three ways to stay close to balance

10:00-10:30 Vanneste, J (Edinburgh)

Inertia-gravity-wave generation: a geometric-optics approach

10:30-11:00 Bustamante, M (Warwick)

Dynamics of nonlinear resonance clusters in atmosphere and oceans

11:30-12:00 Macaskill, C (Sydney)

Vortex simulations of 2D turbulence in confined domains

12:00-12:30 Dritschel, DG (St Andrews)

The hyper-CASL algorithm: an accurate, efficient new approach to modelling complex atmospheric and oceanic flows

### Thursday 11 December

09:30-10:00 Vallis, GK (Princeton)

Is geostrophic turbulence relevant for tropospheric dynamics?

10:00-10:30 Kimura, Y (Nagoya)

Spectral study of stably stratified turbulence

10:30-11:00 Nazarenko, S (Warwick)

Triple cascade and zonal flows in beta-plane turbulence

11:30-12:00 Miyazaki, T (Electro-Communications, Japan)

Equilibrium state of quasi-geostrophic point vortices

12:00-12:30 Carton, X (Bretagne Occidentale)

Influence of external shear and strain on baroclinic vortex alignment

14:00-14:30 Herring, J (N.C.A.R.)

Spectra and distribution functions of stably stratified turbulence

14:30-15:00 Riley, JJ (Washington)

Stratified turbulence: a possible interpretation of some geophysical turbulence measurements

16:00-16:30 Zeitlin, V (LMD-ENS)

Once again about the parallel between stratification and rotation in hydrodynamics and between both and external magnetic field in MHD

16:30-17:00 Sommeria, J (LEGI-CNRS)  
Application of statistical mechanics to the modeling of potential vorticity or density mixing  
17:30-18:30 Parallel discussion sessions

**Friday 12 December**

09:30-10:00 Winters, KB (UC, San Diego)  
Bounds on the energetics and entropy production of a buoyancy forced ocean  
10:00-10:30 Hua, BL (IFREMER)  
Simulations of stratified turbulence surrounding Meddy structures  
10:30-11:00 Lelong, MP (NorthWest Research Associates, USA)  
Internal tide generation from surface tide/geostrophic Eddy interactions  
11:30-12:00 Staquet, C (Joseph Fourier Grenoble )  
Propagation of the internal tide from a continental shelf: laboratory and numerical experiments  
12:00-12:30 Straub, D (McGill)  
2d-3d energy exchanges in a homogeneous thin-aspect-ratio ocean  
14:00-14:30 Caulfield, CP (Cambridge)  
Richardson number-dependent bounds on buoyancy flux  
14:30-15:00 Chomaz, JM (LadHyX)  
Three-dimensional stability of a horizontally sheared flow in a stably stratified fluid

**Report composed by David Dritschell**

**08-8 IUTAM Symposium on Multi Functional Material Structures and Systems**

Bangalore, India, December 10 - December 13, 2008

**a) Scientific Committees**

We should start the report with a sincere thanks to IUTAM for providing us the opportunity to conduct this symposium in Indian Institute of Science, Bangalore, India. We had Assigned Scientific Committee approved by IUTAM and the symposium was also steered by an International Steering Committee. We had very distinguished team of scientists in the International Committee which is chaired by Dr.V.K.Aatre, former Scientific Advisor to Ministry of Defence, Government of India and current visiting Professor, Indian institute of Science, Bangalore who has been championing this field for more than a decade in India. We had a very enthusiastic team as members of the organizing committee which conducted the symposium in a befitting manner.

Chair: Prof. B. Dattaguru, Indian Institute of Science, Bangalore,  
Department of Aerospace Engineering, Bangalore 560 012,  
India, email: datgur@aero.iisc.ernet.in

Members: Christian Boller, Ning Hu, U. Lee, G.R. Liu, KonWell Wang, Norman Wereley

IUTAM Representative: Prof. J. (Jürg) Dual, email: juerg.dual@imes.mavt.ethz.ch

International Steering committee

V.K.Aatre, A.R. Upadhyaya, N.K. Gupta, Kota Harinarayana, D. Banerjee, S. Hanagud, C. Boller, Ed Smith, G. Pratap, M.L. Munjal, F.G.Buchholz, G.R.Liu, V.Adimurthy, J.N. Reddy, I. Chopra, T.S. Krishnamurthy, I.S. Raju, S. Narayanan, C. Venkatesan, Konwell Wang, N. Wereley, B. Dattaguru

National Organizing Committee

Prof.B.Dattaguru, IISc (Chairman), Prof.S.Gopalakrishnan, IISc (Co-Chair), Dr.G.Kamath, NAL, Dr.K.Vijayaraju, ADA, Dr.P.D.Mangalgiri, GM (India) R&D Labs., Prof.R.Ganguli, IISc, Prof.G.K.Ananth Suresh, IISc, Prof.M.Sivakumar, IIT,Chennai, Dr.Mira Mitra, IIT,Powai, Mumbai, Mr.G.Sivagnanam, DRDO, Dr.D.Roy Mahapatra, IISc

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

Past decade witnessed rapid progress in India in the field of Multi-functional Material Structures & Systems. Initiated into this field in 1996 by Dr.V.K.Aatre, the then Chief Controller of R&D, Ministry of Defense, Government of India large number of Scientists

and Institutions developed outstanding research groups in this country. We organized 4 International Conferences and 3 National Conferences in the field of Smart Structures & Systems in a span of 12 years. National Program on Smart Materials was initiated by 5 Government Departments which created competent research groups and also developed critical micro-systems in the past decade in India. Currently this effort is being continued at much higher scale.

IUTAM Symposium on Multi-Scale Material Structures & Systems is very timely. The scale of participation from outside India is a clear indication of the deep interest in International Scientific circles of the developments in India. For Indian Scientists it has become another exposure to focused international group in this emerging field. There are already collaborative programs with Georgia Institute of Technology, Atlanta and University of Arkansas from USA. Similar programs are being worked out with top universities in Europe.

The technical content of the Symposium is at very high level and we hope to bring out highly valuable proceedings.

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

10 Countries: India (51), USA (12), Canada(1), England (1), Wales (1), Ireland (1), France(1), Germany (3), Newzeland (2), Japan (1)

Participants: 74

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

The 46 papers presented at the Symposium will be reviewed by an International review committee and will be published by Springer Verlag. We already had discussions with the publisher and deal has been signed by us and sent to Springer.

It is expected 40-45 papers will finally be published in the proceedings covering various aspects of Multi-Functional Material Structures & Systems. The target for completing the work is by May 2009.

### **e) Financial Support**

The symposium is primarily sponsored by IUTAM and Indian Institute of Science, Bangalore which is the host institution. With IUTAM we understand that Indian National Science Academy is the counter part in India. Further the symposium is also sponsored by Institute of Smart Structures & Systems which is a professional body in India supporting scientists in this newly emerging field. Aeronautics R&D Board, Government of India sponsored and provided a good financial contribution for holding the symposium.

The funds from IUTAM (US \$ 5000) have been used to support several Scientists and a few Ph.D students to attend the symposium and present papers on their current research contributions. This is provided in waiving their Registration fee, providing

accommodation at Bangalore during the symposium and providing transport to pick and drop from Airport.

The symposium was held with the above mentioned financial support and the Registration fee given by the participants. We left enough funding to pay for the proceedings.

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

The IUTAM-MMSS08 Symposium had a wide coverage of New Materials covering Nano-Composites, Functionally Graded Materials and Shape memory Alloys. Multifunctional nature of these materials makes it possible to use them in a wide variety of applications with emphasis on smart concepts and structural health monitoring. The symposium covered engineering aspects of structural health monitoring which is being studied deeply as IVHM (Integrated Vehicle Health Management). The symposium was divided into the following sessions:

Multifunctional Material Systems  
Nano Materials and Composites  
Shape Memory Alloys  
Computational Methods  
Functionally Graded Materials  
Smart Sensors and Structural Health Monitoring  
Applications  
New Materials -I  
Multifunctional Materials

A total of 46 papers were presented and all of them were of outstanding in their content. The presentations were divided into 10 sessions and the sessions were chaired by very distinguished Scientists from India and abroad.

#### **g) Scientific program from December 10-12, 2008**

##### **December 10, 2008**

Multifunctional Material Systems; Chairman: Prof. F.G.Buchholz, Germany

S. Narayanan and V Balamurugan, IIT Madras, Chennai, Functionally Graded Shells with distributed Piezoelectric sensors and actuators for Active Vibration Control  
V.U. Unnikrishnan, G. U. Unnikrishnan and J. N. Reddy, Texas A & M University, USA, Multiscale Computational Analysis of Biomechanical Systems  
C. Boller, M. R. Mofakhami, Fronhofer Institute, Saarland University, Germany, From Structural Mechanics to Inspection Processes - Getting Structural Health Monitoring into Application for Riveted Metallic Structures



Kaushik Mysore and Ganesh Subbarayan, Purdue University, USA, A Theoretical and Computational Framework for Modeling Diffusion-Driver Phase Evolution Problems without Remeshing

H. S. Kushwaha, BARC, Mumbai, Material Damage Modeling Using Multi-Scale Approach

Ning Hu\*, Yoshifumi Karube, and Hisao Fukunaga, Tohoku University, JAPAN, Nanocomposite Strain Sensor from a Polymer/Carbon Nanotube

Nano Materials and Composites; Chairman: Dr. K. Vijayaraju, ADA, Bangalore

D. Bhattacharyya and R. J. Shields, The University of Auckland, New Zealand, Characterisation and Modeling of Oxygen Permeability in Micro-/Nano-Fibrillar Polymer-Polymer Composites

Jayabal K., A. Arockiarajan and S.M. Sivakumar, IIT Madras, Chennai, Multi-axial behavior of ferroelectric single crystals with pressure dependent boundary effects

Mohammed Rabius Sunny and Rakesh K. Kapania, Virginia Tech, USA, A Hysteresis Compensator Based on A Modified Dynamic Preisach Model for Conductive Polymer Nanocomposites

Sujay Deshmukh and Zoubeida Ounaies, Texas A & M University, USA, Active single walled carbon nanotube-polymer composites

Shape Memory Alloys; Chairman: Prof. N G R Iyengar (Rtd), IIT Kanpur

Prakash Mangalgiri and Amol Thakare, GM R & D, Bangalore, Use of SMA Constitutive Model in Finite Element Analysis of Wire-based Actuators

U. Ramamurty, IISc, Bangalore, Structural Fatigue in Shape Memory Alloys

D. Roy Mahapatra, IISc, Bangalore, On the Form of Gibbs Free Energy of Shape Memory Alloys

Ashish Khandelwal and Vidyashankar Buravalla, GM R & D, Bangalore, A Generalized Three Species Model for Shape Memory Alloys

#### **December 11, 2008**

Computational Methods-I; Chairman: Dr. P. S. Nair, ISRO Bangalore

Chandrashekhar Tiwari, Edward C. Smith, Charles E. Bakis, Penn state University, USA, Innovative Energy Absorption and Load Limiting via Extension-Torsion Coupled Stitch Ripping Composite Tubes with Crush Foam Filling

Subramanian Ramakrishnana and Balakumar Balachandran, University of Maryland, USA, Intrinsic Localized Modes and Stochastic Resonance in Micro-scale Oscillator Arrays Subject to Harmonic Excitation and White Noise

Ayech Benejeddou, Supméca – Paris, France, Approximate evaluation of the modal effective electro-mechanical coupling coefficient

B. Banerjee and D. Roy, IISc, Bangalore, A Pseudo-Dynamical Systems Approach for Inverse Problems in Engineering

Prashant Bhise, Abhijit Mukherjee and Sandeep Sharma, Thapar University, Patiala.  
Distributed Point Source Model For Wave Propagation Through Multi-Phase Systems

Functionally Graded Materials; Chairman: Prof. R. Ganguli, IISc, Bangalore

Suresh Shrivastava and Jun Yi, McGill University, Canada, Interface Stresses in  
Bimaterial Rods and Discs, Exact and FE Analyses

Ananth Ramaswamy and Harinadha Reddy, IISc, Bangalore, Time Dependent  
Deformations in Concrete: A Multiscale Approach

Tarun Kant and S.M. Shiyekar, IIT Bombay, Mumbai, Stress analysis of functionally  
graded plates with a higher order theory

Ganapathi M. , T. Prakash, M. K. Singha, Satyam Computers LTd, Bangalore, Nonlinear  
Stability of Functionally Graded Plates subjected to Aero-Thermo-Mechanical Loads

Smart Sensors and Structural Health Monitoring; Chairman: Prof. S. Mohan, IISc,  
Bangalore

S. Mahadevan, G. Biswas, G. Bartram, and S. Shankaraman, Vanderbilt University,  
USA, A Multi-Level Model-based Approach for System Health and capability  
Assessment

Satish Nagarajaiah, Zhiling Li, B.H. Koh, Rice University, USA, Sensor Failure  
Detection using Interaction Matrix Formulation: Direct and Indirect Approach

Sondipon Adhikari and Michael I. Friswellz, University College of Swansea, Swansea  
UK, Shaped Modal Sensors for Uncertain Dynamical Systems

G. K. Ananthasuresh, IISc, Bangalore, Mechanics-based Topology Optimization of  
Manufacturable Microsystems

Rudra Pratap, IISc, Bangalore, Resonant MEMS Sensors and Actuators

Applications; Chairman: Dr. B. R. Somashekar, NALTECH Bangalore

Srinivas N Nampy, Edward C. Smith, Charles E. Bakis, Penn state University, USA , An  
Innovative Structural Design Concept For Heavy Lift Rotor Blades

S. Rao\*, S. Banerjee, K. Jayaraman and D. Bhattacharyya, University of Auckland, New  
Zealand, Compressive Behaviour of Fibre Reinforced Honeycomb Cores

S. Raja, NAL, Bangalore, Design and Development of Smart Composite T-Tail for  
Transport Aircraft

B.M. Dawari and P.C. Pandey, IISc, Bangalore Strain-Space Solution for the Elasto-  
plastic analysis of Adhesively bonded single lap joint

### **December 12, 2008**

New Materials –I; Chairman: Prof. T.S. Ramamurthy, IISc, Bangalore

Baldev Raj and P. Chellapandi, IGCAR, Kalpakkam, Materials And Manufacturing:  
Modeling And Validation For Components Of Fast Reactors

S. Hanagud, X.Lu and R. Zaharieva, Georgia Institute of Technology, USA, Multi-scale models for Multi-Component High Density and High Energy Structural Energetic Materials

Ramana M. Pidaparti, Virginia Commonwealth University, USA, Multifunctional Structural System Mimicking a Supramolecular Complex

Prasad Potluri and Robert J Young, University of Manchester, UK, Manufacturing routes for hybrid multi-functional materials

Prashant Kumar Srivastava and Kartik Venkatrama IISc, Bangalore, Effect of magnetic field on stress-strain behavior of magneto-sensitive elastomers

Multifunctional Materials; Chairman: Prof. C.R.L. Murthy, IISc, Bangalore

Ramesh Talreja, Texas A & M University, USA, On Multi-scale modeling of multi-functional composite structures

Mahesh V. Hosur, Merlin Theodore, Shaik Jeelani, Tusgae University, USA, Effect of Functionalization on the Morphology, Cure Kinetics and Mechanical Behavior of Thermosetting Polymers

Abir Chakraborty, GM R & D, Bangalore, Dynamic Behavior of Porous Piezoelectric Material

K N Shivakumar et. al North Carolina A & T University, USA, Electrospun Nanofabric interleaving to enhance Toughness of Composite laminates

V. L. Sateesh, C. S. Upadhyay and C. Venkatesan, IIT Kanpur, A study on Polarization-Electric Field (P-E) Nonlinearity in Smart Composite Structures

Computational Methods-II; Chairman: Dr. R.Balasubramaniam, Bangalore

S. Schmauder, A. Siddiq, Institut für Materialprüfung, Werkstoffkunde und Festigkeitslehre (IMWF), Germany, Multiscale Simulation of Metal/Ceramic Interface Fracture

Ananth Kumar and Ranjan Ganguly, IISc, Bangalore, Isospectral Rotating and Non-Rotating Beams

A. Sharany and Mira Mitra, IIT Bombay, Mumbai, Force reconstruction for wave based damage detection

Sundararajan Natarajan, Stephane P. A. Bordas and Roy Mahapatra, (institution missing) Germany, On numerical integration of discontinuous approximations in partition of unity finite elements

**Report composed by Bhagavatula Dattaguru**

## Report of the IUTAM Summer School held in 2008

### Report on the IUTAM - CISM Summer School on Advanced Integral Equation Methods in Computational Mechanics

Udine, Italy, July 07 - July 11, 2008

The aim of this course was to present some recent advances in the field of integral equation methods in computational mechanics.

A major progress accomplished over the last few years, with considerable impact on applications, has been the formulation of fast solution methods, which overcome the limitations caused by fully-populated matrices and heavy numerical integration in traditional BEM techniques and allow to run million-DOF problems on ordinary computers. Hence, considerable attention was devoted in the present proposal to this topic. Many current applications of integral equations are made within BEM-FEM coupled formulations and/or address coupled multiphysics problems, as was evidenced in some of the lectures. Another rapidly advancing area of computational mechanics, namely that involving stochastic modelling, was also addressed, within the general scope of this session. The integral-equation treatment of continuous and discrete periodic media, which has important applications in the computational mechanics of materials, was also presented. Finally, integral equation formulations for elastic wave propagation were shown to be instrumental in the definition of new wave-based imaging techniques of elastic media.

The topics actually presented at the course (arranged by lecturer) essentially followed the previously-announced plan, and consisted of:

- 6 lectures by Marc Bonnet on: background on integral equation formulations (so that all other lecturers could take advantage of this review for their lectures); the Fast Multipole method for elliptic (potential, elastic) problems; a detailed overview of other acceleration strategies for boundary element methods.
- 5 lectures by Bojan Guzina on: background on wave propagation in elastic and viscoelastic media; integral formulations for such problems; non-iterative methods (based on topological sensitivity or linear sampling) for wave-based imaging of buried objects.
- 6 lectures by Didier Clouteau on stochastic coupled FEM-BEM formulations: summary on random variables and fields; BIE / BEM with random loads (linear filtering theory); BIE with random boundary conditions; coupling of BEM with stochastic FEM; integral equation formulations in random media (mean field theory, radiative transfert, solution methods).
- 6 lectures by Naoshi Nishimura on Fast Multipole methods for wave problems: 2-D and 3-D Helmholtz and frequency-domain elastodynamics (low-frequency formulations, diagonal form-based formulations for higher frequencies); 2-D scattering of waves by periodic media; time-domain 3-D elastodynamics.
- 6 lectures by Gregory Rodin on: integral equation formulations and acceleration strategies for periodic media; Green's function and boundary algebraic equations for discrete lattices; outlook on new acceleration strategies.

- 6 lectures by Attilio Frangi on: fast integral equation techniques for MEMS and electro-mechanical systems; simulation of Stokes fluid flow with applications to the analysis of damping in MEMS; fast BEM-FEM coupling for industrial applications in magnetostatics.

The lecturers agreed to write one chapter each towards a book in the CISM series, with the course coordinator serving as guest editor of the book.

The course attendance was about 20, from very diverse institutions and countries. Most of the attendees were young, either doctoral students or researchers in the early stages of their career.

**Report composed by Marc Bonnet**

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## Reports of the IUTAM Working Parties

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

We have been “meeting” by email for the past several months to discuss topics within the general areas of non-Newtonian Fluids and Rheology that would be appropriate for (1) IUTAM Symposia, (2) Minisymposium Topics for ICTAM 2012, and (3) Prenominated Session Topics. Our general goal is to increase the visibility and participation of the active researchers in this area in IUTAM and the ICTAM Congress, and promote cooperation between IUTAM and the International Committee on Rheology. We have had one minor success in the latter area, in that we have avoided direct overlap of the International Congress of Rheology to be held in Lisbon from August 5-10, 2012 and the ICTAM Congress in Beijing.

**Report composed by Gary Leal, Chair of WP-1**

### WP-2 - Dynamical Systems and Mechatronics

#### Definition

The synergetic integration of physical (mechanical) systems, decision making and information technologies in design, manufacture and operation of plants, structures, machines or processes with respect to system dynamics and control and with the goal of better system performance. Generally, dynamics is a system science par excellence, undeniable for system design and overall layout of any technical system, and thus the first step after construction in the product development process.

#### Characterisation

Physical (mechanical) systems of concern are mainly assemblies of subsystems with measurable and sometimes predictable behavioural properties, the latter through models and their correct mathematical representation. The process of modelling physical, or more specifically mechanical systems definitely is more an art than a science and follows aspects like engineering experience and intuition. This process is the main key for a success in a sense, that the model should represent reality as good as possible.

Mechanical and mathematical models for components and subsystems are hugely developed, but experimental verification is often very poor or non-existent. This is already true for components; it is the truer for large systems. Therefore we obviously still have a need for new requirements. Multibody system analysis software has made many analyses of large systems relatively straightforward but distributed flexibility, variable boundaries and time-varying features continue to pose problems. Analytical solutions, even in an approximate sense, are only possible for smaller or for linear systems giving

some insight in parameter dependencies, but, in general, they do not extend to systems of both high order and of difficult and generally nonlinear forms. Modelling becomes worse for continuum systems governed by partial differential equations, and in spite of many nice mathematical concepts their combination with control and information technologies is still extremely difficult, both, theoretically and practically. The problems with respect to parameter dependencies, to sensitivities concerning initial conditions and to steady state numeric include many open questions.

On the other hand, numerical solutions are generally achievable and, as computers become more powerful, they become less costly to obtain. Modelling and simulation are at the core of contemporary studies for systems analysis. Capability in analysis naturally leads to (virtual systems) optimisation and later to optimal system synthesis. Evaluating large systems including a physical (mechanical) subsystem of large order and including further on large control and decision making subsystems usually requires today co-simulations of very large computer codes with all the problems of numerical stability and integration algorithms. First order models of even complex systems may be quite easily obtained and solved but they may not be useful practically. At least from an engineering point of view a strict correspondence of theory and practice is mandatory. Very detailed and accurate models are likely to be needed for practical purposes, which require a deep physical understanding of the system under consideration.

The most relevant information technology is from control theory, which is very highly developed. Much contemporary work involves the application of advanced topics in control, optimal control, nonlinear control with constraints, robust control, predictive control and the like to systems of ever increasing complexity. A recurring theme is "how should one deal with such increasing levels of complexity?". The control theory itself does not answer to this question. Mechatronics addresses issues important in implementing control laws provided by the theory on actual systems by utilizing digital signal processors, sensors and actuation devices. In trying to optimise systems, studies must address not only control issues but also issues of reliability, fault tolerance and failure modes. This indicates an aspect of system design, which will be with us for ever. In this sense, mechatronics is nothing but the best practice for designing systems.

From the methodical standpoint of view more and more elements from differential geometry, differential forms, topology and set theory, to name some important ones, enter the treatment of dynamical problems. This is of course not new considering the basics of dynamics and control theories, but the extent and especially the extent with respect to practical solutions is new. Many new solutions and also many new insights could be developed on the basis of modern and partly quite abstract mathematical findings. Very innovative and new fields might emerge from a closer cooperation of engineers and mathematicians.

An application field but still very closely connected with the basics of dynamics and control emerges from the worldwide bionic or bio-mimetic research, which as a matter of fact includes all areas of physics and chemistry. Seen from the mechanics standpoint of

view we mean locomotion and actuation of biological and bio-inspired technological systems in any environment, like fish, bacteria, insects or walking systems. This requires mostly a sophisticated dynamics and control description, and above all, new aspects of the mechanical and physical models. The community is definitely growing.

Mixed hardware and software systems are of interest, for example in the case of “hardware-in-the-loop” tests. In such cases, devices with more complex and uncertain behaviour are included in system studies as they are, with interfacing to the remaining “virtual” system. An important sub-class of uncertain systems concerns the human operator. Man-machine interaction problems demand special treatments of the human component.

Research areas with a good future

Dynamics and control of large systems in connection with system design.

New control concepts and theories, relevant applications.

Transfer of new developments and research findings of modern mathematics into all fields of engineering sciences relevant to dynamics and control.

Geometrical methods in dynamics and control theory and applications.

Dynamics and control of multibody systems including distributed flexibilities, additional bilateral and unilateral constraints of non-smooth character.

Non-linear vibration advances and applications.

Mathematical advances with application to high order nonlinear systems, including also systems of practical significance.

Advancement of techniques for modelling difficult system features like impacts, energy dissipation in structures and assemblies through friction and hysteresis, hydraulic flows, high frequency effects (waves, rate dependent material properties) etc.

New methods for control of mechanical and mechatronic systems.

Properties of MBS-topology as a basis for solving the inverse problem of going from the requirements directly to a technical solution by combining dynamics and design.

Simultaneous optimisation of system design and control.

Advancements in parameter identification and state estimation.

Methods for dealing with ever increasing system complexity of integrated



mechatronical systems including physics (mechanics), control and information technologies.

Methods for faster, more accurate, more reliable numerical solution of describing equations, parameter optimisation, large system synthesis etc. This includes also methods for capitalising on problem features like multi-time-scale dynamics.

Man-machine interaction problems – car driving, bike riding, aircraft piloting, pilot induced oscillations, pilot – helicopter interaction failures.

Application studies in robotics, space exploration, transportation, micro-systems especially medical and computational, mechatronic “smart” structures, power transmission, machine optimisation and synthesis, but also in biological and bio-inspired fields.

**Report composed by Friedrich Pfeiffer, Chair of WP-2**

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

Three members of the Working Party (Allix, Herakovich and Kyriakides) met in Adelaide, Australia, during ICTAM2008. The past activities of the Working Party were reviewed and plans for the future were initiated. These plans include:

- promoting minisymposium in cooperation with other association at the occasion of major international events
- exchange about possible challenging topics in the field in order to promote one or two IUTAM symposia as soon as possible

Olivier Allix (France) became Chair of the Working Party in November, 2008. Other members are: Carl Herakovich (USA), Tatsuo Inoue (Japan), Stelios Kyriakides (USA) and Yulong Li (China).

**Report composed by Olivier Allix and Carl T. Herakovich, Chairs of WP-3**

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

No report has been submitted on WP-4.

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

The main computational event of 2008 was the joint 8th World Congress on Computational Mechanics – WCCM8, and 5th European Congress on Computational

Methods in Applied Sciences and Engineering – ECCOMAS (Venice June 30-July 4). This meeting knew an exceptional success:

- 2916 registered participants from 61 countries
- 3457 abstracts submitted, 2583 papers included in the program after the review process.

The next important meeting for the computational mechanics community will be the next US National Congress on Computational Mechanics – UNSCCM10, Ohio July 16-19, 2009. The 2008 meeting of WP5 took place on July the 1st in Venice during the IACM/ECCOMAS Congress. All the members except T. Oden were present. First the WP discussed the rapid evolution and its great success at Venice of what is called “Computational Mechanics” today and potential important issues for the IAUM/IUTAM to promote. The WP agrees fully with the updated definition given by Tinsley Oden, which could be recalled here: “Mechanics is the study of the motion of bodies under the action of forces. It encompasses virtually every phenomenon in the physical universe, from the deformation and flow of solids and fluids, to the motion of electrons around the nuclei of atoms. Computational mechanics is the science and technology concerned with the use of computational methods and devices to study problems of mechanics. It is more than a science, for it includes as its mission the prediction of physical events governed by the laws of mechanics. It is, thus, the principal tool of engineering. Within its domain are the study and prediction of events on all scales, from the atomic and molecular to the galactic. Computational mechanics is a remarkably rich, challenging and important discipline in engineering and applied science, which has enriched virtually every aspects of human existence”.

Among the few joint IACM/IUTAM pressing issues, one can display at least one: “Model verification and validation” which could be the topic of one of next ICTAM minisymposia. For fostering the synergy between IACM and IUTAM, the WP has stopped on the idea to organize an IUTAM/IACM symposium following the IUTAM rules with some suggestions for the place, the date and the title. A decision should be done at the end of 2009. To promote Computational Mechanics in Mediterranean countries has always been a concern of WP5 thanks to E. Arantès e Oliveira. It seems that a number of Academia of Mediterranean countries, led by the French Academy of Sciences, launched an initiative (Parmendies) of inter-mediterranean cooperation. According to the meeting held in Paris, some of the already existing financial tools, like Tempus, Erasmus Mundus, etc, as well as the 7th Framework Programme, can provide grants for young scientist, and for research projects as well. Summer schools in fundamental science can also be covered by the Framework Programme. Institutions like CISM can play thus an important role. Computational Engineering may well be one of the fields covered by this initiative. E. Arantès e Oliveira is very optimistic.

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

**WP-6 - Biomechanics**

Biomechanics, the subject area of WP-6, is continuing to grow in strength and the year 2008 demonstrated a great deal of activity. One highlight in 2008 was the IUTAM Symposium on "Cellular, Molecular and Tissue Mechanics", which was held in Woods Hole, Cape Cod, Massachusetts, during June. The Symposium, organized by K Garikipati and E Arruda, consisted of 40 oral presentations and 20 posters and attracted 100+ participants who specialize in the application of mechanics in the study of biological systems at the molecular, cellular or tissue level. The Symposium built upon a previous IUTAM Symposium held in Graz, Austria, in 2004, by shifting the emphasis to include the cellular and molecular scales where the success or failure of biological organisms seems to be largely dictated. The conference proceedings will be published by Springer Science and Business Media. The next IUTAM Symposium in this area is to be on "Computer Models in Biomechanics: From Nano to Macro" and will be held in Stanford, USA in 2011.

The number of graduate students and young researchers in the area of biomechanics is increasing and it is observed that students working in biomechanics are particularly enthusiastic, and contribute to a stimulating atmosphere. One specific example here mentioned was the Summer School on "Modeling and Computation in Biomechanics" held at Graz University of Technology, Austria in September 2008 (coordinated by GA Holzapfel and RW Ogden). The aim of the Summer School was to present a state-of-the-art introduction to biomechanical modeling and computation at different length scales. The emphasis was on the nonlinear behavior, embracing models of molecular dynamics, single filaments, network structures, the cytoskeleton and the nucleus. Multiscale and continuum models for soft tissues including arteries, aortic valves, cartilage and the cornea were also presented. The course was attended by 87 participants (including professors and postdoctoral researchers, but mainly PhD students) in mechanical and civil engineering, applied mathematics, physics, biomedical engineering, bioengineering, and materials science, representing 24 countries. The Summer School was a great success and it has been decided to run it every other year in Graz.

In the following, selected events on Biomechanics in 2008 are listed where IUTAM-members has been strongly involved. One category lists events devoted to Biomechanics, while another lists conferences and meetings which were not specifically devoted to biomechanics, but included keynote or plenary lectures and minisymposia on Biomechanics.

- Conferences, meetings, workshops and schools devoted to Biomechanics:

Conference on "Reproductive Bioengineering 2008", Werns im Pitztal, Austria, April 1-5, 2008 (co-organized by Ch Brezinka, H Fritsch, GA Holzapfel, GM Pinggera, I Virgolini, L Wildt).

IUTAM Symposium on "Cellular, Molecular and Tissue Mechanics", Woods Hole, Cape Cod, Massachusetts, USA, June 18-21, 2008 (organized by K Garikipati, E Arruda); 40 oral presentations, 20 posters, 100+ participants.

ASME Summer Bioengineering Conference 2008, Marco Island, Florida, June 25-29, 2008.

16th Congress of the European Society of Biomechanics. Lucerne, Switzerland, July 6-9, 2008.

Summer School on "Modeling and Computation in Biomechanics", Graz, Austria, September 15-19, 2008 (coordinated by GA Holzapfel, Graz, Austria and RW Ogden, Glasgow, UK); 87 participants from 24 Nations.

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

Mechanics of microstructured solids: cellular materials, fibre reinforced solids and soft tissues. EUROMECH-MECAMAT Conference No. 11, University of Torino, Italy, March 10-14, 2008 (co-organized by J-F Ganghoffer and F Pastrone).

Within this conference one specific topic was the biomechanics of soft tissues: anisotropy modeling, growth and instabilities.

79th Annual Meeting of the International Association of Applied Mathematics and Mechanics (GAMM), Bremen, Germany, March 31-April 4, 2008.

One Plenary Speaker on "Biomechanics of bone: from molecules to patients" (Ph Zysset); several Short Communications on "Biomechanics" (organized by GA Holzapfel, St Reese).

2008 World Congress on Computational Mechanics (WCCM), Venice, Italy, June 30 – July 4, 2008.

At the World Congress there was a very strong track on biomechanics in form of several Mini-Symposia such as:

- o "Biofluids and Coupled Problems in Biomechanics" (organized by W Wall, M Behr, M Pasquali, A Figueroa).
- o "Biological Cells and Capsules" (organized by T Ishikawa, D Barthes-Biesel, P Vlahovska, T Yamaguchi).
- o "Computational Modeling in Bone Mechanobiology" (organized by J Manuel Garcia-Aznar, D Kelly, M Doblaré, P Prendergast).
- o "Computational Modeling in Cardiovascular Mechanics" (organized by GA Holzapfel, JD Humphrey, CA Taylor, DA Vorp).

XXII International Congress of Theoretical and Applied Mechanics (ICTAM), Adelaide, Australia, August 24-30, 2008.

One pre-nominated session on “Biomechanics” (organized by St Cowin, R Ethier).

Society of Engineering Science, 45th Annual Technical Meeting, University of Illinois at Urbana-Champaign, October 12-15, 2008.

Among several specialized talks in biomechanics in general sessions there was also “The 4th Symposium on Mechanics of Soft Materials and Tissues” (organized by TD Nguyen, HJ Qi), with 26 presentations, in addition to several MiniSymposia devoted to biomechanics-related topics such as:

- o “Engineering Mechanics of Biologically Inspired Products and Structures” (organized by AK Ghosh, EN Brown).
- o “Mechanobiology of Cell-Extracellular Matrix Interactions” (organized by AW Johnson, B Harley, T Saif, N Wang).
- o “Microstructure and Properties of natural and Synthetic Biomaterials, Biocomposites, and Interfaces” (organized by AW Johnson, B Harley).
- o “Multiscale Modeling in Biological Problems” (organized by Y Gorb, L Berly, JR Walton).
- o “Orthopedic Bioengineering – Nano to Device Level” (organized by T Goswami, OK Muratoglu, D Banerjee).
- o “Dynamics of Biomechanical Processes” (organized by E Hsiao-Wecksler, H Dankowicz).

**Report composed by Gerhard Holzapfel, Chair of WP-6**

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

After decades of efforts, nanotechnology and nanoscience evolve from synthesis nanomaterials and of nanostructures to fabrication of integrated devices and system. Nanomechanics, as a theoretical basis of such a progress, also changes focuses into system-level nano-engineering after understandings of their physical and chemical properties. Here we review some of the most promising works on nanomechanics that were reported in year 2008.

#### **1. Nanoscale friction**

Continuous progresses have recently been achieved in the field of nano-friction, the importance of which arises drastically because of the established micro/nanomechanical devices. However up to now, our knowledge on this classical issue can't help to design materials with desired friction properties. The inconsistency between conventional Amonton's law and recent experimental observation at nanoscale is also asking for a new understanding. Atomistic simulation and experiments [1] have shown that for macroscopically smooth surfaces in contact, the atomistic roughness results in a friction force proportional to the atoms interacted, rather than the overall contact area.

Surprisingly, even at the atomistically smooth contact interfaces like graphene layers in graphite or multiwalled carbon nanotubes, the friction force, and energy dissipation with respect to the relative motion between adjacent graphene layers is much severer than can be neglected. Unlike conventional theory, the friction force and energy dissipation can hardly be correlated in these structures. The friction force that is introduced through interlayer van der Waals interaction is small and can be tuned through lattice registry [2]. While the energy dissipation can't be directly evaluated through the work done by friction force. Phonon excitation has been reported to be responsible for the strong damping [3] so that new notion of the friction force is required. The strong energy dissipation limits life-time of nanoscale mechanical devices to the order of nanoseconds. Understanding of the dissipation process from a nonlinear dynamics point of view and practical techniques to reduce the damping are to be addressed [3].

## **2. Nanomechanics for nanoelectromechanical systems**

Nanoelectromechanical systems, manipulating electrical and mechanical signal and operation, hold the promise for next-generations of future electronics, energy industry and biomedical applications. The outstanding elastic properties and van der Waals binding in graphite and multiwalled carbon nanotubes have inspired novel nanoelectromechanical devices like high frequency oscillators [4] with high quality factors, self-constrained torsional device [5], self-sustaining ultrahigh-frequency nanoelectromechanical oscillators [6], switched capacitor based nanoscale memory cell [7] and thermal gradient driven motors [8]. The design and applications of these devices have posed several mechanical questions to be addressed in the near future, for example (1) How to incorporate both the mechanical and deformation sensitive electronic properties of components in the theoretical model? (2) How do the quantum phenomena affect in the ultra-small scale and low temperature? (3) How to investigate the dynamical process of nano-devices that are working far away from thermodynamics equilibrium?

## **3. Flexible electronics**

Stretchable electronics, also known as elastic electronics or elastic circuits, is a cutting-edge technology to build electronic circuits by depositing electronic devices on flexible substrates or embed them completely in a deformable material such as silicones or polyurethanes. Recently there have been significant advances in the fabrication of thin film materials for flexible electronics applications, including stretchable displays and simple computers that wrap around furniture [9], thin, transparent, flexible speakers from carbon nanotubes [10] and electrical circuits that have performance equivalent to their rigid counterparts [11]. In these devices or materials, mechanics [12], especially nonlinear large deformation elasticity and elastic stability [13] becomes the key theories to design and model their performance.

#### 4. Mechanical properties of extreme materials

With the highest axial stiffness and strength in any known materials, carbon nanotubes have already attracted much attention for structural engineering applications, for example carbon nanotubes is the only material available for space elevator use because of their ultra-high strength and low specific density. However the weak inter-tube interaction results in ultra-low shear performance. Multiwalled carbon nanotubes with mean fracture strength higher than 100 GPa was reported in this year, which exceeds earlier observations by a factor of approximately three. The effects of various irradiation-induced cross-linking defects on load sharing between the shells were also investigated [14]. As an extremely thin membrane material, monolayer graphene has also presented extraordinary mechanical properties [15]. The resistance to fatigue and chemical environmental pave the way for designs of far more robust, newer, safer materials.

#### 5. Single-molecular mechanics and nano-bio-mechanics

Mechanical concepts and behavior under external loading such as stretching, compression, bending and twisting have been applied at the single molecule level, with applications in the understanding of bio-macromolecules behavior and bio-medical applications. Atomic force microscopy produced great opportunities in nano-bio-technology from imaging technique to a multifunctional “lab-on-a-tip” [16]. Computer simulation has also been widely conducted at the molecular or microscopic level. The concepts in mechanics such as deformation, fracture and failure have been utilized to treat observed phenomena [17, 18] and understand biological process. The studies on deformation and failure of protein materials in physiologically extreme conditions can finally help to understand and treat diseases and design of biomaterials for drug delivery, tissue engineering and medical diagnostics [19].

#### 6. Nano-fluids

Several stimulating conferences were held on Nano-fluids. For examples, Microfluidics and Nanofluidics Conference 2008. 21 - 24 February 2008, Cancun, Mexico, Organised by Andrew Mello, with 10 plenary speakers and 565 delegates; Control of Micro and Nanoscale Fluid Flows, June 24 - 25, 2008, at Lyon, France, the French organisers were Dr Catherine Barentin and Dr C. Cottin-Bizonne from the University of Lyon; the New Zealand organiser was Dr Shaun Hendy; Computational Nanofluidics, 2 - 5 September, 2008, CECAM, Lausanne, Switzerland, Organised by Donal MacKernan, Nick Quirke, Vlad Sokhan and Gerhard Hummer.

(WP7 thanks Prof. QS Zheng and Dr. ZP Xu in preparing part of the report.)

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**Report composed by Wei Yang, Chair of WP-7**

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

No report has been submitted on WP-8.

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

Some members of IUTAM Working Party #9 on Education in Mechanics and Capacity Building had the opportunity to meet in person during the Adelaide Congress in 2008. Other than that all business was conducted by e-mail. By action of the Bureau, Keith Moffatt was added to our membership since several of his recent activities are very much in line with the charge to WP#9. The activities of the Working Party are currently focused on the following issues:

1. Proper representation of the topic of education in mechanics at IUTAM congresses  
A pre-nominated session, FS08, on education in mechanics was held at ICTAM2008 in Adelaide. The session was co-chaired by Carl Herakovich (USA) and Igle Gledhill (South Africa). As contrasted with the first such session at ICTAM2004 in Warsaw, the sessions in Adelaide did not attract nearly the same level of attendee interest. Since having sessions on educational issues is valuable, we obviously have some work to do to make these attractive. The Working Party welcomes suggestions on how to achieve this. On the practical side, we currently treat the education session a bit differently than other sessions. In general, the rule at an IUTAM congress is that each author may present only



one paper in one of the pre-nominated sessions. However, the Congress Committee currently allows an author to present a paper on education in mechanics in addition to another "technical" presentation in one of the other sessions. Members of WP#9 are in favor of the current arrangement. Opinions from others on whether this policy is appropriate for the future would be valuable.

#### 2. Associate membership of IUTAM; recruitment of new adhering organizations

The proposal to allow a category of membership that is preliminary to full membership, in the hope that this would induce countries that are not currently members of IUTAM to "test the waters" as a step to full membership, was passed by the General Assembly in Adelaide. The new category is called associate membership. The Working Party sees this initiative as important to broadening the reach of IUTAM and, hence, to building capacity worldwide in mechanics. Members of the Working Party are charged with engaging colleagues in discussions on this issue.

In connection with the discussion regarding associate membership Keith Moffatt, former president of IUTAM, contacted a number of individuals in countries that are members of ICSU, that have a significant effort in mechanics within their research portfolio, but that are not members of IUTAM. This recruitment initiative is continuing. A very welcome development in Adelaide, in which WP#9 played a catalyzing role, was the application of Mexico to join IUTAM. This application was approved by the General Assembly and Mexico is now a member of IUTAM with Prof. Eduardo Ramos as the delegate to the General Assembly. Also Brazil increased its number of delegates in the General Assembly, again a most positive development.

#### 3. Spring School on Fluid Mechanics and Geophysics of Environmental Hazards

An initiative to approach ICSU, jointly with IUGG, for a grant to conduct a capacity-building school in Asia and the Pacific Region on the fluid mechanics and geophysics of environmental hazards was successful; the school was held 19 April - 2 May, 2009, at Institute for Mathematical Sciences, National University of Singapore. Keith Moffatt was the main organizer of this event. Hassan Aref (chair WP#9) and Paul Linden (chair WP#8) served on the International Scientific Committee. 38 graduate students from 12 countries of Asia and the Pacific Region were supported by travel and subsistence grants. For full details, see the website at <http://www.ims.nus.edu.sg/Programs/09fluidss/index.htm>

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

## ICTAM 2008 Adelaide

### **Local Organizing Committee:**

President and Chairman: Ernie Tuck

Secretary General: Jim Denier

The 22nd International Congress of Theoretical and Applied Mechanics (ICTAM2008) was held in Adelaide, Australia, over the week of the 24th to the 29th of August 2008. The Congress was organized by the University of Adelaide and the Flinders University of South Australia. The Congress venue was the Adelaide Convention Centre, set on the bank of the beautiful Torrens Lake in the heart of Adelaide. The meeting's scientific program consisted of plenary opening and closing lectures, sectional lectures, mini-symposia, and contributed papers presented in lecture and seminar presentation sessions. These covered all aspects of mechanics. There were also two additional lectures, the Batchelor Prize Lecture and the Rodney Hill Prize Lecture.

### **Special Lectures, Mini-Symposia and Pre-nominated Sessions**

#### ***Opening Lecture:***

John Hutchinson (USA): The role of mechanics in advancing thermal barrier coatings

#### ***Closing Lecture:***

Jorg Imberger (Australia): Physical limnology: advances and future challenges

#### ***Batchelor Prize Lecture***

Howard Stone (USA): Interfaces: in fluid mechanics and across disciplines

#### ***Rodney Hill Prize Lecture***

Michael Ortiz (USA): Nonconvex plasticity and deformation microstructures

#### ***Sectional Lecturers***

Davide Bigoni (Italy) - Material instabilities in elastic and plastic solids

Hugh Durrant-Whyte (Australia) - Maximal Information Systems

David Elad (Israel) - Biomechanical aspects in human reproduction

Norman Fleck (UK) - Micro-architected solids - from blast resistant structures to morphing wings

Narinder Gupta (India) - Plasto-mechanics of large deformation under impact loading

Sascha Hilgenfeldt (USA) - Cellular matter: interfacial mechanics and geometry

Wen Rui Hu (China) - Onset of oscillatory thermocapillary convection in a floating half zone

Fazle Hussain (USA) - Nonlinear transient growth on a vortex column

Oliver Jensen (UK) - Instabilities of flows through deformable tubes and channels

Detlef Lohse (The Netherlands) - Bubbles in micro- and nano-fluidics

Olivier Pouliquen (France) - From dry granular flows to submarine avalanches

David Quéré (France) - Capillary constructions

John Rudnicki (USA) - Failure of rocks in the laboratory and the Earth

Jens Sørensen (Denmark) - The aerodynamics of wind turbines

Nancy Sottos (USA) - Mechanics of self-healing materials systems: from microcapsules to microvascular networks to mechanochemistry

Peter Wriggers (Germany) - Characterization of heterogeneous materials by multi-scale simulations

Toshio Yamagata (Japan) - Indian Ocean dipole and its possible link with climate modes in the Pacific

### *Mini-Symposia and Chairs*

#### *MS1 Cohesive zone models of fracture and failure*

Alberto Carpinteri (Italy), Thomas Siegmund (USA) – Co-Chairs

Introductory Lectures:

Alberto Carpinteri (Italy): Modelling strain localization by cohesive/overlapping zones in tension/compression: Brittleness size effects and scaling in material properties

Thomas Siegmund (USA): Modelling of bone failure by cohesive zone models: Nano- and microscale

Roberta Massabò (Italy): Bridged and cohesive crack models for fracture in composite material systems

Michael Thouless (USA): Cohesive-zone modelling of adhesive joints

#### *MS2 Multi-component materials – modelling on different scales*

Henryk Petryk (Poland), Francis Rose (Australia) – Co-Chairs

Introductory Lectures:

Jean-Louis Chaboche (France): Multi-scale analysis of polycrystalline metals and composites

Brian Cox (USA): Modelling multi-scale damage evolution in composite materials

Hans Mühlhaus (Australia): Instabilities across the scales

#### *MS3 Dynamics and control of walking was cancelled and replaced with a mini-symposium on Mechatronics.*

#### *MS4 Mechanics of colloidal systems*

Dominique Langevin (France), Peter Pusey (UK) – Co-Chairs

Introductory Lectures:

John Brady (USA): Computer simulation of colloidal flow

Henri van Damme (France): Colloidal aspects of engineering materials

Sriram Ramaswamy (India): The hydrodynamics of self-propelled suspensions

David A. Weitz (USA): Colloids and microfluidics

*MS5 Classical and quantum vortex rings*

Hassan Aref (USA), Carlo Barenghi (UK) – Co-Chairs

## Introductory Lectures:

Keith Moffatt (UK): Classical vortex rings, with and without swirl

Natalia Berloff (UK): Vortices in quantum fluids

Karim Shariff (USA): Quantum fluid questions suggested by phenomena in classical fluids

Carlo Barenghi (UK): Vortex rings and their use

*MS6 Fluid dynamics of animal swimming and flying*

John Blake (UK), Jane Wang (USA) – Co-Chairs

## Introductory lectures:

Lisa Fauci (USA): Understanding swimming at low Reynolds numbers: successes and challenges

Jane Wang (USA): How insects fly

Daniel Weihs (Israel): Fish swimming dynamics - knowns and unknowns

*Pre-Nominated Sessions and Chairs*

<b>Topics involving both fluid mechanics and solid mechanics</b>			
FSM1	Acoustics	FSM5	Granular materials and flows
	R. Ohayon (France)		D. Lohse (The Netherlands)
	N. Peake (UK)		T. Mullin (UK)
FSM2	Biomechanics	FSM6	Mechanics of material processing
	S. C. Cowin (USA)		F. Chinesta (France)
	C. R. Ethier (Canada)		G. Stepan (Hungary)
FSM3	Chaos and pattern formation in fluid and solid mechanics	FSM7	Porous media
	T. Kapitaniak (Poland)		W. Ehlers (Germany)
	E. Kreuzer (Germany)		D. Salin (France)
FSM4	Fluid-structure interaction	FSM8	Education in mechanics
	J. Grue (Norway)		I. Gledhill (South Africa)
	M. Paidoussis (Canada)		C. Herakovich (USA)

<b>Fluid Mechanics</b>			
FM1	Boundary layers K. Cassel (USA) A. Kluwick (Austria)	FM11	Flow in thin films S. Kalliadasis (UK) L. Schwartz (USA)
FM2	Combustion and flames S. Candel (France) I. Puri (USA)	FM12	Geophysical and environmental fluid dynamics W.R. Young (USA) J-C. Li (China)
FM3	Complex and smart fluids A.L. Yarin (USA) O. Harlen (UK)	FM13	Low-Reynolds-number flow E. Guazzelli (France) O. Sano (Japan)
FM4	Compressible flow P. Doerffer (Poland) H. Babinsky (UK)	FM14	Magnetohydrodynamics S.T. Surzhikov (Russia) J.F. Pinton (France)
FM5	Computational fluid dynamics J. Kim (USA) W. Schröder (Germany)	FM15	Microfluidics C. Meinhart (USA) Henrik Bruus (Denmark)
FM6	Convection J.C. Patterson (Australia) A. Thess (Germany)	FM16	Microgravity fluid mechanics W.R. Hu (China) H.J. Rath (Germany)
FM7	Drops, bubbles and multiphase flows J. Magnaudet (France) A. Prosperetti (USA)	FM17	Solidification and crystal growth G. Amberg (Sweden) M.G. Worster (UK)
FM8	Experimental methods in fluid mechanics C. Tropea (Germany) J. Westerweel (The Netherlands)	FM18	Stirring and mixing N. Aubry (USA) S.M. Cox (UK)
FM9	Flow Control A. Seifert (Israel) J.F. Morrison (UK)	FM19	Turbulence F. Hussain (USA) E. Bodenschatz (Germany)
FM10	Flow instability and transition J-M. Chomaz (France) D. Henningson (Sweden)	FM20	Waves F. Dias (France) K. Melville (USA)

<b>Solid Mechanics</b>			
SM1	Computational solid mechanics	SM11	Mechanics of composites
	J. Fish (USA) W-X. Zhong (China)		P. Gudmundson (Sweden) J. S. Hansen (Canada)
SM2	Contact and friction mechanics	SM12	Mechanics of phase transformations
	I. Goryacheva (Russia) P. Wriggers (Germany)		K. Bhattacharya (USA) E. van der Giessen (The Netherlands)
SM3	Control of structures	SM13	Mechatronics
	F. L. Chernousko (Russia) A. Preumont (Belguim)		J. K. Hedrick (USA) H. Ulbrich (Germany)
SM4	Damage mechanics and fatigue	SM14	Multibody and vehicle dynamics
	N. Morozov (USA) R. C. Batra (USA)		J. Ambrosio (Portugal) W. Schiehlen (Germany)
SM5	Elasticity	SM15	Nanostructures and MEMS
	R. Kienzler (Germany) G. Maugin (France)		K. S. Kim (USA) F. de Bona (Italy)
SM6	Experimental methods in solid mechanics	SM16	Plasticity and viscoplasticity
	J. Desrués (France) J. Greer (USA)		M. Geers (The Netherlands) C. Miehe (Germany)
SM7	Fracture and crack mechanics	SM17	Stability of structures
	D. Gross (Germany) R. Goldstein (Russia)		H. Myhre Jensen (Denmark) N. Triantafyllidis (USA)
SM8	Geophysics and geomechanics	SM18	Structural optimization
	N. Lapusta (USA) I. G. Vardoulakis (Greece)		M. Xie (Australia) B.M. Kwak (Korea)
SM9	Impact and wave propagation	SM19	Structural vibrations
	N. K. Gupta (India) R. Clifton (Brown)		M. Wiercigroch (UK) P. Ribeiro (Portugal)
SM10	Material instabilities	SM20	Viscoelasticity and creep
	A. Benallal (France) R. de Borst (The Netherlands)		A. C. F. Cocks (UK) G. Z. Voyiadjis (USA)

All contributed papers were peer reviewed. Recommendations were received from Pre-selection Committees of the National Committees of the nine countries: Canada, France, Germany, Japan, PR China, Poland, Russia, UK and USA. Recommendations were also received from the Chairs of the Mini-Symposia and of the Pre-nominated Sessions. During its deliberations the International Papers Committee paid careful attention to these recommendations. At the end of their meetings 1323 (87%) of the 1517 eligible

submissions were invited by the IPC for presentation at the Congress. Finally 862 contributed papers and 39 invited talks were given in Adelaide.

Of the total 901 papers, 375 of these were in the area of Fluid Mechanics, 394 in the area of Solid Mechanics and 132 were at the Fluid-Solid Mechanics interface. The total number of participants, accepted papers relative to the previous congresses is given in Table 1. Table 2 displays country statistics of the presentations.

As has been the tradition since the 1988 Congress in Grenoble the IUTAM Bureau selected 3 outstanding young scientists for Buerau prizes, based upon their papers, and their presentations at the Congress. The recipients of the prizes at ICTAM2008 were Mr. Wim van Hoeve of the University of Twente, The Netherlands, for his paper entitled *Microbubble pinch-off in flow-focussing devices*, presented during a Lecture (fluid mechanics)

Ms. Katia Bertoldi of Massachusetts Institute of Technology, USA, for her paper entitled *Mechanically-triggered transformations of pattern and phononic band gaps in periodic elastomeric structures*, presented during a Lecture (solid mechanics)

Mr. Kazuya Shimizu of the The University of Tokyo, Japan, for his paper *Study on the occurrence of the liquid jet and the bubble breakup in a convergent divergent channel flow*, presented during a Seminar.

ICTAM	Submitted Papers	Papers presented		Participants	
		All	Host	All	Host
Grenoble 1988	1262	573	n. a.	951	340
Haifa 1992	1183	420	n. a.	525	85
Kyoto 1996	1642	703	192	936	332
Chicago 2000	1953	1126	445	1430	587
Warsaw 2004	2086	1273	144	1515	194
Adelaide 2008	1517	901	109	1176	139

Table 1. A comparison of the attendance figures for the past six congresses

A book of abstracts with a CD-ROM including Extended Summaries of all accepted papers was distributed during the Congress. The Abstracts and Short Papers are available online on the Congress website [ictam2008.adelaide.edu.au](http://ictam2008.adelaide.edu.au). The congress proceedings will be published by Springer in early 2010. This volume will include full text of invited talks and attached CD-ROM with all Short Papers presented during the Congress.

Session Statistics			
Session	Lectures	Seminars	Total
Acoustics	8	1	9
Biomechanics	30	11	41
Boundary layers	12	7	19
Chaos and pattern formation in fluid and solid mechanics	7	3	10
Classical and quantum vortex rings	8	2	10
Cohesive zone models of fracture and failure	13	4	17
Combustion and flames	7	3	10
Complex and smart fluids	4	2	6
Compressible flow	7	2	9
Computational fluid dynamics	4	12	16
Computational solid mechanics	14	10	24
Contact and friction mechanics	7	7	14
Control of structures	6	2	8
Convection	8	6	14
Damage mechanics and fatigue	8	3	11
Drops, bubbles and multiphase flows	19	21	40
Education in mechanics	7	0	7
Elasticity	19	13	32
Experimental methods in solid mechanics	10	7	17
Flow control	6	2	8
Flow in thin films	14	1	15
Flow instability and transition	25	11	36
Fluid dynamics of animal swimming and flying	10	7	17
Fluid-structure interactions	12	13	25
Foams	6	0	6
Fracture and crack mechanics	20	11	31
Geophysical and environmental fluid dynamics	20	7	27
Geophysics and geomechanics	12	4	16
Granular materials and flows	14	0	14
Impact and wave propagation	15	18	33
Low-Reynolds-number flow	13	4	17
Magnetohydrodynamics	6	3	9
Material Instabilities	0	7	7



Mechanics of colloidal systems	10	3	13
Mechanics of composites	14	9	23
Mechanics of material processing	5	0	5
Mechanics of phase transitions	9	2	11
Mechatronics	6	3	9
Microfluidics	8	5	13
Microgravity fluid mechanics	6	5	11
Multi-component materials, modelling on different scales	17	7	24
Multibody and vehicle dynamics	20	7	27
Nanostructures and MEMS	7	10	17
Plasticity and viscoplasticity	17	2	19
Porous media	7	3	10
Solidification and crystal growth	5	3	8
Stability of structures	7	7	14
Stirring and mixing	10	0	10
Structural optimization	10	3	13
Structural vibrations	12	13	25
Turbulence	11	12	23
Viscoelasticity and creep	0	2	2
Waves	25	3	28
Grand Total	577	303	880

*Table 2.* ICTAM 2008 SESSION STATISTICS: The table provides a breakdown of the numbers of papers presented in each pre-nominated session or mini-symposium (excluding sectional, opening and closing lectures of which there were 21).

Country Statistics					
Country	Number	Percentage	Country	Number	Percentage
USA	151	13.67%	Estonia	4	0.36%
Australia	139	12.58%	Hong Kong	4	0.36%
China	120	10.86%	Hungary	4	0.36%
France	89	8.05%	Iran	4	0.36%
Japan	84	7.60%	Malaysia	4	0.36%
Germany	69	6.24%	Singapore	4	0.36%
UK	62	5.61%	Romania	3	0.27%
Russia	40	3.62%	Georgia	2	0.18%
Poland	33	2.99%	Ireland	2	0.18%
Taiwan	30	2.71%	Kazakhstan	2	0.18%
Denmark	26	2.35%	Latvia	2	0.18%
India	25	2.26%	Norway	2	0.18%
Netherlands	25	2.26%	Slovenia	2	0.18%
South Korea	19	1.72%	Yugoslavia	2	0.18%
Italy	18	1.63%	Armenia	1	0.09%
Canada	14	1.27%	Belarus	1	0.09%
Sweden	13	1.18%	Croatia	1	0.09%
Switzerland	11	1.00%	Cyprus	1	0.09%
Israel	10	0.90%	Egypt	1	0.09%
Czech Republic	9	0.81%	Jordan	1	0.09%
South Africa	9	0.81%	Kyrgyzstan	1	0.09%
Austria	8	0.72%	Lebanon	1	0.09%
Belgium	6	0.54%	Macau	1	0.09%
Brazil	6	0.54%	Mexico	1	0.09%
Finland	6	0.54%	Moldova	1	0.09%
Spain	6	0.54%	Nigeria	1	0.09%
Ukraine	6	0.54%	Thailand	1	0.09%
Greece	5	0.45%	Turkey	1	0.09%
New Zealand	5	0.45%	Vietnam	1	0.09%
Portugal	5	0.45%			

*Table 3. ICTAM 2008 COUNTRY STATISTICS:* The table provides a breakdown of the number of delegates from each of the 62 countries represented at ICTAM2008.

**Summary Record of the General Assembly Meeting 2008****Summary Record of the  
General Assembly of IUTAM  
in Adelaide, Australia, on 26 and 27 August 2008**

The General Assembly of IUTAM convened in Hall A of the Adelaide Convention Centre, Adelaide, Australia. The schedule of sessions was as follows:

**Tuesday, 26 August 2008**

18.30 – 22.30 h: *General Assembly: 1<sup>st</sup> session*

**Wednesday, 27 August 2008**

14.00 – 17.15 h: *General Assembly: 2<sup>nd</sup> session*

**Attendance:***Members with voting rights:*

A. Acrivos (USA, Member-at-Large), H. Aref (USA), N. Aubry (USA), Y. Bai (China), A. Benallal (France), L. Bevilacqua (Brazil), P. Boulanger (Belgium), D. van Campen (Netherlands), F. Chernousko (Russia), N. Cristescu (Romania), J. Denier (Australia), F. Dias (France), J. Dual (Switzerland), C. Du Toit (South Africa), P. Eberhard (Germany), J. Engelbrecht (Estonia), N. Fleck (UK), J. Floryan (Canada), B. Freund (USA), I. Goldhirsch (Israel), J. Grue (Norway), N. Gupta (India), W. Gutkowski (Poland), C. Herakovich (USA), G. Jaiani (Georgia), T. Kambe (Japan), B. Karihaloo (UK), A. Kluwick (Austria), G. Leal (USA), J. Li (China), B. Lundberg (Sweden), C. Ma (China Taipei), G. Maier (Italy), K. Moffatt (UK), P. Monkewitz, P. O'Donoghue (Ireland), M. Okrouhlik (Czech Republic), N. Olhoff (Denmark), J. Paavola (Finland), N. Peake (UK), T. Pedley (UK), P. Podio-Guidugli (Italy), P. Ribeiro (Portugal), M. Rubin (Israel), W. Schiehlen (Germany, Member-at-Large), W. Schröder (Germany), S. Shrivastava (Canada), N. Sorensen (Denmark), Z. Suo (USA), T. Tatsumi (Japan, Member-at-Large), A. Thess (Germany), E. Tuck (Australia), K. Uetani (Japan), I. Vardoulakis (Greece), W. Wang (China-Taipei), G. Weir (New Zealand), L. van Wijngaarden (Netherlands, Member-at-Large), W. Yang (China), S. Zaleski (France), Z. Zheng (China)

*Non-voting observers:*

J. Achenbach (USA; chair Solid Mechanics Panel), M. Burgess (Australia; repres. of ICA), K. Hedrih-Stevanovic (Serbia; observer), C. Howard (Australia; repres. of IIAV), P. Huerre (France; chair Fluid Mechanics Panel), M. Kataka (South Africa; observer), P. Linden (USA; chair WP-8), R. McMeeking (USA; chair WP-4; repres. of ICF), A. Saarenheimo (Finland; observer), B. Schrefler (Italy, repres. of CISM), D. Thomas (Sweden; repres. of IAVSD)

*Members with voting rights represented by proxies:*

J. Aranha (Brazil), represented by L. Bevilacqua  
B. Boley (USA), represented by C. Herakovich  
R. de Borst (Netherlands), represented by D. van Campen  
G. Chernyi (Russia), represented by F. Chernousko  
E. Dick (Belgium), represented by P. Boulanger  
M. Hayes (Ireland), represented by D. van Campen  
Ph. Hodge (USA, Member-at-Large), represented by C. Herakovich  
S. Kaliszky (Hungary), represented by G. Maier  
T. Kobayashi (Japan), represented by T. Kambe  
C. Miehe (Germany), represented by P. Eberhard  
G. Mikhailov (Russia), represented by F. Chernousko  
N. Morozov (Russia), represented by F. Chernousko  
A. Morro (Italy), represented by P. Podio-Guidugli  
F. Niordson (Sweden), represented by N. Olhoff  
S. Savage (Canada), represented by S. Shrivastava  
A. van Steenhoven (Netherlands), represented by L. van Wijngaarden  
D. Vandepitte (Belgium), represented by P. Boulanger  
E. Watanabe (Japan), represented by T. Kambe  
A. Zaoui (France), represented by A. Bernallal  
F. Ziegler (Austria), represented by A. Kluwick  
J. Zu (Canada), represented by J. Floryan

**Agenda Tuesday, 26 August 2008, 18.30 – 22.30 h**

1. Opening of the meeting by the President  
Minutes of the General Assembly in Providence (Rhode Island, USA), on 12 and 13 August 2006 (IUTAM Report 2006, pp. 74-97)
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. Brazil
  - 6.2. Mexico
7. Matters concerning Affiliated Organizations
  - 7.1. CACOFD
  - 7.2. IAVSD – International Association for Vehicle System Dynamics
  - 7.3. ICA – International Commission for Acoustics
8. Reports and preliminary discussions on Working Parties
  - 8.1. Reports on the Working Parties
  - 8.2. Change of Chairman of WP-3
9. Report of the Electoral Committee
10. Proposals for election of Members-at-Large
11. Proposals for election of members of Symposia Panels

12. Preliminary discussion on future IUTAM Symposia. Reports from Symposia Panels
13. Preliminary discussion on future International Summer Schools on Mechanics
14. Preliminary discussion on Associate Membership, including discussion on changes of Statutes
15. Publication of Proceedings
16. IUTAM Prizes for Fluid Mechanics and for Solid Mechanics

**Agenda Wednesday 27 August 2008, 14.00 – 17.15 h**

17. Relations with ICSU
  - 17.1 ICSU's Strategic Plan 2006 – 2011
  - 17.2 IUTAM Proposal for ICSU Grants Programme 2008
  - 17.3 ICSU Regional Office for Latin America and the Caribbean
18. Matters concerning Inter-Union Committees
  - 18.1 SCOPE – Scientific Committee on Problems of the Environment
  - 18.2 SCOR – Scientific Committee on Ocean Research
19. Matters concerning non-ICSU Organizations
20. Continued discussion and final decision regarding future IUTAM Symposia
21. Continued discussion and final decision regarding future International Summer Schools on Mechanics
22. Continued discussion and final decision regarding annual dues
23. Continued discussion and final decision regarding Working Parties
24. Continued discussion and final decision regarding Associate Membership, including decision on changes of Statutes
25. Election of members of the Bureau
26. Election of Members-at-Large
27. Election of members of the Congress Committee of IUTAM
28. Election of members of the Symposia Panels
29. Date and venue of the next General Assembly
30. Any other business

**Proceedings of the General Assembly****Item 1 – Opening of the meeting by the President**

The President, Prof. L.B. Freund, opened the meeting and greeted all members and observers welcome. He also welcomed the Treasurer of ICSU, Prof. Roger Elliott, who will present ICSU's Strategic Plan under item 17 of the Agenda.

The minutes of the General Assembly held in Providence, Rhode Island, USA, in 2006 were adopted.

**Item 2 – Report by the Secretary-General**

The Secretary-General, Prof. D.H. van Campen, submitted the following report to the General Assembly on the activities of IUTAM since the last General Assembly in Providence, Rhode Island, USA, on 12 and 13 August 2006:

Mr. President, Dear Colleagues,

Two years have passed since our last General Assembly in Providence, Rhode Island, USA. 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 Nguyen Van Dao* died on 11 December 2006 in a car accident in Hanoi, Vietnam. He made major contributions to the shaping of the mechanics community in mechanics in Vietnam. He was the Founding Director of the Institute of Mechanics, Founder and President of the Vietnam Association of Mechanics, and Founding Editor of the Vietnam Journal of Mechanics.

The research of Prof. Nguyen Van Dao was in the area of nonlinear dynamics, among other things he investigated dynamic absorbers for non-linear systems and asymptotic methods for non-linear systems with multiple degrees of freedom.

Prof. Nguyen Van Dao was very active in developing international co-operations and contacts for Vietnamese scientists. He represented the Vietnam Association of Mechanics in IUTAM since 1990 and organized an IUTAM Symposium in 1999.

Prof. Nguyen Van Dao received many token of appreciation, among them the Ho Chi Minh Prize on Science and Technology and the Ukraine National Prize on Science and Technology. He was elected Member of the European Academy of Science; Member of the Czech Academy of Science and Member of the Ukraine National Academy of Science.

The tragic death of Prof. Nguyen Van Dao is an enormous loss both for the mechanics community in Vietnam and for the international mechanics community. As a person and as a scientist, he remains embedded in our memory.

*Professor Peter Carpenter* died on 21 April 2008 following a prolonged illness.

He joined the University of Warwick in 1990 as Professor of Mechanical Engineering. Between 1997 and 2007 he was Head of the Civil & Mechanical Engineering Division of the School of Engineering.

During his career Prof. Carpenter made many significant contributions to a broad area within fluid mechanics. In the early phase he research varied from hydro- elasticity and aero-elasticity of panels till industrial heat & mass transfer. Later, his interests turned to boundary-layer flow.

Prof. Carpenter also worked on many other topics including industrial aero-acoustics and biomechanics. In biomechanics, his work on the swimming of dolphins was directly related to his interests in flow control and drag reduction. He also published research results on butterflies in gliding flight.

Prof. Carpenter's extensive work in both computational and practical fluid dynamics brought him international recognition, whereas in 2007/8 he gained a DSc from the University of Warwick.

Besides representing the UK in the General Assembly from 1996 till 2006, Prof. Carpenter organized an IUTAM Symposium in 2001.

The passing away of Prof. Carpenter is a big loss for the mechanics community both in the UK and world-wide. He will be greatly missed.

Our sympathy and grateful thoughts for what Prof. Nguyen Van Dao and Prof. Peter Carpenter did for our Union go to their families and their nations.

Let me continue with my report.

*IUTAM Reports 2006 and 2007.* These have been edited and published in good standing.

Matters on *Adhering Organizations, Affiliated Organizations, Working Parties, ICSU and Inter-Union Committees* will be addressed under later items of the Agenda.

#### *IUTAM Symposia*

Nine IUTAM Symposia have been successfully organized in 2006 with average attendance 67.

Nine IUTAM Symposia have been successfully organized in 2007 with average attendance 65.

Eight IUTAM Symposia are scheduled for 2008. Three of those have already been successfully organized. All remaining Symposia will be organized in the period September till December 2008.

Eight IUTAM Symposia are scheduled for 2009. The dates of all have been fixed.

#### *IUTAM Summer Schools*

In 2006 there was one IUTAM Summer School at CISM, Udine, with 98 participants.

In 2007 there was one IUTAM Summer School at CISM, Udine, with 79 participants.

In 2008 there will be one IUTAM Summer School, which took already place in July at CISM, Udine.

Two Summer Schools are scheduled for 2009. One of those relates to the approved application of IUTAM to the ICSU Grants Programme and it will be organized in Singapore in the period April/May 2009. The other one will be organized in Beijing with dates yet to be fixed.

#### *Grants for IUTAM Symposia and Summer Schools*

In view of developments with respect to currency exchanges rates the Bureau agreed that the maximum available grant for each of the 2010/2011 set of IUTAM Symposia should be increased to US\$ 6,000.

#### *Maximum registration fees for IUTAM Symposia*

For the same reason the Bureau agreed that the maximum registration fee for the set of 2010/2011 IUTAM Symposia should be increased to US\$ 500.

*Co-Sponsorship*

The Bureau agreed to co-sponsor the following events:

- The Conference Euler Equations: 250 Years On, held in Aussois, France, from 18-23 June 2007.
- The International Summer school on Sea Ice, held in the framework of the International Polar year at the University Centre in Svalbard (UNIS), Longyearbyen, Norway from 2-13 July 2007.
- The First Joint International Conference on Multibody System Dynamics, to be organized in Finland in May 2010.

*IUTAM website*

The IUTAM website continues to run smoothly and it is of great help to the Secretary-General. 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, the website has been used to implement the decisions taken by the General Assembly.

*IUTAM Newsletter*

The revived IUTAM Newsletter continues to appear twice a year since 2002.

*Publications*

As far as I can see, the publication of Symposia Proceedings is running smoothly. Sales of the Symposia Proceedings are developing favorably.

The contract with Springer will be addressed under item 15 of the Agenda.

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, Prof. J. Engelbrecht, submitted the following report to the General Assembly.

Mr. President and colleagues in the General Assembly,

The IUTAM financial matters since the previous GA 2006 are described in the IUTAM Reports 2006 and 2007. Here I shall focus more on the present situation. With reference to the Accountants's Report 2007, the IUTAM's assets as of 31 Dec 2007 stood at 427,005 USD. This reflects of a budget loss of 24,616 USD (revenues less than expenses), which was still balanced by gain from exchange rate from EUR to USD, so the final loss was 10,995 USD. But one should stress that in EUR our budget reads certainly less than in previous years.



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 request was added in invoices to transfer the dues before June 30 of the current year but several countries run different schemes and transfer the dues in Dec of the current year. The total income from dues in 2007 was 90,518 USD. In 2008, the sum of dues collected as of June 30 is 87,410 USD and some dues arrived also in July (I keep here and further the half a year data). The situation is better than in 2007. However, in three cases the dues are seriously in arrears. This problem will be discussed in the Bureau.

The cash reserves of the Union earned interest in the amount of 5,759 USD in 2007. This amount is derived from savings accounts in banks in the US and the Netherlands. In addition, 3,951 USD were returned from Symposia awards. On the other hand, the amounts shown as bank fees represent per transaction costs charged by banks for receiving dues payments, arranging symposia awards, etc. In 2007, this amount was 440 USD.

The level of support of symposia and summer schools sponsored by the Union has been constantly 5,000 USD for each event and less for co-sponsored events (decided case by case). The discussion is needed whether to enlarge this standard grant due to the weak USD (presently the grant is 3,125 EUR). In 2007 altogether 10 Symposia (incl one for 2008) plus one Summer School were awarded and the ICTAM 2008 was supported by the seed money of 15,000 USD (earmarked from ICTAM 2004). In 2008, up to now, 5 Symposia and one Summer School were awarded with at least two Symposia coming. In addition, one conference was co-sponsored with a grant of 1,000 USD.

The travel costs of Bureau and XCCC in 2007 were 27,682 USD. In 2008, the travel costs for the Electoral Committee and the International Papers Committee were 19,440 USD.

The cost of the administration is principally the cost of operating the Office of the Secretary-General and totalled 20,335 USD in 2007. In 2008, we have paid 27,267 USD (this cost is influenced by the weak USD while we get an invoice in EUR). ICSU dues are 2,839 EUR in 2008. It must be stressed that ICSU has changed its dues in 2007 by charging the dues in EUR instead of the same amount in USD.

The financial records of the Union are subject to an audit by an independent accounting firm each year. In many years already, this audit has been conducted by UWP UNITREU GmbH in Eschborn, Germany with great care and helpness. A formal report and certification was submitted to ICSU.

In summary, the financial state of the Union has remained stable despite of fluctuations of the financial market. We support now 8 Symposia and one Summer School per year. However, as mentioned above, the amount of a grant together with the number of Symposia must be discussed in order to meet inflation.

Finally, it is a pleasure to acknowledge the help and advice provided by Assistant Treasurers Professors Ben Freund and Dick van Campen. As far this report to the GA is the last one signed by me, it is my pleasure to thank the GA, the Bureau, all the IUTAM committees and all the IUTAM family for the support, understanding and cooperation. It has been an exciting period to be so close to the pulse of the IUTAM.

Respectfully submitted,  
J.Engelbrecht, Treasurer

The report by the Treasurer was adopted.  
The President thanked the Treasurer for his report.

#### **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 (CPI). The latest OECD figures as of May 2008 show the increase of consumer prices in the OECD area by 3.9% being certainly different for different countries. In the US, for example, the CPI increased 4.0%, in Japan 1.2%, in Europe mostly more than 3%. The main force behind the increase of the CPI is energy and food. This has an immediate effect for Symposia grants and also travelling expenses.

Our dues have been the following:

year	2004	2005	2006	2007	2008	2009
unit dues, USD	656	670	676	696	710	726

The increase of dues has been less than the OECD CPI but they have followed almost linear increase trend except in 2003-2004 when due to the Euro-zone difficulties it was decided to keep the level of 2003 for 2004. Now we face difficulties in the USD-zone. If we think about the real value of Symposia grants then we should now increase the dues not by 2% as we did previously but more, increasing also the Symposia grants. I propose to increase the dues for 2010 up to 752 USD (increase about 3.5% from 2009) and for 2011 up to 778 USD (increase again 3.5% from 2010). The dues of equal amounts for those years will then be 765 USD. This increase will cover the deficit of our annual budget including the Symposia grants.

*It was noted that the final decision regarding annual dues would be made in the second session of the General Assembly, see item 22 below.*

Prof. L. van Wijngaarden asked if the increase in dues is accompanied by an increase in the grant for IUTAM Symposia.

The Treasurer responded that this is indeed the case and that the Bureau agreed that the grant for IUTAM Symposia should be increased from US\$ 5,000 to US\$ 6,000.

Prof. H. Aref reported that the US National Committee on TAM has compared the dues which the US is paying to various Unions. Very large fluctuations were found, ranging up to a factor of 10.

The Bureau might consider a rather dramatic change in the dues structure of IUTAM. The current number appears to be quite low, whereas there are many expenses. E.g. the grants for IUTAM Symposia have been flat for about 20 years. There is a real need to consider if a vibrant Union should collect in future a larger amount of dues.

Prof. Aref hoped to get some thoughts on this matter of the Treasurer of ICSU.

The Treasurer of ICSU, Prof. R. Elliott, responded that the Unions pay very little to ICSU. In fact, the total amount paid by the Unions is less than 10% of ICSU's total income. Recently, ICSU decided not to increase the dues from the Unions and to let the Unions concentrate on their own activities. Those Unions having their own publication program generate additional income from that program. Bigger unions, like the one in Chemistry, also get substantial money from industry. If a Union would have a larger program of deliverables, it might go to their members and ask for more dues.

#### **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,

In August last year, the Executive Committee of the Congress Committee (XCCC) met in Beijing, China. That meeting was entirely concerned with the preparations for the present ICTAM.

The full Congress Committee (CC) met two days ago (24 August) and the following items were on the agenda:

1. First, the preparations for the 22<sup>st</sup> ICTAM by the Local Organizing Committee (LOC), led by the Congress President, Prof. Ernie Tuck, and its Secretary-General, Dr. Jim Denier, have been going very well. The Congress is going very smoothly and our Australian hosts are to be congratulated with having put everything together so well.
2. A new development since the last ICTAM has been the announcement of the two major prizes that are being awarded for the first time this year: the G K Batchelor Prize for Fluid Mechanics and the Rodney Hill Prize for Solid Mechanics. Each prize is awarded for major research achievements in the previous 10 years and is worth USD25000. We are all very grateful to the sponsors of the prizes, Cambridge University Press, publishers of the Journal of Fluid Mechanics, and Elsevier, publishers of the Journal of the Mechanics and Physics of Solids and other solid mechanics journals. The committees to select the prizewinners were set up one year ago, when nominations were

invited, and announced the results at the start of December 2007. The prizewinners are Professor Howard Stone of Harvard University and Professor Michael Ortiz of CalTech.

3 Another change implemented in the build-up to this Congress is that the chairs of Prenominated Sessions (PNS) were told that they could firmly invite up to two speakers, not merely encourage them to submit an abstract, without fear of their being rejected by the International Papers Committee (IPC). Mini-symposium chairs were already able to invite up to three speakers in addition to their introductory lecturers. This made the task of the IPC, when it met in March, a little less burdensome than in the past.

4 Selection of the site of ICTAM-2012, to be made during the second session of the CC on Thursday afternoon and to be announced at the banquet on Thursday evening. There are three strong bids from the cities of Beijing (China), Budapest (Hungary) and Montreal (Canada).

5 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. Altogether, the CC has 35 members. A number of these are retiring, having served two four-year terms. If people have served just one four-year term on the CC, they should be re-elected automatically for a second term. These are Professors N. Aubry, D. Barthes-Biesel, A. Carpinteri, G.-D. Cheng, I. Goryacheva, T. Kowalewski, S. Kyriakides, P. Ladevèze, A. Thess and V. Tvergaard. There are 12 CC members who have served more than one term and who would normally retire from the CC. These are Professors H. Aref, M. Bendsoe, D. van Campen, D. Durban, B. Freund, P. Gudmundson, T. Kambe, B. Karihaloo, G. Leal, F. Lund, P. Monkewitz and T. Pedley. The CC recommends to re-elect five people of these twelve in view of special circumstances, namely, Professors H. Aref (future Secretary of CC), M. Bendsoe (member of CC), D. van Campen (intended member of CC), F. Dias (expected future Secretary-General) and T. Pedley (expected future President). For the 7 resulting vacancies the CC composed a slate of 14 candidates. In the second session on Wednesday, the members of the GA have to vote for 7 of the 14 short listed candidates.

Finally, I am sure we would like to record our gratitude to the retiring CC members for their cooperation in the work of the CC over at least 8 years.

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. *Brazil*

The Secretary-General reported that, recently, the Adhering Organization from Brazil, ABCM, has decided to expand their representation in IUTAM to two votes. The additional dues for 2008 have been paid already. The additional Representative of ABCM in the General Assembly is Prof. José Aranha.

The Bureau and the General Assembly are very pleased with this expansion.

6.2. *Mexico*

The Secretary-General reported that, recently, Mexico has applied for full membership in IUTAM, category 1. Prof. Hassan Aref acted as catalyst. The representation of Mexico in IUTAM runs through the Mexican Academy of Sciences, acting as the Adhering Organization. If Mexico is accepted as a new member of IUTAM, Dr. Eduardo Ramos will be the Representative of Mexico in the IUTAM General Assembly.

The Bureau proposed to the General Assembly to accept Mexico as a new member of IUTAM.

*The General Assembly accepted unanimously by hand vote Mexico as a new member of IUTAM.*

**Item 7 – Matters concerning Affiliated Organizations**7.1. *CACOFD*

The Vice-President, introducing this item, recalled that at the 2006 General Assembly it was proposed to transform the existing Affiliated Organization CACOFD to a broader organization LACCOTAM. Then, it was agreed that such a transition should be supported by the Adhering Organizations from the Latin American countries Argentina, Brazil and Chile through their representatives. From subsequent correspondence it became clear that the Adhering Organizations of Argentina and Chile supported the LACCOTAM proposal, whereas the Adhering Organization of Brazil came up with rather serious objections. At the 2007 Bureau meeting the Vice-president was asked to act as an “Ombudsman”. Since then things have gone rather slow. The Vice-President has been in contact with Profs Ramkissoon and Bevilacqua, but no real progress has been made. In a recent message Prof. Ramkissoon suggested to defer the matter until the next meeting of CACOFD/LACCOTAM.

Prof. L. Bevilacqua remarked that he is prepared to organize a more strong community in South America. The proper organizations should get together to join IUTAM. Two years ago his doubts were that the contacts were not well organized. He is sure that at the end a good solution will come out and he is prepared to help in this.

Prof. G. Leal asked about the status of the existing Affiliated Organization. The Secretary-General responded that formally nothing has changed, so that CACOFD is still

the Affiliated Organization. However, the Affiliated Organizations should be evaluated and, in fact, this has been the trigger of the proposed change.

The President added that the original organizer of CACOFD is now retired and that no one is actually taking his place. There is no need for immediate action, but it will remain a point of attention for the Bureau.

7.2. *IAVSD – International Association for Vehicle System Dynamics*

The President of IAVSD, Prof. Hans True, has informed the Secretary-General that IAVSD has appointed Prof. Mats Berg from KTH Stockholm, Sweden, as the new representative of IAVSD in IUTAM.

7.3. *ICA – International Commission on Acoustics*

ICSU has informed the IUTAM Secretariat that they have assigned the Scientific Associate status to our Affiliated Organization ICA.

The Representative of IUTAM in ICA, Prof. Anders Boström, has expressed that he wishes to resign. The Bureau agreed that Prof. Andrew Norris of Rutgers University, USA, should be invited to become the new representative of IUTAM in ICA.

### **Item 8 – Reports and preliminary discussion on Working Parties**

8.1. *Reports on the Working Parties*

The Secretary-General reported that reports have been received from all WPs, except from the WP-1 on Non-Newtonian Fluid Mechanics and Rheology. The WP reports received have been enclosed in the material distributed to the General Assembly prior the present meeting.

Following recommendations of the chairman of the WP-1, Prof. Gary Leal, the membership of this WP has been reconsidered. The Bureau and the chairman of the WP-1 agreed upon a new membership of this WP.

Additionally, there have been less far-reaching changes in the membership of the WP-3, WP-4, WP-5, WP-6, WP-7 and WP-9.

The current membership of the WPs can be found on the IUTAM website, see <http://www.iutam.net/iutam/Organization/index.php/12>.

From the WP reports it can be observed that the involvement of the WPs in reviewing proposals for IUTAM Symposia and co-sponsored events is increasing.

8.2 *Change of Chairman of WP-3*

The chairman of the WP-3 on Mechanics of Materials, Prof. Carl Herakovich, has expressed that he wishes to resign in this capacity. The Bureau proposes to appoint one of the current members, Prof. Olivier Allix, as his successor. Prof. Allix is willing to accept. This change in chairmanship is consistent with the principle of rotating chairmanship accepted by the General Assembly in Warsaw in 2004.

*It was noted that the decision regarding the above proposal would be made in the second session of the General Assembly, see item 23 below.*

Prof. L. van Wijngaarden recalled that Working parties started already in the early nineties and that he is pleased to see how they have grown now. With respect to the report of WP-7 (*Nano- and Micro-Scale Phenomena in Mechanics*) he remarked that, although this is an excellent report, it focuses mainly on solid mechanics, whereas there is also much activity going on in nano- and micro-fluidics. Unless this WP wants to restrict itself to solid mechanics, the fluid aspects should also be included, eventually by extending the membership to include fluid experience.

The chairman of this WP, Prof. W. Yang, responded that only accidentally the fluid aspects were not included in the report, but that this will be done in future.

Prof. L. van Wijngaarden remarked that the WPs should be more active in preparing proposals for IUTAM Symposia. A step forward has been made already by including in the Proposal Form a question concerning the consulting of WPs. It appears that in the set of proposals for 2010/2011 the colleagues from solid mechanics have responded to this question to a large extent, whereas this is much less so for the colleagues from fluid mechanics.

Prof. Van Wijngaarden would like to encourage the WPs in fluid mechanics to be more involved in preparing proposals for fluids Symposia.

The Secretary-General remarked that the matter of increasing the involvement of the WPs in preparing proposals for IUTAM Symposia was also discussed by the Bureau. The Bureau would like each WP to be involved in preparing at least one proposal.

#### **Item 9 – Report of the Electoral Committee**

The President, who according to the Statutes acted as chairman of the Electoral Committee, reported on the work of the Committee, consisting apart from himself of the GA members Prof. A. Acrivos (USA), Prof. Y. Bai (China), Prof. W. Schiehlen (Germany) and Prof. L. van Wijngaarden (Netherlands).

Around mid-November 2007 the chairman of the Electoral Committee invited the members of the General Assembly to submit suggestions for candidates for the Bureau election ultimately by 15 January 2008. Because the call for suggestions appeared to have only limited response, another call was sent out by the end of January 2008.

The electoral Committee met for two days during the 2008 Easter weekend in Providence, Rhode Island, USA.

After careful consideration, the Electoral Committee prepared a shortlist of nominees for the positions of three officers and four members. In generating the shortlist, the Electoral Committee took account of spreading over the globe, of fields of endeavor, of age and of continuity and renewal.

On request of the Electoral Committee three candidates indicated their willingness to accept an election for the three positions of officers, whereas eight candidates indicated their willingness to accept an election for the four positions of members.

On 15 May 2008 the final nominations, given below, were presented to the Secretary-General, who conveyed these nominations to the members of the General Assembly well in time.

Officer positions:

President: Prof. T.J. Pedley (UK)

Secretary-General: Prof. F. Dias (France)

Treasurer: Prof. N. Olhoff (Denmark)

Non-Officer positions (one for each slot to be chosen by the General Assembly):

W: Prof. F. Chernousko (Russia) and Prof. J. Dual (Switzerland)

X: Prof. I. Goldhirsch (Israel) and Prof. F. Lund (Chile)

Y: Prof. D. Henningson (Sweden) and Prof. A. Thess (Germany)

Z: Prof. N. Gupta (India) and Prof. W. Yang (China)

After having concluded his report, the President pointed out that the nominations for each of the positions will be put to a vote in the second session of the General Assembly under item 25. Furthermore, the members of the Electoral Committee would be pleased to answer any questions.

Prof. H. Aref asked if all nominees have accepted being nominated to serve and if all nominees are present in this General Assembly.

The President responded that the answer to the first question is yes, whereas the answer to the second question is no.

#### **Item 10 –Proposals for election of Members-at-Large**

The Secretary-General reported that, currently, there are 104 voting members of the General Assembly. Hence, according to article 3 of the Procedure for electing Members-at-Large (MaLs) of the GA, the total number of MaLs should not exceed approximately 1/8 of 104, i.e. 13. Indeed, after the previous

(re-)election of MaLs in Warsaw (2004) there were 13 MaLs. Since then Prof. Wlodek Fiszdon passed away, so that currently there are 12 MaLs.

Besides the "ordinary" MaLs, who are elected for four years and could be re-elected, there are still "Members elected by the General Assembly" who might be viewed as "life members". The present MaLs Prof. B. Boley, Prof. J. Hult and Prof. F. Niordson belong to this category.

According to article 2 of the Procedure for electing MaLs of the General Assembly, "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 ICTAMs".

By this deadline the Secretary-General had received four proposals for re-election of MaLs and four proposals for election of new MaLs. Additionally, Prof. P. Hodge had



indicated not to be available for re-election. No proposals were received after the deadline.

Taking account of the above, the Bureau recommended to the General Assembly to re-elect Prof. A. Acrivos, Prof. W. Schiehlen, Prof. T. Tatsumi and Prof. L. van Wijngaarden as MaLs for the period 2008-2012, and to elect Prof. J.D. Achenbach, Prof. D.H. van Campen, Prof. H.K. Moffatt and Prof. R. Narasimha as MaLs for the period 2008-2012.

*It was noted that the final decision regarding this proposal would be made in the second session of the General Assembly, see item 26 below.*

#### **Item 11 – Proposals for election of members of Symposia Panels**

The Secretary-General reported that both Panel chairs have served for two consecutive terms in this capacity and that new chairs should be appointed. Additionally, one member of the Fluids Panel and two members of the Solids Panel have served for two consecutive terms and should be replaced.

The Bureau proposed to the General Assembly to appoint Prof. Gary Leal (USA) and Prof. Viggo Tvergaard (Denmark) as new chairs of the Fluids Panel, respectively the Solids Panel. Furthermore, the Bureau proposed to the General Assembly to appoint Prof. Nigel Peake (UK) as new member to the Fluids Panel and to appoint Prof. Norman Fleck (UK) and Prof. Huajian Gao (USA) as new members to the Solids Panel.

*It was noted that the final decision regarding these proposals would be made in the second session of the General Assembly, see item 28 below.*

#### **Item 12 –Preliminary discussion on future IUTAM Symposia. Reports from Symposia Panels**

The Secretary-General had received 23 proposals for IUTAM Symposia in 2010/2011, listed below.

- F.1 *Complex Flows of Multi-Phase and Multi-Component in Natural Environment* (Lanzhou, China)
- F.2 *Computational Aero-Acoustics (CAA) for Aircraft Noise Prediction* (Southampton, UK)
- F.3 *Bluff Body Flows* (Kanpur, India)
- F.4 *Bluff Body Wakes and Vortex-Induced Vibrations* (Marseille, France)
- F/S.1 *50 Years of Chaos: Applied and Theoretical* (Kyoto, Japan)
- F/S.2 *Mechanics of Liquid and Solid Foams* (Austin, TX, USA)
- F/S.3 *Computer Models in Biomechanics: From Nano to Macro* (Stanford, CA, USA)
- F/S.4 *Unsteady Separation in Fluid Structure Interaction* (Rhodes, Greece)
- S.1 *Nonlinear Stochastic Dynamics and Control* (Hangzhou, China)

- S.2 *Surface Effects in the Mechanics of Nanomaterials and Heterostructures* (Beijing, China)
- S.3 *Linking Scales in Computations: From Microstructure to Macro-scale Properties* (Shalimar, FL, USA)
- S.4 *Experimental approaches to nonlinear dynamics of mechanical and structural systems* (Tsukuba, Japan)
- S.5 *Theoretical and Computational Aspects of Gradient Theories for Multi-Scale Interactions* (Sheffield, UK)
- S.6 *Full-field Measurements and Identification in Solid Mechanics* (Cachan, France)
- S.7 *Advanced PDE-methods for the Mechanics and Control of Solids and Structures* (Linz, Austria)
- S.8 *Nonsmooth Mechanics* (Bristol, UK)
- S.9 *Human Body Dynamics: From Multibody Systems to Biomechanics* (Waterloo, Canada)
- S.10 *Analysis and simulation of human movement* (Leuven, Belgium)
- S.11 *From Generalised Continua to Dislocation Theory – Bridging the Scales* (Nottingham, UK)
- S.12 *Mechanical problems in seismology* (Brescia, Italy)
- S.13 *Impact Biomechanics in Sport* (Dublin, Ireland)
- S.14 *Nonlinear Dynamics for Advanced Technologies and Engineering Design* (MDATED) (Aberdeen, UK)
- S.15 *Dynamics Modeling and Interaction Control in Virtual and Real Environments* (Budapest, Hungary)

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 Adelaide, Australia, on 24 August 2008, 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. P. Huerre, 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 15 Symposia for the years 2010 and 2011.*

The President recalled that, consistent with the discussion at the General Assembly in Providence (2006), the members of the General Assembly are entitled to downgrade proposals for IUTAM Symposia from the A category to the B category and from the C category to the B category, provided proposals to do this are seconded and subsequently supported by at least 10 GA members with voting rights.

After preliminary discussion the proposals coded F.2, F.4, F/S.2, F/S.3, S.1, S.2, S.3, S.6, S.9, S.10, S.13, S.15 were ranked “alpha”, those coded F.1, F.3, F/S.1, F/S.4, S.4, S.5, S.7, S.8, S.11, S.12, S.14 were ranked “beta”, whilst no proposals were ranked “gamma”.

*It was agreed that the proposals ranked “alpha” would be accepted in the second session. The proposals ranked “beta” would be further considered at the second session.*

#### **Item 13 – Preliminary discussion on future IUTAM Summer Schools on Mechanics**

The Secretary-General had received the following three proposals for IUTAM Summer Schools:

SS.1 *Simulation Based Engineering & Science for Nano Mechanics, Materials and Micro/Nano Manufacturing* (Evanston, IL, USA, 2010)

SS.2 *Turbulence in Multiphysical Flow Phenomena* (Erlangen, Germany, 2010)

SS.2 *Modelling and Simulation of Multiscale Continuum System* (Udine, Italy, 2010)

The proposal coded SS.1 had been reviewed only by the Solids Symposia Panel, whereas the proposals coded SS.2 and SS.3 had been reviewed by both Symposia Panels.

*It was agreed to accept altogether no more than 2 Summer Schools for the years 2010 and 2011. The 3 proposals would be further considered at 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 20 and 21, respectively.*

#### **Item 14 – Preliminary discussion on Associate Membership, including changes of Statutes**

The Committee on Associate Membership has composed a revised report in which the remarks made by the General Assembly in Providence (2006) are accounted for. This revised report, which had been enclosed in the material distributed to the members of the General Assembly, is supported by the Bureau. Acceptance of the revised report by the General Assembly implies a change of the Statutes, which is indicated in Appendix B of the report.

*It was noted that the final decision regarding the change of Statutes would be made in the second session of the General Assembly, see item 24 below.*

**Item 15 – Publication of Proceedings**

The current contract with Springer runs till the end of 2008. At the 2007 Bureau meeting in Beijing it has been decided that Springer should be invited to make an offer for renewal of the present contract. Their offer had been enclosed in the material distributed to the members of the General Assembly.

Prof. H. Aref remarked that time for stand alone Proceedings volumes has almost passed out. He suggested that the Bureau should consider alternate ways of publishing the Proceedings of IUTAM Symposia or leave it to the creativity of Symposia organizers to find a way of publishing. One of the more effective ways is to do special issues of Journals rather than stand alone volumes. The pricing of the present volumes is quite high. The prize of the volumes if they are not bought at a special rate for the attendees of Symposia is very high and so is the prize for libraries. So, there is a serious issue that many of the papers are, in fact, lost in the scientific literature. It would be in IUTAM's interest to explore something different than just renewing the contract with Springer.

The Secretary-General remarked that over the past period paperback editions were also seriously considered, but that there was no interest at all of the Symposia chairs to use this alternative. So, the only alternatives are publication as special issues of Journals or publishing completely electronic. In fact, there exists already an increasing tendency to the publish Proceedings as special issues of Journals. It should also be noticed that Springer has entered a citation database with the present Proceedings.

The President remarked that the Proceedings volumes do have a better chance now of ending up in citation databases. He promised to put the matter of publication of Proceedings of IUTAM Symposia for consideration at the last session of this week's Bureau meeting with the suggestion to form a Study Group to make a recommendation.

Prof. L. Bevilacqua remarked that last year Brazil organized an IUTAM Symposium where the participants expressed that they would like the papers being published in a special issue of a Journal. The Symposium Chair arranged publication in a special issue of the Proceedings of the Brazil Academy of Sciences.

Prof. H. Aref remarked that if there is an agreement with Springer, then the Symposium organizers are tight to include the publishing costs as part of the registration fee, which means that for, say, 100 attendees automatically 5000 Euros has to be spent for the Proceedings.

Prof. W. Schiehlen remarked that the issue of Proceedings of IUTAM Symposia has been discussed many times over the past decades. The advantage of the present Proceedings is that the contributions to IUTAM Symposia have been documented appropriately. One should be very careful to make a far-reaching change now. If we stop now the current way of publishing, there should be another way to preserve the contributions to IUTAM Symposia. In view of this, he supported the proposal by the President to form a Study Group on this matter.

Prof. M. Rubin remarked that, since IUTAM has the attitude of publishing Proceedings of its Symposia, this could be done on the website. In that case, everything would be documented and could be downloaded in PDF. This could stimulate participation from countries that are unable to provide funds for buying the present Proceedings. All in all, he considers this way of publishing to be more important than citation.

Prof. H. Aref suggested to re-new the contract with Springer just for two years.

Prof. G. Leal asked if the contract requires the Symposium organizers to take any number of Proceedings. This appeared not to be the case.

The President closed this item by remarking that different alternatives should be carefully considered. In the meantime IUTAM should have the contract with Springer in place.

#### **Item 16 – IUTAM Prizes for Fluid Mechanics and for Solid Mechanics**

Last year the Fluids Prize, named The Batchelor Prize for Fluid Mechanics, and the Solids Prize, named The Rodney Hill Prize in Solid Mechanics, were launched successfully. They will be awarded on Wednesday morning, 27 August, prior to the lectures by the Prize winners. The statements regarding the creation of those Prizes had been enclosed in the material distributed to the members of the General Assembly.

The President pointed out that this is a new initiative, which worked out at least as well as was hoped for. The awarding will continue with at least one more cycle with Elsevier and at least three more cycles with Cambridge University Press. The Bureau is reviewing the procedures used for these Prizes. Although a little more lead time will be needed for the next ICTAM, no substantial changes are to be expected with either of these Prizes.

Then, the President adjourned the meeting.

#### **The meeting reconvened on 27 August 2008.**

#### **Item 17 – Report on matters relating to ICSU**

##### **17.1. *ICSU's Strategic Plan 2006 – 2011***

The Treasurer of ICSU, Prof. R. Elliott, presented ICSU and its strategic plan.

The major items of the presentation were:

- A short survey of the history of ICSU, starting with its foundation in 1931
- ICSU's vision: Strengthening international science for the benefit of society
- ICSU's three inter-related themes: (1) International Research Collaboration, (2) Science and Policy and (3) Universality of Science
- Special projects like the International Polar Year 2007 – 2008
- ICSU's Regional Offices

- Changes to ICSU
- Concerns and new opportunities for Unions
- Importance of Unions to ICSU
- Finances – dues
- Finances – ICSU Grants Programme

The President thanked Prof. Elliott for his illuminating presentation.

Prof. H. Aref remarked that many Unions are active in areas where science and society are involved. IUTAM is a rather technical Union. How does ICSU see this Union becoming more engaged?

Prof Elliott responded that there are similar Unions like the mathematical one. Such Unions should realize that they could also make important contributions to problems dealing with earthquakes, environmental problems, etc.

The President asked if there is news on the establishment of a Regional Office for the Arab region.

Prof. Elliott responded that this was disappointingly not the case. The Jordanians attempted to call a meeting on this matter, but failed to get appropriate attendance.

#### 17.2. *IUTAM Proposal for ICSU Grants Programme 2008*

The Vice-President reported on this item as follows:

May I say first how glad I am that ICSU is making such efforts to keep in touch and in tune with its Union members; and I wish to thank Roger Elliott for having come to this General Assembly to bring us up-to-date on developments within ICSU with which I feel sure we can all resonate.

We have reason to be grateful to ICSU for a previous grant to IUTAM in 2003 to support the launching of the African Institute for Mathematical Sciences (AIMS) in Muizenberg, South Africa. That project, which involved also the support of our sister Unions, IAU, IMU, IUPAC, IUPAP, and IUGG, and also of TWAS, is now well established, and five cohorts of graduate students from all over Africa have now graduated from its one-year diploma course. AIMS is now the hub for the development of a network (AMINet) of similar Institutes planned across the African continent, with the backing of NEPAD (the New Partnership for African Development). ICSU's seed-corn grant in 2003 was of crucial importance in getting all this started; and our resulting involvement with AIMS has given IUTAM (and ICSU) welcome visibility in Africa.

We should also note that IUTAM has been involved in the International Polar Year, another great ICSU-sponsored initiative to which Roger Elliott has made reference, through its support of the International Summer School on Sea Ice held in Svalbard,

Spitzbergen, 2-13 July 2007, at which Grae Worster, who is present at this Congress, was one of the key lecturers.

I am happy to report now on this more recent successful application by IUTAM for a grant under the programme announced by ICSU in October 2007. The deadline for applications under this programme was 1 March 2008, so the Bureau was obliged to act quickly, and it authorised me, after some e-mail correspondence, to prepare in the name of IUTAM the proposal that you now have before you. You will also have among your papers the letter from Thomas Rosswall, Executive Director of ICSU, announcing the grant of 30,000 Euros, and the list of the 10 grants awarded, of which ours is number 6 on the list. You will see that these proposals were graded A, B or C, and that our proposal was one of the four graded A, which is very encouraging. I must admit that I felt a sense of exhilaration like that of a teenager receiving his or her School Certificate examination results, when this result was announced at the end of May this year! A condition of the grant is that the money should be spent before 1 August 2009, and that a final report should be submitted to ICSU by 1 September 2009. ICSU's time-scale for project planning and expenditure is much shorter than we are accustomed to in IUTAM!

May I draw your attention to several key features of our proposal:

- There were three supporting applicants: our sister Union IUGG; ICSU's Regional Office for Asia and the Pacific Region, recently established in Kuala Lumpur under the Directorship of Nord Hasan; and the Royal Society as the UK's National Adhering Organisation of ICSU. We also had the informal support of the Chinese Society of Theoretical and Applied Mechanics and of our affiliate organisation, the Asian Fluid Mechanics Committee, although these could not be taken into account by ICSU. I'd like to thank Zhemin Zheng and Jiachun Li for their support during the preparation of the application.
- The title of our proposal is **Fluid Mechanics and Geophysics of Environmental Hazards**, and the intention is to hold a two-week Spring School in April/May 2009 in Singapore, this school to be targeted at young researchers from Asia and the Pacific Region. This brings the proposal within two of the priority areas of ICSU, namely *Natural and Human-Induced Environmental Hazards and Disasters* and *Building Scientific Capacity*. It also brings it within the scope of our two Working Parties, WP8 on *Geophysical and Environmental Mechanics* and WP9 on *Education and Capacity Building in Mechanics*, and I'd like to thank also the Chairs of these Working Parties, Paul Linden and Hassan Aref for their support at all stages.
- The School will be hosted by the *Institute for Mathematical Sciences* at the *National University of Singapore*, and detailed planning is now underway. We have an excellent team of lecturers lined up, who will cover the basics of

Geophysical Fluid Dynamics with particular attention to tropical cyclones, tsunamis, monsoons and flooding, and problems of environmental pollution. We are working on a series of posters on these topics, mainly for the purpose of outreach to the wider public; in this, I am greatly assisted by Andrew Burbanks of the University of Portsmouth, UK, who is skilled in graphic design work. A webpage is under construction and will go public in mid-September. I shall then ask members of the General Assembly to help diffuse the information and to encourage good student applicants, particularly from our own member countries of the region, China, India, Japan, Korea and Vietnam and also from developing countries of the region that are not, or not yet, members of IUTAM: in particular, Malaysia, Thailand, Indonesia, Philippines, Sri Lanka, and Bangladesh. As regards follow-up, it is planned to establish an informal research network based on the lecturers and the students who attend the school, in order to stimulate research in this priority field. Just as previously in Africa, this school will obviously give IUTAM welcome visibility in Asia and the Pacific Region.

Finally, as regards financial support in addition to the ICSU grant which is primarily intended for the support of students, IMS has promised S\$30,000 (about US\$24,000), and IUGG will support the two lecturers (G. Tetzlaff, Germany, and A.W. Jayawardena, Japan) that it has nominated. I anticipated in the application that IUTAM would provide its usual Summer School support of US\$5000, which would go towards the costs of lecturers that *we* nominate, and I hope that you will now endorse this contribution to what I anticipate will be an important initiative in the South-East Asia region.

H.K.Moffatt

*It was agreed to endorse the standard IUTAM grant for this Spring School.*

### 17.3. *ICSU Regional Office for Latin America and the Caribbean*

The Secretary-General reported that ICSU has asked IUTAM to provide the name of a contact person on behalf of IUTAM for their Regional Office for Latin America and the Caribbean. The Bureau is very pleased that Prof. L. Bevilacqua agreed to accept this duty.



**Item 18 –Matters concerning Inter-Union Committees***18.1. SCOPE – Scientific Committee for Problems of the Environment*

The Secretary-General reported that Prof. Paul Linden accepted appointment to the vacant position of representative of IUTAM in SCOPE. He combines this duty with the chairmanship of the WP-8 on Geophysical and Environmental Mechanics.

*18.2. SCOR – Scientific Committee for Ocean Research*

The Secretary-General reported that the representative of IUTAM in SCOR, Professor Wolfgang Fennel, has expressed that he wishes to resign. The Bureau has appointed Prof. Michael Stiassnie (Haifa) as his successor.

**Item 19 –Matters concerning non-ICSU organizations**

Nothing to report

**Item 20 – Continued discussion and final decision regarding future****IUTAM Symposia**

*The General Assembly decided to accept the 12 symposia proposals, rated “alpha”, and coded F.2, F.4, F/S.2, F/S.3, S.1, S.2, S.3, S.6, S.9, S.10, S.13 and S.15*

After further discussion of the remaining 11 proposals, rated “beta”, a vote was taken.

*The following further 3 proposals were finally accepted:*

- F.3 *Bluff Body Flows*
- F/S.1 *50 Years of Chaos: Applied and Theoretical*
- S.14 *Nonlinear Dynamics for Advanced Technologies and Engineering Design (NDATED)*

**Item 21 –Continued discussion and final decision regarding future International Summer Schools on Mechanics**

After further discussion of the 3 proposals for Summer Schools a vote was taken.

*The 2 Summer Schools coded SS.1 and SS.3 were finally accepted.*

**Item 22 –Continued discussion and final decision regarding annual dues**

Following the proposal made by the Treasurer, Professor J. Engelbrecht, see item 4, *the General Assembly unanimously decided the following amounts for the units of dues:*

*US \$ 752 in 2010*

*US \$ 778 in 2011*

*The dues of equal amounts for those years will be US \$ 765.*

**Item 23 – Continued discussion and final decision regarding Working Parties**

*With reference to the proposal under item 8.2, the General Assembly appointed Prof. O. Allix as chairman of the WP-3 on Mechanics of Materials.*

**Item 24 –Continued discussion and final decision regarding Associate Membership, including decision on changes of Statutes**

*The General Assembly agreed by hand vote to accept the revised report of the Committee on Associate Membership, including the change of Statutes specified in Appendix B of the Report.*

**Item 25 –Election of members of the Bureau**

*The General Assembly elected unanimously by raising hands the following persons to the three vacant Officer positions P, S and T for the period 2008-2012:*

President: Prof. T.J. Pedley (UK)

Secretary-General: Prof. F. Dias (France)

Treasurer: Prof. N. Olhoff (Denmark)

(according to Article XI of the Statutes, the retiring President, Prof. L.B. Freund, will serve as Vice-President)

*The General Assembly elected by secret ballot the following persons to the three vacant non-Officer positions W, X, Y, and Z for the period 2008-2012:*

Position W: Prof. F. Chernousko (Russia)

Position X: Prof. I. Goldhirsch (Israel)

Position Y: Prof. A. Thess (Germany)

Position Z: Prof. N. Gupta (India)

**Item 26 –Election of Members-at-Large**

*The General Assembly re-elected Prof. A. Acrivos, Prof. W. Schiehlen, Prof. T. Tatsumi and Prof. L. van Wijngaarden as Members-at-Large for the period 2008-2012.*

(The Members-at-Large Prof. B. Boley, Prof. J. Hult and Prof. F. Niordson belong to the category of “life members”.)

*The General Assembly elected Prof. J.D. Achenbach, Prof. D.H. van Campen, Prof. H.K. Moffatt and Prof. R. Narasimha as Members-at-Large for the period 2008-2012.*

**Item 27 –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 2008 through 2012:*

Prof. H. Aref, USA  
Prof. N. Aubry, USA  
Prof. D. Barthes-Biesel, France  
Prof. M.P. Bendsøe, Denmark  
Prof. D.H. van Campen, Netherlands  
Prof. A. Carpinteri, Italy  
Prof. G.-D. Cheng, China  
Prof. I. Goryacheva, Russia  
Prof. T. Kowalewski, Poland  
Prof. S. Kyriakides, USA  
Prof. P. Ladevèze, France  
Prof. T.J. Pedley, UK  
Prof. A. Thess, Germany  
Prof. V. Tvergaard, Denmark

*The General Assembly decided to elect the following persons as members of the Congress Committee for the period 2008 through 2012:*

Prof. L. Banks-Sills, Israel  
Prof. F. Dias, France  
Prof. N. Gupta, India  
Prof. Y. Kaneda, Japan  
Prof. G. Leal, USA, representative of ICR  
Prof. J. Magnaudet, France  
Prof. B. McMeeking, USA, representative of ICF  
Prof. R. Ogden, UK

*The new membership of the Congress Committee is recorded in the following table:*

Prof. H. (Hassan) Aref, USA, 2012, Secretary, member of XCCC  
Prof. N. (Nadine) Aubry, USA, 2012  
Prof. L. (Leslie) Banks-Sills, Israel, 2012  
Prof. D. (Dominique) Barthes-Biesel, France, 2012  
Prof. M.P. (Martin) Bendsøe, Denmark, 2012, member of XCCC,  
representative of ISSMO  
Prof. D.E. (Dimitri) Beskos, Greece, 2010  
Prof. D.H. (Dick) van Campen, Netherlands, 2012, member of XCCC  
Prof. A. (Alberto) Carpinteri, Italy, 2012  
Prof. G.-D. (Gengdong) Cheng, China, 2012  
Prof. L. (Frédéric) Dias, France, 2012  
Prof. F. Ellyin, Canada, 2010, representative of ICM  
Prof. I. (Irina) Goryacheva, Russia, 2012  
Prof. N. (Narinder) Gupta, India, 2012  
Prof. M.A. (Michael) Hayes, Ireland, 2010, representative of ISIMM  
Prof. C.T. (Carl) Herakovich, USA, 2010

Prof. Y. (Yukio) Kaneda, Japan, 2012  
Prof. A. (Alfred) Kluwick, Austria, 2010  
Prof. T.A. (Tomasz) Kowalewski, Poland, 2012, member of XCCC  
Prof. E.J. (Edwin) Kreuzer, Germany, 2010  
Prof. S. (Stelios) Kyriakides, USA, 2012  
Prof. P. (Pierre) Ladevèze, France, 2012  
Prof. L.G. (Gary) Leal, USA, 2012, representative of ICR  
Prof. J.-B. (Jean-Baptiste) Leblond, France, 2010  
Prof. J. (Jacques) Magnaudet, France, 2012  
Prof. R.M. (Bob) McMeeking, USA, 2012  
Prof. N. (Nikita) Morozov, Russia, 2010  
Prof. R. (Ray) Ogden, UK, 2012  
Prof. N. (Nigel) Peake, UK, 2010  
Prof. T.J. (Timothy) Pedley, UK, 2012, President, member of XCCC  
Prof. B.A. (Bernhard) Schrefler, Italy, 2010, member of XCCC,  
representative of CISM  
Prof. A. (André) Thess, Germany, 2012  
Prof. E.O. (Ernie) Tuck, Australia, 2010  
Prof. V. (Viggo) Tvergaard, Denmark, 2012  
Prof. M.G. (Manuel) Velarde, Spain, 2010  
Prof. G. Yagawa, Japan, 2010

#### **Item 28 – Election of members of Symposia Panels**

*With reference to the proposals under item 11, the General Assembly agreed:*

- to appoint Prof. Gary Leal (USA) as new chair of the Symposia Panel for Fluid Mechanics for the period 2008 - 2012,
- to appoint Prof. Viggo Tvergaard (Denmark) as new chair of the Symposia Panel for Solid Mechanics for the period 2008 - 2012,
- to appoint Prof. Nigel Peake (UK) as new member to the Symposia Panel for Fluid Mechanics for the period 2008 - 2012,
- to appoint Prof. Norman Fleck (UK) and Prof. Huajian Gao (USA) as new members to the Symposia Panel for Solid Mechanics for the period 2008 - 2012.

#### **Item 29 – Date and venue of the next General Assembly**

*The General Assembly agreed to hold its next meeting in the summer period of 2010 with precise dates yet to be fixed.*

#### **Item 30 – Any other business**

None.

Then, the President closed the meeting.

*Dick van Campen, Secretary-General*

**2008 Treasurer's Report****Statement of Change in Fund Balance** **USD**

<b>Balance, 31 December 2007</b>	427,005
Net revenues minus expenses for 2008	13,016
<b>Balance, 31 December 2008</b>	<b>440,021</b>

**Statement of Cash Revenues Collected over Expenses Paid****Revenues collected during 2008:**

Subscription dues	120,423
ICSU Spring-School Grant (€ 30,000)	47,170
Interest income	4,535
<b>Total</b>	<b>172,128</b>

**Expenses paid during 2008:**

Symposia	35,000
IUTAM Summer School	11,000
ICTAM 2008	1,500
Travel, Bureau	2,197
Travel, Congress Committee Executive Committee	765
Travel, others	21,599
Contribution to ICSU	4,415
Administration & printing	67,912
Auditor's fee	3,600
Website	2,666
Bank fees	1,653
<b>Total</b>	<b>152,307</b>

**Revenues minus expenses for 2008** **19,821**

Gain (loss) from exchange of currency -6,805

**Net revenues minus expenses for 2008** **13,016**

**Statement of IUTAM Bank Accounts  
(1 January 2008 through 31 December 2008)**

**Running Accounts**

<b>Bank</b>	<b>Balance 31 Dec. 07</b>	<b>Withdrawals 2008</b>	<b>Deposits 2008</b>	<b>Balance 31 Dec. 08</b>
Citizens Bank Providence 1009-367-2	50,504.33	-91,735.46	83,877.00	42,645.87
Citizens Bank Providence 1597-967-1	133,916.10	0.00	1,007.83	134,923.93
ABN-AMRO Bank Eindhoven 41.41.42.551	25,563.34	-48,000.00	25,537.50	3,100.84
ABN-AMRO Bank Eindhoven 41.41.28.311	10,504.01	-135,226.83	125,283.44	560.62
Spar Nord Bank Aalborg 383 88 37963	0.00 <sup>*)</sup>	3.47	34,000.00	33,996.53
Spar Nord Bank Aalborg 383 88 37955	0.00 <sup>*)</sup>	10.68	95,066.39	95,055.71

<sup>\*)</sup> Account opened 4 Dec. 08.

**Savings Accounts**

<b>Bank</b>	<b>Balance 31 Dec. 07</b>	<b>Withdrawals 2008</b>	<b>Deposits 2008</b>	<b>Balance 31 Dec. 08</b>
Citizens Bank Providence	86,941.68	0.00	1,622.00	88,563.68
ABN-AMRO Bank Eindhoven	77,690.00	78,933.04 <sup>**)</sup>	1,243.04	0.00

<sup>\*\*)</sup> Transferred to ABN-AMRO Bank Account 41.41.28.311 on 9 Dec. 08 and Account closed.

**IUTAM Bank Account Information****Treasurer:**

Professor N. Olhoff, Department of Mechanical Engineering, Aalborg University,  
Pontoppidanstraede 101, DK-9220 Aalborg East, Denmark

**Assistant Treasurer:**

Professor L. B. Freund, Division of Engineering, Brown University, 182 Hope Street,  
Providence, RI 02912-9104 USA

**Running Accounts:**

Citizens Bank, One Citizens Drive, Riverside, RI 02915-3000, Account 1009-367-2  
(USD), Account 1597-967-1 (USD)

ABN-AMRO Bank, Postbus 515, 5600 AM Eindhoven, The Netherlands, Account  
41.41.28.311 (EUR), 41.41.42.551 (USD)

Spar Nord Bank, Post Office Box 162, DK-9100 Aalborg, Denmark, Account 383 88  
37955 (EUR), Account 383 88 37963 (USD)

**Subscription Due Paid in Membership Units  
(1 January 2008 through 31 December 2008)**

<b>Adhering Organization</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
Argentina	--	--	--	--	--	--
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	3
Bulgaria	--	1	--	--	--	--
Canada	8	8	8	8	8	8
Chile	1	1	1	1	1	1
China/Beijing	8	8	8	8	8	8
China/Hong Kong**	1	1	1	1	1	--

<b>Adhering Organization</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
China/Taipei	3	3	3	3	3	3
Croatia	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	--	--
Estonia	1	1	1	1	1	1
Finland	3	3	3	3	3	3
France**	8	8	8	8	8	--
Georgia	--	--	--	1	1	1
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	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	--	--
Latvia	1	1	1	1	1	1
Netherlands	5	5	5	5	5	5
New Zealand	1	1	1	1	1	1
Norway	1	1	1	1	1	1



<b>Adhering Organization</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
Poland	3	3	3	3	3	3
Portugal	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	1	1	1	1	1	1
Slovakia	1	1	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	--
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 2008. Dues are expressed in membership units of 1, 3, 5, 8 or 12, corresponding to category of membership from I through V, respectively.

\* Brazil has decided to pay 3 units of dues from 08

\*\* China/Hong Kong and France paid for 08, however not recorded in Bank Statement for 2008

## Reports on Affiliated Organizations

### AFMC (Asian Fluid Mechanics Committee)

The 12th Asian Congress on Fluid Mechanics was successfully held in Daejeon, Korea, during 18-21 August, 2008. More than 260 representatives of 15 countries: Korea, Japan, China, India, Iran, Pakistan, Indonesia, Thailand, Sri Lanka, Singapore, Oman, Russia, Viet Nam, USA and Netherland from Asia and other continents took part in the activities. Fifteen invited speakers delivered presentations, including 3 memorial lectures in honor of AFMC founders. On the occasion the first AFMC & TSI prize for young Asian fluid dynamicists was awarded to Dr. Meheboob Alam, Jawaharlal Nehru Center for Advanced Scientific Research, India in recognition of his contribution in granular flow research. AFMC members had a regular meeting during the period. Professor V. V. Kozlov, Institute of Theoretical and Applied Mechanics, RAS was agreed to become a new member of AFMC. It was decided that the next ACFM will be held in Dhaka and AFMC member, Professor A.K.M. Sadrul Islam from Bangladesh University of Engineering and Technology will coordinate the Congress activities.

**Report composed by Jiachun Li**

### CACOFD (Caribbean Congress of Fluid Dynamics)

No report has been submitted on CACOFD.

### CISM (International Centre for Mechanical Sciences)

#### 1. Courses and Seminars

The regular programme of courses and seminars, planned by the Scientific Council at the Centre for 2008, took place in two Scientific Sessions, the Krajinovic Session (May-July 2008) and the Batchelor Session (September-October 2008). 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 sponsored by IUTAM and one was organized within NoE-KMM project, sponsored by EC.

#### *The Krajinovic Session*

Mechanical Size-Effects of Materials: Processing, Characterization and Modeling  
Modern Engineering and Mathematical Concepts in Computational Shell Mechanics  
Brittle Fracture and Plastic Slip: from the Atomistic to the Engineering Scale

Instabilities of Flows with and without Heat Transfer and Chemical Reactions  
Advanced Nonlinear Strategies for Vibration Mitigation and System Identification  
Advanced Design of Mechanical Systems: from Analysis to Optimization  
Damage Mechanics and Micromechanics of Localized Fracture Phenomena in Inelastic Solids  
Nonlinear Fracture Mechanics Models  
Impact Engineering of Composite Structures

16th IUTAM International Summer School on Advanced Integral Equation Methods in Computational Mechanics

*The Batchelor Session*

Transport Phenomena in Micro- and Nanofluidics  
Computational and Experimental Mechanics of Advanced Materials  
Reduced Order Modelling for Flow Control  
New Trends in Vibration Based Structural Health Monitoring  
New Trends in Thin Structures: Formulation, Optimization and Coupled Problems

## 2. Other Events

Besides the above courses the following meeting was organized by CISM in 2008:

- NoE/KMM - Fourth Summer School, "Processing, Modelling & Design of Multi-layered and Graded Material Systems" sponsored by EC (September 16-26, 2008)

## 3. Editorial Activities

The lectures of several courses held at CISM were published in book form and distributed by Springer Verlag Vienna-New York. The following books were published in 2008:

A. Morassi - F. Vestroni "Dynamic Methods for Damage Detection in Structures"  
P. Arena - "Dynamical Systems, Wave-based Computation and Neuro-inspired Robots"  
C.F. Barengi - Y.A. Sergeev "Vortices and Turbulence at Very Low Temperatures"  
O.S. Bursi - D. Wagg "Modern Techniques for Structural Systems: Dynamics and Control"  
A. Morassi - R. Paroni "Classical and Advanced Theories of Thin Structures: Mathematical Aspects"  
G. Della Riccia - R. Dubois - R. Kruse - H.J. Lenz "Preferences and Similarities"  
R. Ohayon - G. Sandberg "Computational Aspects of Structural Acoustics and Vibration"  
H. Norstrud "Sport Aerodynamics"  
M. Arnold - W. Schiehlen "Simulation Techniques for Applied Dynamics"

The scientific International Journal "Mechanics Research Communications" (bimonthly) was founded in 1973 by CISM and Pergamon Press (Oxford-New York); at present is published by Elsevier. In 2008 its thirty fifth volume appeared. It contains peer-reviewed short communications of high standard and aims at providing fast means for communication of research results and exchange of ideas related to the 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. In addition free board and lodging in Udine were granted to several participants from European and extra-European countries, thanks to contributions by IUTAM and EC.

#### **5. International Participation**

In 2008, 87 lecturers from 20 countries delivered lectures in the Krajcinovic and Batchelor Sessions. The courses were attended by 401 participants coming from 37 countries.

**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 Non-linear 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 2008**

- [495] Advances in simulation of multibody systems dynamics, 18-21 February 2008, Bryansk, Russia
- [498] Nonlinear Dynamics of Composites and Smart Structures, 21- 4 May 2008, Kazimierz Dolny, Poland
- [499] Nonlinear Mechanics of Multiphase Flow in Porous Media: Phase Transitions, Instability, Non equilibrium, Modeling 9-12 June 2008, Nancy, France
- [500] Non-smooth Problems in Vehicle Systems Dynamics - Analysis and Solutions, 17-20 June 2008, Lyngby, Denmark
- [501] Mixing of coastal, estuarine and riverine shallow flows, 8-11 June 2008, Ancona, Italy
- [502] Reinforced Elastomers: Fracture Mechanics statistical Physics and numerical simulation, 8-10 September 2008, Dresden, Germany

#### **EUROMECH CONFERENCES in 2008**

- MÉCAMAT, 11th European Mechanics of Materials Conference, 10-14 March 2008, Turin, Italy
- 6th EUROMECH Nonlinear Oscillations Conference, 30 June 2008-4 July 2008, St. Petersburg, Russia
- 7th EUROMECH Fluid Mechanics Conference, 14-18 September 2008, Manchester, UK

For more details see [www.euromech.org](http://www.euromech.org) .

**Report composed by Bernard 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 2007 several workshops and scientific meetings have been conducted involving the active participation of HYDROMAG and its members.

A group of European Scientists successfully established a network on EPM 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=412>

**Report composed by André Thess**

**IABEM (International Association for Boundary Element Methods)**

No report has been submitted by IABEM.

**IACM (International Association for Computational Mechanics)**

No report has been submitted by IACM.

**IAVSD (International Association for Vehicle Systems Dynamics)**

No report has been submitted by IAVSD.

**ICA (International Commission for Acoustics)**

The ICA board elected at the ICA General Assembly in 2007 continues with the executive comprising Samir Gerges as President, Sonoko Kuwano as Vice President, Hugo Fastl as the Treasurer and Marion Burgess as Secretary General. The 2008 board meeting held in Paris at the time of a major international acoustics meeting was well attended and the day long meeting allowed for good discussion on many matters important to ICA at this time. In particular there was consideration of the governance and options for changes to the structure of the board. The Board will continue to work on this for voting by the ICA membership at the next General Assembly in Sydney in 2010. The membership of the ICA has not been increasing while it is clear that the interest in acoustics is expanding. So the Board is seeking suggestions for encouraging more members for ICA. We request the membership to forward any suggestions on societies or groups which should be invited to consider membership of ICA

The Board continues with its task of obtaining greater acknowledgement of the role of acoustics with a view to seeking full membership of ICSU. The inclusion of the following international affiliates has increased the strength of the board: European Acoustics Association (EAA), IberoAmerican Federation of Acoustics (FIA), International Institute of Noise Control Engineering (I-INCE), International Institute of Acoustics and Vibration (IIAV), Western Pacific Acoustics Commission (WESPAC) and the International Congress on Ultrasonics (ICU). The Board has set up an International Conference Coordination Committee with a view to encouraging improved coordination of these international activities.

The major activity for the ICA is the congress held every 3 years. In 2010 this will be held in Sydney Australia and we look forward to the assistance of IUTAM in promoting this important activity. In the current international economic environment it will be a challenge to ensure that this event is both scientifically and financially viable.

The ICA has also provided support to the following specialist symposia in 2008 and has offered support to a number of meetings in 2009 and a commitment for 2010:

<b>2008</b>		Euro
Wave and Quantum Acoustics	Wisla, Poland	1000
Acousto-Optics	Sopot, Poland	1000
Acoustic Communication by Animals	Oregon, USA	1000
<b>2009</b>		
ICU 2009 - Ultrasonics	Chile	1000
34 Int Conference Acoustics High Tatras 2009.	Slovakia	500
Pacific Rim Underwater	China	1000
Speech and Computer, SPECOM 2009	Russia	500

Acoustics & Biomed Eng	Poland	1000
Environmental Acoustics and Acoustical Sustainable Buildings	Spain	1000
<b>2010</b>		
Musical Acoustics, ISMA	Australia	

The ICA acknowledges the ongoing collaboration with IUTAM and the valued contribution from the IUTAM representative at Board Meetings. We look forward to strengthening this link in the future.

**Report composed by Samir Gerges and Marion Burgess**

**ICF (International Congress on Fracture)**

No report has been submitted by ICF.

**ICHMT (International Centre for Heat and Mass Transfer)**

No report has been submitted by ICHMT.

**ICM (International Congress on the Mechanical Behaviour of Materials)**

No report has been submitted by ICM.

**ICR (International Committee on Rheology)**

From August 3-8, 2008, the Society of Rheology hosted the largest ever world-wide gathering of rheologists. Scientists and technologists from 41 countries met that week in Monterey, California, USA for the XVth International Congress on Rheology. The Congress was organized by Gerry Fuller, Stanford University, Andy Kraynik, Sandia National Laboratories, and Robert Powell, UC Davis.

The International Congress on Rheology 2008 was a resounding success. More than a thousand participants (728 full delegates, 281 student delegates) attended and delivered five days of talks (656 oral presentations and 208 poster presentations), including invited plenary and keynote addresses delivered by, among others, Paul Callaghan, Michael Rubinstein, Howard Stone, Kenji Urayama, Michel Cloitre, Victor Steinberg, Jae Ryoung Youn, and Peter Olmsted.



The week kicked off with an opening reception at the Monterey Convention Center. After the first full day of technical talks, the Society of Rheology welcomed all to the Monterey Bay Aquarium, where delegates and their guests had the opportunity to view the exhibits while enjoying a buffet dinner served throughout the facility. Exhibits were open to all of the guests of the reception, giving congress attendees a chance to pet gentle bat rays, learn about the life of the Bay, and contemplate the peaceful grace of floating jelly fish.

The International Committee on Rheology (ICR) met on Tuesday on the invitation of Andy Kraynik and the SOR. Delegates of 20 National Rheological Societies worldwide were present. ICR Chairman Jae Chun Hyun complimented Gerry Fuller and Bob Powell on their choice of venue for the XVth International Congress, and congratulated them for a most successful, well-organized Congress with the largest participation of rheologists ever.

Paul Slatter, President of the Southern African Society of Rheology (SASOR), applied for ICR membership on behalf of SASOR. SASOR was officially founded in 2006, and since then, has made considerable progress in establishing an international reputation, particularly due to the work of an enthusiastic, supportive and active membership. It has so far hosted successfully three international events, ample evidence of “a membership large and active enough to make it reasonable for the group to host an international Congress or meeting on rheology” as required by ICR By-Law 2B. By unanimous acclaim, SASOR was admitted as a member of the ICR.

Concerning the affiliation of SASOR to the regional unions (ICR By-Law 3C), SASOR opted for affiliation with Europe. By unanimous acclaim, the second sentence of ICR By-Law 3C was amended by “The three regions shall be the Americas, Europe/Africa and Asia/Australia, ...”.

According to rule 3C of the ICR by-laws, the International Congress on Rheology 2012 will be held in Europe. In its meeting in 2007, the Committee of the European Society of Rheology (ESR) has decided to propose Lisbon as the venue of the 2012 Congress, and the Congress will be jointly organized by the Portuguese, Spanish and Slovenian Societies of Rheology. Igor Emri, co-Chair of Lisbon 2012 and responsible for the liaison with the ICR and the ESR, presented the bid. Co-Chair Joao Maia will coordinate the local Organising Committee, and co-Chair Crispulo Gallegos will coordinate the Scientific and Technical Committee. By unanimous acclaim, the next (XVIth) International Congress of Rheology will be held at Lisbon in 2012.

Jae Chun Hyun proposed that the next Chairman of the ICR be Gerry Fuller. The motion was approved by unanimous acclaim, followed by a note of appreciation to Jae Chun Hyun. Jae Chun Hyun proposed that Manfred H. Wagner be re-elected as Secretary of the Committee. The motion was approved by unanimous acclaim. Gary Leal was re-nominated as the ICR Liason at IUTAM by acclaim, and his work as ICR representative in IUTAM was applauded.

On Wednesday, delegates took a break from the technical sessions to attend a variety of afternoon excursions, from bus tours of wine country to kayaking on the bay. After an afternoon pursuing individual diversions, Congress attendees gathered at the beach for an unforgettable beach party.

On Thursday evening, following another full day of technical sessions, Congress attendees gathered to thank their hosts and to honor recipients of Society of Rheology awards. The 2008 Bingham Medal of the Society of Rheology was presented to Hans Christian Öttinger, ETH Zurich, Switzerland, in recognition of his contributions to kinetic theory and non-equilibrium thermodynamics. Öttinger was fêted through the recitation of a short poem in his honor composed by R. Byron Bird. Journal of Rheology Editor John Brady presented the SOR Publication award, which went to Alexander Meyer, Andrew Marshall, Brian G. Bush, and Eric M. Furst from the University of Delaware for a paper entitled "Laser tweezer microrheology of a colloidal suspension" (*J. Rheol.*, 50, 77 (2006)).

Technical program chairs Ralph Colby and Gary Leal kept the stakes high right to the end of the week by scheduling a plenary on the last day, delivered before the serving of a closing Congress luncheon. Although it had been a full week of rheological speculation and articulation, attendance was good at the closing lecture by Fred MacKintosh of Vrije Universiteit, The Netherlands.

**Report composed by Faith Morrison and Manfred Wagner**

### **ICTS (International Congresses on Thermal Stresses)**

The International Congresses on Thermal Stresses are held every two years, consecutively on three continents. The last one, the 7th Congress, was held in Taipei, Taiwan, in June 2007 (see 2007 report). The only activities of ICTS in 2008 were the preparation of the next Congress. That Congress, the 8th, will be held at the University of Illinois at Urbana-Champaign on June 1-4, 2009.

**Report composed by Richard Hetnarski.**

### **IHAV (International Institute of Acoustics and Vibration)**

IHAV at present has over 500 individual members in 55 countries. In addition there are 32 affiliated or cooperating societies with IHAV. The eleventh IHAV annual election was held in 2007 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: Tamer Elnady (Egypt), Leonid Gelman (United Kingdom), Chris K. Mechefske (Canada), Bert Roozen (Netherlands), and Rupert M. Thornely-Taylor (United Kingdom). Professor Franz Ziegler of Austria will complete his two year term as

president of IIAV in July 2008 and Professor Luis Bento Coelho of Portugal will take over the position as president for a two-year term beginning in July 2008.

The Fourteenth International Congress on Sound and Vibration (ICSV14) was held at the Cairns Convention Centre in Cairns, Australia on July 2-6 2007. ICSV14 was hosted by the International Institute of Acoustics and Vibration in cooperation with the Acoustical Society of Australia and the American Society of Mechanical Engineers. More than 750 abstracts from 55 different countries on all areas of sound and vibration were submitted. Altogether 600 delegates attended ICSV14. A list of submitted abstracts can be found on the Congress website, <http://www.icsv14.com/>

The opening ceremony and the first keynote lecture were given to a large audience on Monday morning 9 July. The ICSV14 technical proceedings were available to delegates at the congress itself on CD-ROM. The ICSV14 CD includes all abstracts and the full texts of all the accepted papers. During the congress banquet at a special ceremony, Professors Jeremy Astley, UK and Colin H. Hansen, Australia were presented with certificates for their elevation as fellows of the IIAV. A welcome reception party was held on Monday 9 July, a rainforest nature park trip on Tuesday 10 July, and the congress banquet on Wednesday 11 July.

The seven ICSV14 keynote lectures covered very different aspects of acoustics and vibration and were presented by prominent researchers such as Professor Jeremy Astley, Southampton, UK 'Predicting and reducing aircraft noise'; Professor Ilene Busch-Vishniac, Baltimore, USA; 'The challenges of noise control in hospitals'; Associate Professor Svante Finnveden, Stockholm, Sweden, 'Two observations on the wave approach to SEA'; Professor Colin Hansen, Adelaide, Australia, 'Optimisation of active and semi-active noise and vibration systems'; Professor Jeong-Guon Ih, Daejeon, Korea', Acoustic holography based on the inverse-BEM for the source identification of machinery noise'; Professor Kimihiro Sakagami, Kobe, Japan, 'Recent developments in applications of microperforated panel absorbers'; and Professor David Thompson, Southampton, UK, 'But are the trains getting any quieter?'

The ICS14 technical programme also included lectures arranged in 11 parallel technical sessions over a period of three and a half days. Thirty five special structured sessions were organised by members of the ICSV14 scientific committee. A large exhibition of sound and vibration transducers, measurement equipment and materials was held in conjunction with ICSV14 in which 25 major exhibitors took part. In addition there were three gold, one silver and two bronze sponsors for ICSV14 who provided financial support for the congress. Further details can be found on the ICSV14 website: <http://www.icsv14.com/>

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.

A new improved website was designed and implemented for IIAV in 2007. It is now operational at <http://www.iiav.org/>

**Report composed by Malcolm J. Crocker (Executive Director IIAV)**

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

### **1. STAMM XVI (September 22-25, 2008)**

The STAMM conference was held in Levico (close to Trento, in the Italian Alps) on September 22-25, 2009. It was organized by P.L. Colli, I. Mueller, A. Visintin. Consistently with the aims of ISIMM, mathematical modeling was at the focus. A number of problems originating from physics, engineering and other disciplines were presented. The list of the invited speakers is the following: H.-D. Alber (Darmstadt); G. Bertotti (INRIM - Turin); A. Fasano (Florence); G. Kremer (Curitiba); A. Mielke (Berlin); A. Mikelic (Lyon); R. Monneau (Champs sur Marne); W. Müller (Berlin); G. Mulone (Catania); B. Piccoli (IAC - Rome); M. Plapp (Paris); E. Presutti (Rome); M. Pulvirenti (Rome); T. Ruggeri (Bologna); L. Truskinovsky (Paris); W.-A. Yong (Beijing). There were also a number of 15-minute communications, and a poster section. A small financial support was provided to young participants. The program and further details are available at <http://www.science.unitn.it/%7Evisintin/2002.html>

### **2. STAMM XVII**

During the conference the Executive Committee of the Society has met for the annual meeting. Here, the next STAMM meeting has been planned to be held in 2010 at a conference hotel in Potsdam near Berlin. The local organizing committee consists of Prof. Alexander Mielke from the Weierstraß-Institut für Angewandte Analysis und Stochastik in Berlin and Prof. Wolfgang H. Müller from the Technical University of Berlin, Chair of Continuum Mechanics and Materials Theory. Topics of interest will include: 1) Self-organized criticality in fracture, damage and plasticity 2) Mechanics of active materials and systems (biophysics aspect) 3) Matching micro and macro scales (defects).

### **3. ISIMM prize**

During the same Executive Committee meeting it has been decided to launch the 'ISIMM prize'. The award will be given every two years at the regular STAMM conferences. The recipient of the prize is expected to make exceptional contributions towards building a link between Mathematics and Mechanics. To choose the winner for the current round we now solicit nominations from the Society Members (to be sent to [bigoni@ing.unitn.it](mailto:bigoni@ing.unitn.it)). The winner may be outside of the Society. After nominations are received, they will be reviewed by the Board and the winner will be decided by a simple majority vote.

### **4. New books from the ISIMM series**

A new book divided into two parts has been added to the ISIMM series: “Variational Principles of Continuum Mechanics: Part I. Fundamentals and Part II. Applications Series: Interaction of Mechanics and Mathematics,” by V. Berdichevsky (2009, ISBN: 978-3-540-88466-8 and 978-3-540-88468-2).

**Report composed by Adriano Montanaro**

### **ISSMO (International Society for Structural and Multidisciplinary Optimization)**

ISSMO has co-sponsored the following international scientific meetings during 2008:

- International Conference on Design, Fabrication and Economy of Welded Structures, DFE 2008, University of Miskolc, Hungary, April 24-26, 2008.
- 5th China-Japan-Korea Joint Symposium on Optimization of Structural and Mechanical Systems, Jeju, South Korea, June 16-19, 2008.
- EngOpt 2008, Rio de Janeiro, Brazil, June 1-5, 2008.
- 7th ASMO-UK / ISSMO Conference on Engineering Design Optimization, Bath, UK, July 7-8, 2008.
- ASME 34th Design Automation Conference (DAC), New York, NY, August 3-6, 2008.
- 22nd International Congress of Theoretical and Applied Mechanics, Adelaide, Australia, August 24-30, 2008. (Prenominated Session on Structural Optimization.)
- 12th AIAA / ISSMO MA&O Conference, Victoria, Canada, September 10-12, 2008.
- 36th Solid Mechanics Conference, Gdańsk, Poland, September 9–12, 2008.

The 8th (biannual) ISSMO World Congress on Structural and Multidisciplinary Optimization (WCSMO-8) is to be held in Lisbon, Portugal, June 1-5, 2009, and its organization is at an advanced stage. All signs indicate that the submission of papers and numbers of participants will be higher than for any of the preceding ISSMO World Congresses.

Please consult the website <http://www.issmo.net> for more information about ISSMO.

**Report composed by Niels Olhoff**

## Reports on ICSU and its Scientific Committees

### ICSU (International Council for Science)

#### Report on the 29th General Assembly of ICSU, Maputo, Mozambique, 21-24 October 2008

ICSU (the International Council for Science) is now at the half-way stage of its first-ever Strategic Plan, which covers the six-year period 2006-2011. This Plan sets out ICSU's vision in the following terms: *The long-term ICSU vision is for a world where science is used for the benefit of all, excellence in science is valued, and scientific knowledge is effectively linked to policy-making. In such a world, universal and equitable access to high quality scientific data and information is a reality, and all countries have the scientific capacity to use these and to contribute to generating the new knowledge that is necessary to establish their own development pathways in a sustainable manner.* Within this vision, emphasis is placed on the triple themes of *International Research Collaboration* (particularly in ICSU's priority areas, Environment, Sustainable Development, Human Health), *Science for Policy* (involving effective transfer of scientific knowledge to policymakers and to the wider public), and the *Universality of Science* (with emphasis on *capacity building* and *equitable access to scientific knowledge* in the developing world).

In this respect, the choice of location (Maputo, Mozambique) in sub-Saharan Africa was appropriate, the more so in view of the recent establishment of ICSU's Regional Office for Africa in Pretoria, South Africa, which, under the energetic Directorship of Sospeter Muhongo, played a large part in the organisation of this General Assembly (GA). The presence of the President of Mozambique, H.E.Armando Emilio Guebuza, at the Opening Ceremony, and the availability throughout the GA of the Minister for Science and Technology, Venâncio Massingue, for discussions with participants, was noteworthy, and underlined Mozambique's eagerness to embrace Science and Technology in establishing its own national 'development pathways'. ICSU's members are of two types: National Adhering Organisations, and International Scientific Unions. 47 of the 76 National Members were represented at the GA, and 26 of the 29 Scientific Union members. There were also 8 (non-voting) Associate National Members, and about 6 Nations having Observer status. In all, 21 African states were represented at this Assembly, making an impressive contribution to the deliberations.

The GA was opened by the retiring President of ICSU, Goverdhan Mehta (India), who made an outstanding opening address, emphasising both the achievements of ICSU and the challenges that it now faces. Reports on current major ICSU initiatives were considered over the next two days: *the International Polar Year (IPY, 2007/8)*, *Integrated Research on Disaster Risk (IRDR)*, *Ecosystem Change and Human Well-being (ECHW)*, *Health and Well-being in the Changing Urban Environment (HWCUE)*. A comprehensive report on IPY was provided by David Carlson, followed by a beautiful

video describing a recent South African (National Research Foundation) scientific expedition to Antarctica. Decisions were taken to establish IRDR and ECHW as major 10-year interdisciplinary programmes; and continued planning towards a new initiative on a *Systems Analysis Approach to Health and Well-being in the Changing Urban Environment* was approved (it being noted that *Systems Analysis*, being essentially *dynamical systems modelling and analysis*, requires the active involvement of mathematicians expert in this field). Progress on reviews of four of ICSU's Global Environmental Change Programmes were presented: *the Earth System Science Partnership (ESSP)*, *the International Geosphere-Biosphere Programme (IGBP)*, *the World Climate Research Programme (WCRP)*, and *the International Human Dimensions Programme on Global Environmental Change (IHDP)*. ESSP was recognised as an ICSU Interdisciplinary Body. Proliferation, and possible overlap, of the various initiatives relating to environmental issues was noted!

In partial mitigation, guided by a recent review of ICSU's Scientific Committee on Problems of the Environment (SCOPE) (on which IUTAM has a representative), the Executive Board (EB) recommended that the status of SCOPE as an ICSU Committee should cease after a transition period of two years. It was argued that, while SCOPE had a distinguished record, it had failed to adapt to the rapidly changing situation in regard to environmental studies (compounded by the launching of so many new initiatives, all competing for the same sources of funding), and that in effect it had been by-passed by developments of recent years. The recommendation was naturally opposed by the President of SCOPE, who argued for continuation of SCOPE's attachment to ICSU at least until the 2011 General Assembly; this was supported by several contributions from the floor, but the recommendation of the EB was carried by a substantial majority, when put to the vote. [It was later suggested, in humour though not without reason, that *all* ICSU's new initiatives having a bearing on the environment could well be reassembled under a new overarching committee on problems of the environment with the attractive acronym ... COPE!].

The GA then proceeded to elect its new Officers and Executive Board members for the next triennium. The procedure regarding the President is interesting: the retiring President (Goverdhan Mehta) continues as 'Past President' until March 2010. The new President (Catherine Bréchnignac, France, who has served as 'President-Elect since March 2007) takes over with immediate effect. A new President-Elect (Yuan Tseh Lee, Nobel Laureate, of China Taipei) has now been elected and will take office as President-Elect in March 2010, and as President at the next GA in 2011. The procedure ensures continuity and smooth transition from one President to the next.

ICSU also has two Vice-Presidents (one for Scientific Planning and Review, and one for External Affairs). I was one of two nominees on the EB slate for the latter position, having been nominated by IUTAM, but in the event the post went to Reiko Kuroda, nominated by the National Research Council of Japan, an election that helps promote gender balance on the EB. I did however have the opportunity to present my case, and I

was able to emphasise the very positive relation between IUTAM and its parent body ICSU over the last decade.

An important part of ICSU's strategy over the last 3 years has been the establishment of three Regional Offices (ROs), for (i) Africa (ROA, in Pretoria), (ii) Asia and the Pacific Region (ROAP, in Kuala Lumpur), and (iii) Latin America and the Caribbean (ROLAC, in Rio de Janeiro). The Directors of these ROs reported on progress in establishing their priorities (which broadly reflect those of ICSU itself). The current collaboration between IUTAM, IUGG, and ROAP in promoting research in the SE Asia region on *Fluid Dynamics and Geophysics of Environmental Hazards* (funded by an ICSU grant) was particularly welcomed by the ROAP Director, Nordin Hassan.

A new rationalised structure for Membership dues to ICSU was agreed: National dues are to be in 10 bands, allocation to bands being based on GDP. The question of whether voting should be weighted (in some nonlinear manner) according to band remains under consideration. Scientific Union dues will be in 4 bands, allocation to bands being determined by the dues income as declared by each Union from its member adhering organisations. The dues payable by IUTAM will be marginally affected by the changes, which do not take effect until 2012. The retiring Treasurer of ICSU, Roger Elliott, reported that the finances of ICSU are now on an even keel, after an earlier period of turbulence. At the closing ceremony (attended by both the Minister for Science and Technology, and the Minister for Finance), the Presidency passed to Catherine Bréchignac, who gave her Presidential address on the theme that *Universality of Technology* should go hand-in-hand with *Universality of Science*, a ambitious aspiration in view of its economic implications, but nevertheless warmly applauded.

The next General Assembly of ICSU will be held in Rome in 2011, the precise dates yet to be determined. IUTAM now has a strong voice within ICSU, and it is important that we continue to collaborate with our sister Unions through the medium of such gatherings as well as in other ways, in striving to contribute to realisation of the ICSU vision.

**Report composed by Keith Moffatt**



**COSPAR (Committee on Space Research)**

No report has been submitted by COSPAR.

**SCOPE (Scientific Committee on Problems of the Environment)**

No report has been submitted by SCOPE.

**SCOR (Scientific Committee on Oceanic Research)**

No report has been submitted by SCOR.

## 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 «organisations associées adhérentes» (cf. art. IX)
- vi) des représentants des pays candidats à l'adhésion;
- vii) 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 27 août 2008 à Adélaïde, Australie*

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\*\*\* Des organisations de scientifiques en mécanique théorique ou appliquée qui représentent une activité scientifique indépendante dans un pays ou dans un territoire du monde en voie de développement et qui ne sont pas déjà représentées par des « organisations adhérentes » de l'Union peuvent, avec le soutien écrit d'une « organisation adhérente », être admises en tant qu' « organisations associées adhérentes » de l'Union. La dénomination de l'organisation adhérente proposée doit être sans ambiguïté et politiquement neutre afin d'exclure tout malentendu quant à la qualification du pays ou du territoire qui est représenté.

\*\*\*) *Article IX adopté par l'Assemblée Générale de l'Union, le 27 août 2008 à Adélaïde, Australie*

X\*\*\*\* 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. XV ci-après). Chaque « organisation associée adhérente » dispose d'un représentant dans l'Assemblée Générale de l'Union sous la forme d'un observateur sans droit de vote, et doit acquitter une seule cotisation tous les quatre ans (cf. Art. XVI ci-après).

\*\*\*\*) *Article X adopté par l'Assemblée Générale de l'Union, le 27 août 2008 à Adélaïde, Australie*

XI 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.

XII\*\*\*\*\* 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 XII adopté par l'Assemblée Générale de l'Union, le 2 Septembre 1990 à Vienne, Autriche*

XIII 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.

XIV\*\*\*\*\* Les ressources financières de l'Union sont constituées par:

- a) les cotisations annuelles des «organisations adhérentes»;
- b) les cotisations des « organisations associées adhérentes » ;
- c) 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.

\*\*\*\*\*) *Article XIV adopté par l'Assemblée Générale de l'Union, le 27 août 2008 à Adélaïde, Australie*

XV Le nombre de représentants d'une «organisation adhérente» et le montant de la cotisation annuelle qu'elle doit acquitter sont définis dans le tableau suivant, par la catégorie à laquelle elle désire appartenir, et avec l'accord de l'Assemblée Générale.

Catégorie	Nombre de représentants	Nombre d'unités de la cotisation annuelle
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.

XVI\*\*\*\*\* La cotisation d'une « organisation associée adhérente » est établie pour couvrir une période de quatre ans, et le montant de ce paiement unique est égal à la cotisation annuelle de l'année en cours d'une « organisation adhérente » de catégorie I. L'admission en tant qu'« organisation associée adhérente » devient effective dès réception de cette cotisation par le Trésorier. Le statut de chaque « organisation associée adhérente » est réexaminé après les quatre premières années, ainsi qu'après les quatre années suivantes. La catégorie de Membre Associé est normalement limitée à un maximum de huit ans. La possibilité de demander l'admission en tant que Membre de la Catégorie I est offerte à tout moment à un Membre Associé.

\*\*\*\*\*) *Article XVI adopté par l'Assemblée Générale de l'Union, le 27 Août 2008 à Adélaïde, Australie.*

XVII\*\*\*\*\* 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 XVII adopté par l'Assemblée Générale de l'Union, le 28 Août 1994 à Amsterdam, 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;

c) 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 XII) 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

- a) representatives of the adhering organizations (Article VIII);
- b) members of the Bureau (Article XII);
- 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 XI);
- ii) Secretary of the Congress Committee (Article XIII);
- iii) chairmen of the Symposia Panels;
- iv) chairmen of the Working Parties;
- v) representatives of Adhering Associated Organisations (Article IX)
- vi) representatives of countries applying for membership;
- vii) representatives of committees and groups of scientists, if so decided by the General Assembly.

*\*\*\*) Article VI adopted by the General Assembly on August 27, 2008, in Adelaide (Australia)*

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.\*\*\* Organisations of scientists in theoretical or applied mechanics which represent independent scientific activity in a country or territory of the developing world and

which are not already represented by an adhering organisation of the Union may, with the written support of one adhering organisation, be admitted as an adhering associate organisation of the Union. The name of the proposed adhering organisation must be unambiguous and politically neutral in order to avoid misunderstanding about the country or territory being represented.

\*\*\*) *Article IX adopted by the General Assembly on August 27, 2008, in Adelaide (Australia)*

- X.\*\*\*\* 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 XV. Each adhering associate organisation shall have one representative as a nonvoting observer in the General Assembly of the Union, and shall pay a single subscription once for each four-year period in accordance with Article XVI.

\*\*\*\*) *Article X adopted by the General Assembly on August 27, 2008, in Adelaide (Australia)*

- XI. 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.

- XII\*\*\*\*\*. 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 center for all matters affecting the Union, including relations with adhering, affiliated and other organizations.

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

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

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

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

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

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

\*\*\*\*\*) *Article XI adopted by the General Assembly on September 2, 1990, in Vienna (Austria)*

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

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

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

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

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

XIV.\*\*\*\*\* The financial means of the Union are formed by:

- a) the annual subscriptions of the adhering organizations;
- b) the subscriptions of the adhering associate organisations;
- c) 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.

\*\*\*\*\*) *Article XIV adopted by the General Assembly on August 27, 2008, in Adelaide (Australia)*

XV. 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.

XVI.\*\*\*\*\* The subscription of an associate adhering organisation shall be set to cover a four-year period, and the level of this single payment shall be equal to the current annual subscription of a Category I adhering organisation. Admission as an associate adhering organisation shall be conditional on receipt of this subscription by the Treasurer. The status of each adhering associate organisation shall be reviewed after the initial four years and again after a further four years. Associate Membership shall normally be limited to a maximum of eight years. The option to apply for Category I Membership shall be open to an Associate Member at any time.

\*\*\*\*\*) *Article XVI adopted by the General Assembly on August 27, 2008, in Adelaide (Australia)*

XVII\*\*\*\*\*. 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, 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**

**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.

**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. Khariif, 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).

**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 Elasto-hydrodynamics and Microelasto-hydrodynamics*  
(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.



**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
- 06-2 *IUTAM Symposium on Interactions for Dispersed Systems in Newtonian and Viscoelastic Fluids* (Guanajuato, Mexico, March 26-31, 2006).  
A report on the Symposium was published and appeared in *Physics of Fluids*, Vol 18, 121501-1, 2006.
- 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.
- 06-4 *IUTAM Symposium on Hamiltonian Dynamics, Vortex Structures, Turbulence* (Moscow, Russia, August 25-30, 2006).  
The Proceedings of the Symposium edited by Borisov, A.V., Kozlov, V.V. et.al., have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2007. ISBN 978-1-4020-6743-3
- 06-5 *IUTAM Symposium on Discretization Methods for Evolving Discontinuities* (Lyon, France, September 04-07, 2006).  
The Proceedings of the Symposium edited by Combescure, Alain, Borst, René de, Belytschko, Ted, have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2007. ISBN 978-1-4020-6529-3
- 06-6 *IUTAM Symposium on Computational Physics and new Perspectives in Turbulence* (Nagoya, Japan, September 11-14, 2006).  
The Proceedings of the Symposium edited by Kaneda, Yukio, have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2007. ISBN 978-1-4020-6471-5

- 06-7 *IUTAM Symposium on Dynamics and Control of Nonlinear Systems with Uncertainty* (Nanjing, China, September 18-22, 2006).  
The Proceedings of the Symposium edited by Hu, H.Y., Kreuzer E.J., have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2007. ISBN 978-1-4020-6331-2
- 06-8 *IUTAM Symposium on Flow Control and MEMS* (London, UK, September 19-22, 2006).  
The Proceedings of the Symposium edited by Morrison, J.F., Birch, D.M., Lavoie, P., have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2007.  
ISBN 978-1-4020-6857-7
- 06-9 *IUTAM Symposium on Computational Contact Mechanics* (Hannover, Germany, November 05-09, 2006).  
The Proceedings of the Symposium edited by Wriggers, Peter, Neckenhorst, Udo have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2007.  
ISBN 978-1-4020-6404-3

**2007**

- 07-1 *IUTAM Symposium on Shell, Plate, Beam and 3D Models* (Tbilisi, Georgia, April 23-28, 2007).  
The Proceedings of the Symposium edited by Jaiani, George; Podio-Guidugli, Paolo, have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2008.  
ISBN 978-1-4020-8773-8.
- 07-2 *IUTAM Symposium on Recent Advances in Multiphase Flows: Numerical and Experimental* (Istanbul, Turkey, June 11-14, 2007).  
The Proceedings of the Symposium have been published as a regular issue of the journal *Physics of Fluids*, Vol. 20, Issue 4, April 2008, together with selected papers from the meeting, all of which will have gone through the standard reviewing process of that journal.
- 07-3 *IUTAM Symposium on Unsteady Separated Flows and their Control* (Corfu, Greece, June 18-22, 2007).  
The Proceedings of the Symposium edited by Braza, Marianna; Hourigan, K. have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2009, and as a special issue of the *Journal of Fluids and Structures*, Vol. 24, Issue 8, November 2008.  
ISBN: 978-1-4020-9897-0.

- 07-4 *IUTAM Symposium on Scaling in Solid Mechanics* (Cardiff, UK, June 25-29, 2007).  
The Proceedings of the Symposium edited by Borodich, F., have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2009.  
ISBN 978-1-4020-9032-5.
- 07-5 *IUTAM Symposium on Fluid- Structure Interaction in Ocean Engineering* (Hamburg, Germany, July 23-26, 2007).  
The Proceedings of the Symposium edited by Edwin Kreuzer, have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2008.  
ISBN 978-1-4020-8629-8
- 07-6 *IUTAM Symposium on Swelling and Shrinking of Porous Materials: From Colloid Science to Poro-Mechanics* (Petrópolis, Brazil, August 6-10, 2007).  
The Proceedings of the Symposium were published containing the abstracts of the lectures.
- 07-7 *IUTAM Symposium on Advances in Micro- and Nanofluidics* (Dresden, Germany, September 6-8, 2007).  
The Proceedings of the Symposium edited by Ellero, M.; Hu, X.; Fröhlich, J.; Adams, N., have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2009  
ISBN 978-90-481-2625-5.
- 07-8 *IUTAM Symposium on Mechanical Properties of Cellular Materials* (Cachan, France, September 17-20, 2007).  
The Proceedings of the Symposium edited by Zhao, Han; Fleck, N.A., have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2009  
ISBN 978-1-4020-9403-3.
- 07-9 *IUTAM Symposium on Multi- Scale Plasticity of Crystalline Materials* (Eindhoven, The Netherlands, November 05-09, 2007).  
The Proceedings of the symposium have been published as a special issue of the Philosophical Magazine (Publisher: Taylor & Francis), Vol. 88, Issue 30 – 32, October 2008.

**2008**

- 08-1 *IUTAM Symposium on Theoretical, Computational and Modelling Aspects of Inelastic Media* (Cape Town, South Africa, January 14-18, 2008).  
The Proceedings of the Symposium edited by Daya Reddy have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2008.  
ISBN: 978-1-4020-9089-9

**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.

**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

<http://www.iutam.net>

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## List of Addresses

A full mailing list is available upon request to the Secretary General of IUTAM.

### List by Country

#### Argentina

Sergio Idelsohn, Luis Thomas

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#### Austria

Helmut Böhm, Gerhard Holzapfel, Alfred Kluwick, Peter Lugner, Herbert Mang, Franz Rammerstorfer, Hans Troger, Franz Ziegler

#### Belgium

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#### Bulgaria

Angel Baltov, Hristo Kuyumdzhiev, Evtim Ttoshev

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