

Warsaw, April 25, 2005

ICTAM04 Report

Local Organizing Committee:

President and Chairman: Witold Gutkowski, Co-Chairmen: Michał Kleiber & Włodzimierz Kurnik, Secretary General: Tomasz Kowalewski

The 21st International Congress of Theoretical and Applied Mechanics (ICTAM04) took place August 15-21, 2004, in Warsaw, Poland. It was organized by Polish National Committee of IUTAM, Institute of Fundamental Technological Research of the Polish Academy of Sciences (IPPT PAN) and Warsaw University of Technology. The Congress venue was the main building of Warsaw University of Technology. The scientific program of the meeting consisted of plenary opening and closing lectures, sectional lectures, mini-symposia, and contributed papers presented in lecture and seminar presentation sessions. These were intended to cover all aspects of mechanics.

Special Lectures, Mini-Symposia and Pre-nominated Sessions

General Lectures

Opening Lecture:

Leen van Wijngaarden (Netherlands): Interplay between air and water

Closing Lecture:

Kazimierz Sobczyk (Poland): Stochastic dynamics of engineering systems

Sectional Lectures:

Jorge Ambrosio (Portugal): Multibody dynamics: bridging multidisciplinary applications

Konrad Bajer (Poland): Rapid formation of strong gradients and diffusion in the transport of scalar and vector fields

Daniel Beysens (France): Near-critical point hydrodynamics and microgravity

John F. Brady (USA): Suspensions: from micromechanics to macroscopic behaviour

Huajian Gao (Germany): Nanoscale mechanics of biological materials

Tom J. R. Hughes (USA): Variational and multiscale methods in turbulence

Roland Keunings (Belgium): Non-Newtonian fluid mechanics using molecular theory

Edwin Kreuzer (Germany): Nonlinear dynamics in ocean engineering

Pierre Ladevèze (France): A bridge between the micro- and mesomechanics of laminates: fantasy or reality

Marcel Lesieur (France): Turbulence and large-eddy simulations

Anatoly Neishtadt (Russia): Probability phenomena in perturbed dynamical systems

Raymond W. Ogden (UK): Mechanics of rubberlike solids

André Preumont (Belgium): Some issues in active vibration control of smart structures

Peter B. Rhines (USA): Ocean circulation and its influence on climate

Erich Sackmann (Germany): Microviscoelasticity of cells: cells as viscoplastic bodies

Dudley A. Saville (USA): Electrokinetics & electrohydrodynamics in microfluidics

Edward A. Spiegel (USA): Problems in astrophysical fluid dynamics

Harry L. Swinney (USA): Scaling in quasi-2D turbulence experiments in a rotating flow

Mini-Symposia:

MS1. Smart materials and structures

N. Sottos (USA) – Chair; J. Holnicki-Szulc (Poland) – Co-Chair

Introductory Lectures:

R. D. James (USA) *A way to search for smart materials with unprecedented physical properties*

W. Ostachowicz (Poland) *Elastic wave propagation development for structural health monitoring*

S. R. White (USA) *Autonomic healing of polymers and composites*

MS2. Tissue, cellular and molecular biomechanics

P. Janmey (USA) – Chair; D. Barthès-Biesel (France), A. Hoger (USA) – Co-Chairs

Introductory Lectures:

S. Margulies (USA) *Tissue mechanics*

S. Safran (Israel) *Elastic interactions of biological cells*

C. Schmidt (Netherlands) *Molecular mechanics cytoskeletal components*

MS3. Mechanics of thin films and nanostructures

K.S. Kim (USA) – Chair; Z. Suo (USA), H.M. Jensen (Denmark) – Co-Chairs

Introductory lectures:

H. M. Jensen (Denmark) *Mechanics of thin film structures*

R Ruoff (USA) *Strength of nanostructures*

Z. Suo (USA) *Nanoscale mechanics of biological materials*

MS4. Microfluidics

P. Tabeling (France) – Chair; R. J. Adrian (USA), J. Santiago (USA) – Co-Chairs

Introductory Lectures:

D. S. Stewart (USA) *Miniaturization of explosive technology and microdetonics*

J. Santiago (USA) *Electrokinetic flow instabilities in microfluidic systems*

P. Tabeling (France) *Slip, patterns, and other small things in microfluidic systems*

MS5. Microgravity flow phenomena

J.C. Legros (Belgium) – Chair; P. Neitzel (USA), J. I. D. Alexander (USA) – Co-Chairs

Introductory Lectures:

G. M. Homsy (USA) *Microgravity and microscale fluid mechanics*

M. Louge (USA) *Collisional granular flows with and without gas interactions in microgravity*

D. Weaire (Ireland) *Foams, films and surfaces in microgravity*

MS6. Atmosphere and ocean dynamics

J. Sommeria (France) – Chair; M.E. McIntyre (U.K.) – Co-Chair

Introductory Lectures:

O. Bokhove (Netherlands) *Wave-vortex interactions in the atmosphere and oceans, with applications to climate*

P. H. Haynes (UK) *Transport and mixing in the atmosphere*

O. Talagrand (France) *Assimilation of observations into numerical models*

Pre-Nominated Sessions and Chairs
Fluid Mechanics:

- FM1. Biological fluid dynamics*
M. Gharib (USA)
F. van de Vosse (Netherlands)
- FM2. Boundary layers*
P. W. Duck (UK)
A. Kluwick (Austria)
- FM3. Combustion and flames*
N. Peters (Germany)
P. Wolanski (Poland)
- FM4. Complex and smart fluids*
B. Khusid (USA)
A. L. Yarin (Israel)
- FM5. Compressible flow*
H. Hornung (USA)
- FM6. Computational fluid dynamics*
(jointly with IACM)
L. Kleiser (Switzerland)
W. Schröder (Germany)
- FM7. Convective phenomena*
G. de Vahl Davis (Australia)
K. Zhang (UK)
- FM8. Drops and bubbles*
J. Eggers (Germany & UK)
A. Prosperetti (USA)
- FM9. Environmental fluid dynamics*
H. E. Huppert (UK)
R. Narasimha (India)
- FM10. Experimental methods in fluid mechanics*
A. Leder (Germany)
J. Westerweel (Netherlands)
- FM11. Flow control*
J. B. Freund (USA)
M. Gad-el-Hak (USA)
- FM12. Flow in porous media*
A. K. Mojtabi (France)
V. Nikolaevskiy (Russia)
- FM13. Flow instability and transition*
P. Huerre (France)
P.A. Monkewitz (Switzerland)
- FM14. Flow in thin films*
N. Aksel (Germany)
V. Shkadov (Russia)
- FM15. Fluid mechanics of materials processing*
F. Dupret (Belgium)
R. Moreau (France)
- FM16. Fluid mechanics of suspensions*
R. Bonnecaze (USA)
E. Guazzelli (France)
- FM17. Granular flows*
R. Behringer (USA)
I. Goldhirsch (Israel)
- FM18. Low-Reynolds-number flow*
R. H. Davis (USA)
C. Pozrikidis (USA)
- FM19. Magnetohydrodynamics*
P. A. Davidson (UK)
A. Thess (Germany)
- FM20. Multiphase flows*
S. Balachandar (USA)
J. Magnaudet (France)
- FM21. Solidification and crystal growth*
M. Glicksman (USA)
M. G. Worster (UK)
- FM22. Stirring and mixing*
H. Aref (USA)
E. Villermaux (France)
- FM23. Topological fluid mechanics*
P. L. Boyland (USA)
K. Ohkitani (Japan)
- FM24. Turbulence*
O. Metais (France)
R. D. Moser (USA)
- FM25. Vortex dynamics*
G. J. F. van Heijst (Netherlands)
E. Krause (Germany)
- FM26. Waves*
W. K. Melville (USA)
V. I. Shrira (UK)

Solid Mechanics:

- SM1. Computational solid mechanics*
(jointly with IACM)
T. Belytschko (USA)
P. Wriggers (Germany)
- SM2. Contact and friction mechanics*
(jointly with IAVSD)
I. Goryacheva (Russia)
A.I. Klarbring (Sweden)
G. Szefer (Poland)
- SM3. Control of structures*
F. Chernousko (Russia)
S. Pellegrino (UK)
- SM4. Damage mechanics*
M. Chrzanowski (Poland)
P. Steinmann (Germany)
- SM5. Dynamic plasticity of structures*
N. Jones (UK)
T. Wierzbicki (USA)
- SM6. Elasticity*
R. Kienzler (Germany)
L. Wheeler (USA)
- SM7. Experimental methods in solid mechanics*
I. Emri (Slovenia)
J. Freire (Brazil)
- SM8. Fatigue*
J. Dominguez (Spain)
K. Reifsnider (USA)
- SM9. Fracture and crack mechanics*
(jointly with ICF)
D. Gross (Germany)
A. Needleman (USA)
- SM10. Functionally graded materials*
R. Batra (USA)
G. H Paulino (USA)
- SM11. Impact and wave propagation*
A Norris (USA)
K Wilmanski (Germany)
- SM12. Material instabilities*
D. Bigoni (Italy)
H. Petryk (Poland)
- SM13. Mechanics of composites*
S. Adali (South Africa)
N. A. Fleck (UK)
- SM14. Mechanics of phase transformations*
(jointly with IACM)
F. D. Fischer (Austria)
A. Molinari (France)
- SM15. Mechanics of porous materials*
W. Ehlers (Germany)
J. M. Huyghe (Netherlands)
- SM16. Mechatronics*
W. O. Schiehlen (Germany)
M. Tomizuka (USA)
- SM17. Multibody dynamics*
M. Geradin (Belgium)
F. Pfeiffer (Germany)
- SM18. Plasticity and viscoplasticity*
E. van der Giessen (Netherlands)
P. Perzyna (Poland)
- SM19. Plates and shells*
(jointly with IACM)
H. Mang (Austria)
E. Ramm (Germany)
- SM20. Rock mechanics and geomechanics*
Z. Mroz (Poland)
I. Vardoulakis (Greece)
- SM22. Stability of structures*
Zs. Gaspar (Hungary)
S. Kyriakides (USA)
- SM23. Stochastic micromechanics*
Y. Brechet (France)
Y. Shibutani (Japan)
- SM24. Structural optimization*
(jointly with ISSMO)
K. K. Choi (USA)
J. Herskovits (Brazil)
- SM25. Structural vibrations*
I. Blekhman (Russia)
K. Popp (Germany)
- SM26. Vehicle dynamics*
S. Iwnicki (UK)
R. Sharp (UK)
- SM27. Viscoelasticity and creep*
F. Cocks (UK)
N. Ohno (Japan)

Topics involving both fluid mechanics and solid mechanics:

- FSM1. Acoustics*
T. Geers (USA)
N. Peake (UK)
- FSM2. Chaos in fluid and solid mechanics*
I. Mezic (USA)
G. Rega (Italy)
- FSM3 Continuum mechanics*
K. R. Rajagopal (USA)
G. Saccomandi (Italy)
- FSM4. Fluid-structure interaction*
J. Grue (Norway)
M. P. Paidoussis (Canada)
- FSM5. Mechanics of foams and cellular materials*
S. Hilgenfeldt (Netherlands)
D. L. Weaire (Ireland)
- FSM6. Multiscale phenomena in mechanics*
A. Carpinteri (Italy)
C. Miehe (Germany)
- FSM7. Education in mechanics*
R. Engel (USA)
B. Karahaloo (UK)

All contributed papers were peer reviewed. Recommendations had been received from Pre-selection Committees of the National Committees of the nine countries: Canada, France, Germany, Japan, PR China, Poland, Russia, UK and USA. Moreover, recommendations had been received from the Chairs of the Mini-Symposia and of the Pre-nominated Sessions. Finally, the International Papers Committee paid careful attention to the above recommendations. Accordingly, of the 2086 eligible submissions 1574 contributions were invited by the IPC for their presentation. Finally 1235 contributed papers and 38 invited talks were given in Warsaw.

Fluid Mechanics was a subject of 550 presentations, Solid Mechanics was selected as a subject of 611 presentations, and 112 contributions aimed to cover problems involving both areas of mechanics and education in mechanics. The total number of participants, accepted papers and presentations represent a quite substantial enhancement relative to the previous congresses (Table 1), providing evidence of vitality of the contemporary mechanics. Table 2 displays country statistics of the presentations.

Table 1. ICTAM04 compared with four previous congresses

ICTAM	Submitted Papers	Presented papers /		Participants /	
		presented from	organizers country	participants from	organizers country
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

A book of abstracts with a CD-ROM including Extended Summaries of all accepted papers was distributed during the Congress. The Abstracts and Extended Summaries are available online on the Congress website <<http://ictam04.ippt.gov.pl>>. After congress proceedings “Mechanics of 21st Century” are published by Springer. They include full text of invited talks and attached CD-ROM with Extended Summaries of papers presented during the Congress by authors.

Table 2.

ICTAM04 COUNTRY STATISTICS

Submitted and accepted contributed papers. Presented lecture, seminar and invited presentations.

	Country	Sub.	Acc.	Lec.	Sem.	Inv.
1	ALGERIA	5	2	0	1	0
2	ARMENIA	9	4	0	1	0
3	AUSTRALIA	12	9	4	3	0
4	AUSTRIA	17	16	10	5	0
5	BANGLADESH	1	0	0	0	0
6	BELARUS	17	8	1	3	0
7	BELGIUM	19	14	10	3	2
8	BOSNIA & HERTZ	1	0	0	0	0
9	BRAZIL	20	15	5	6	0
10	BRUNEI	1	0	0	0	0
11	BULGARIA	9	8	0	5	0
12	CAMEROON	1	1	0	0	0
13	CANADA	17	16	7	6	0
14	CHILE	2	1	0	1	0
15	CHINA	96	51	17	24	0
16	COLOMBIA	1	0	0	0	0
17	CROATIA	1	1	0	0	0
18	CUBA	1	1	0	0	0
19	CZECH REPUBLIC	19	15	2	12	0
20	DENMARK	21	20	15	5	1
21	EGYPT	5	0	0	0	0
22	ESTONIA	9	8	4	4	0
23	FINLAND	9	7	2	5	0
24	FRANCE	207	180	90	58	5
25	GEORGIA	5	1	0	0	0
26	GERMANY	124	109	63	34	3
27	GREECE	11	10	6	3	0
28	HUNGARY	12	11	6	4	0
29	INDIA	39	19	4	7	0
30	INDONESIA	1	0	0	0	0
31	IRAN	16	11	2	6	0
32	IRELAND	4	4	2	1	1
33	ISRAEL	37	34	13	13	1
34	ITALY	42	33	11	8	0
35	JAPAN	99	80	36	36	0
36	JORDAN	1	1	0	0	0
37	KAZAKHSTAN	11	5	0	2	0
38	KENYA	2	2	0	0	0
39	KYRGYZSTAN	3	0	0	0	0
40	LATVIA	6	5	1	4	0

41	LIBYA	4	3	1	0	0
42	LITHUANIA	4	3	1	2	0
43	MALAYSIA	1	0	0	0	0
44	MEXICO	7	6	1	4	0
45	MOLDOVA	1	1	0	0	0
46	NETHERLANDS	42	40	28	7	3
47	NEW ZEALAND	3	1	0	1	0
48	NIGERIA	3	2	0	1	0
49	NORWAY	7	7	2	4	0
50	PAKISTAN	1	0	0	0	0
51	POLAND	200	147	42	99	3
52	PORTUGAL	8	7	6	1	1
53	QATAR	1	1	0	1	0
54	ROMANIA	18	7	2	3	0
55	RUSSIA	235	132	31	43	1
56	S. KOREA	26	21	5	12	0
57	SAUDI ARABIA	1	1	0	1	0
58	SERBIA	4	2	0	2	0
59	SINGAPORE	8	4	2	1	0
60	SLOVAKIA	3	2	0	1	0
61	SLOVENIA	4	4	0	3	0
62	SOUTH AFRICA	6	4	2	2	0
63	SPAIN	19	17	7	7	0
64	SWEDEN	13	12	8	3	0
65	SWITZERLAND	11	10	7	2	0
66	TAIWAN	27	20	1	14	0
67	THAILAND	1	0	0	0	0
68	TURKEY	9	6	0	2	0
69	UK	118	110	60	36	2
70	UKRAINE	92	55	4	32	0
71	USA	282	243	120	50	15
72	UZBEKISTAN	11	1	0	0	0
73	VIETNAM	1	0	0	0	0
	TOTAL	2084	1571	641	594	38