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Institute of Fundamental Technological Research
Polish Academy of Sciences
Warsaw, Poland

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Bureau: Officers and Members

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Professor V. Tvergaard (Denmark)	Vice-President
Professor P. Eberhard (Germany)	Treasurer
Professor H. Petryk (Poland)	Secretary-General

Members

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Professor A.P.S. Freire (Brazil)	(elected 2016)
Professor I.G. Goryacheva (Russia)	(elected 2016)
Professor B.A. Schrefler (Italy)	(elected 2012)

Secretariat

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Polish Academy of Sciences, Pawińskiego 5B, 02-106 Warsaw, Poland
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Internet: https://www.iutam.org

Past Officers

Elected	*President*	*Vice-President*	*Treasurer*	*Secretary*
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)
2008	T.J. Pedley (UK)	L.B. Freund (USA)	N. Olhoff (Denmark)	F. Dias (France)
2012	V. Tvergaard (Denmark)	T.J. Pedley (UK)	P. Eberhard (Germany)	F. Dias (Ireland)

Past Congress Presidents

No.	*Year*	*Place*	*Congress-President*
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
23	2012	Beijing, China	Y. Bai
24	2016	Montréal, Canada	J.M. Floryan

Adhering Organizations

Armenia (2016) ***(Associate Organization)***
Armenian National Committee on Theoretical and Applied Mechanics
24B Marshall Baghramyan Ave., 0019 Yerevan
President/Chair: Prof. A. (Ara) Avetisyan
Representative in IUTAM: Prof. A.V. (Avetik) Sahakyan

Australia (1964)
The Australian National Committee for Mechanical and Engineering Sciences of the Australian Academy of Science
GPO Box 783, Canberra City, ACT 2601
President/Chair: Prof. M. (Mark) Bradford
Representatives in IUTAM: Prof. M. (Mark) Bradford, Prof. J.E. (John) Sader

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. M. (Manfred) Kaltenbacher
Contact: Prof. F. (Franz) Rammerstorfer
Representative 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
President/Chair: Prof. P. (Patrick) Guillaume
Contact: Prof. W. (Walter) Bosschaerts
Representatives in IUTAM: Prof. W. (Wim) Desmet, Prof. P. (Patrick) Guillaume, Prof. D.V.H. (Dirk) Vandepitte

Brazil (1982)
Associação Brasileira de Engenharia e Ciências Mecânicas – ABCM
Avenida Rio Branco 124/18° andar, 20040-001 Rio de Janeiro
President/Chair: Prof. G. (Gherhardt) Ribatski
Contact: Prof. A.P.S. (Atila) Freire
Representatives in IUTAM: Prof. J.B.R. (Juliana) Loureiro, Prof. M.A.F. (Marcello) de Medeiros

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. S. (Stefan) Radev
Representative in IUTAM: Prof. S. (Stefan) Radev

Canada (1963)
The National Research Council of Canada, Canadian National Committee for IUTAM
1200 Montreal Road, Building M-50, Ottawa, Ontario K1A OR6
President/Chair: Prof. M. (Marco) Amabili
Secretary: Prof. P. (Peidong) Wu
Representatives in IUTAM: Prof. M. (Marco) Amabili, Prof. K. (Kamran) Behdinan, Prof. J.M. (Maciej) Floryan, Prof. M. (Marilyn) Lightstone

Chile (1996)
The Chile National Committee on Theoretical and Applied Mechanics
Academia Chilena de Ciencias
Almirante Montt 454, Santiago
President/Chair: Dr. J. (Juan) Asenjo
Secretary: Dr. F. (Francisco) Hervé
Contact: Prof. F. (Fernando) Lund
Representatives in IUTAM: Prof. F. (Fernando) Lund

China (1980)
The Chinese Society of Theoretical and Applied Mechanics
15 Beisihuanxi Road, 100190 Beijing
President/Chair: Prof. D. (Daining) Fang
Secretary: Prof. Y.Z. (Yazheng) Yang
Contact: Mr. J. (Jie) Chen
Representatives in IUTAM: Prof. D. (Daining) Fang, Prof. G.W. (Guowei) He, Prof. T.J. (Tianjian) Lu, Prof. W. (Wei) Yang, Prof. X.J. (Xiaojing) Zheng

China-Hong Kong (1996)
The Hong Kong Society of Theoretical and Applied Mechanics (HKSTAM)
Department of Mechanical Engineering, City University of Hong Kong
83 Tat Chee Avenue, Kowloon Tong, Hong Kong
President/Chair: Prof. L. (Li) Cheng
Secretary: Prof. Z.-Q. (Zhong-Qing) Su
Representative in IUTAM: Prof. Q.-P. (Qing-Ping) Sun

China-Taipei (1980)
The Society of Theoretical and Applied Mechanics
Department of Mechanical Engineering, National Tsing Hua University
101 Kuang-Fu Road, 30013 Hsinchu
President/Chair: Prof. K.-N. (KuoNing) Chiang
Secretary: Y.-B. (Yu-Bin) Chen
Contact: Y.-B. (Yu-Bin) Chen
Representatives in IUTAM: Prof. C.-C. (Chien-Cheng) Chang,
Prof. W.-C. (Wei-Chung) Wang

Croatia (1994)
Croatian Society of Mechanics
Ivana Lučića 5, HR-10000 Zagreb
President/Chair: Prof. Z. (Zdenko) Tonković
Contact: Prof. G. (Goran) Turkalj
Representative in IUTAM: Prof. G. (Goran) Turkalj

Czech Republic (2018/1949)
Czech Society for Mechanics
Dolejškova 5, CZ-18200 Prague 8
President/Chair: Prof. J. (Jindrich) Petruska
Secretary: Dr. J. (Jiri) Naprstek
Contact: Prof. M. (Miloslav) Okrouhlík
Representative in IUTAM: Prof. M. (Miloslav) Okrouhlík

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
Contact: Prof. C. (Christian) Niordson, Prof. J.N. (Jens Nørkær) Sørensen
Representatives in IUTAM: Prof. C. (Christian) Niordson,
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, 11516 Cairo
President/Chair: Prof. M. (Mahmoud) Sakar
Contact: Prof. S. (Sameh) Soror, Dr. O. (Osama) Marzouk
Representative 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
Representative in IUTAM: Prof. A. (Andrus) Salupere

Finland (1952)
The Finnish National Committee on Mechanics
Tampere University, Attent. Prof. Reijo Kouhia, PO Box 600, FI-33014 Tampere
President/Chair: Prof. R. (Reijo) Kouhia
Secretary: Assoc. Prof. J. (Jarkko) Niiranen
Contact: Prof. R. (Reijo) Kouhia
Representatives in IUTAM: Prof. R. (Reijo) Kouhia, Prof. J. (Juha) Paavola

France (1949)
Comité National Français de Mécanique, Académie des Sciences
23, quai Conti, F-75006 Paris
President/Chair: Prof. P. (Pierre) Suquet
Secretary: Prof. J. (Jacques) Magnaudet
Representatives in IUTAM: Prof. S. (Samuel) Forest, Prof. P. (Patrick) Huerre, Prof. D. (Djimedo) Kondo, Prof. S. (Stéphane) Popinet

Georgia (2000)
Georgian National Committee of Theoretical and Applied Mechanics
I. Vekua Institute of Applied Mathematics of Iv. Javakhishvili Tbilisi State University
2 University Str., 0186 Tbilisi
President/Chair: Prof. G. (George) Jaiani
Representative in IUTAM: Prof. G. (George) Jaiani

Germany (1950)
Gesellschaft für angewandte Mathematik und Mechanik/Deutsches Komitee für Mechanik (GAMM/DEKOMECH)
TU Dortmund University, Institute of Mechanics, Leonhard-Euler-Strasse 5, D-44227 Dortmund
President/Chair: Prof. A. (Andreas) Menzel
Representatives in IUTAM: Prof. M. (Marc) Avila, Prof. S. (Stefan) Hartmann, Prof. J. (Jörg) Schumacher, Prof. R. (Robert) Seifried

Greece (1979)
Hellenic Society for Theoretical and Applied Mechanics
National Technical University of Athens, Mechanics Division
Zographou Campus, GR-15773, Athens
President/Chair: Prof. G.E. (Georgios) Stavroulakis
Secretary: Prof. G.C. (George) Tsiatas
Representative in IUTAM: Prof. G.E. (Georgios) Stavroulakis

Hungary (1948)
Hungarian National Committee for IUTAM
Department of Applied Mechanics, Budapest University of Technology and Economics
Müegyetem rkp. 3, H-1521 Budapest
President/Chair: Prof. G. (Gábor) Stépán
Secretary: Dr. P. (Peter) Varkonyi
Representative in IUTAM: Prof. G. (Gábor) Stépán

India (1950)
National Committee for Theoretical and Applied Mechanics of the Indian National Science Academy
Bahadur Shah Zafar Marg, 110 002 New Delhi
President/Chair: Prof. V.D. Sharma
Contact: Prof. S. Gopalakrishnan
Representatives in IUTAM: Prof. S. (Santosh) Kapuria, Prof. S. (Sanjay) Mittal, Prof. G.P. Rajasekhar

Ireland (1984)
Irish National Committee for Mathematical Sciences
Royal Irish Academy, 19 Dawson Street, Dublin 2
Contact: Y. (Yvonne) Graham
Representative in IUTAM: Prof. M.D. (Michael) Gilchrist

Israel (1950)
Israel Society for Theoretical and Applied Mechanics (ISTAM)
Faculty of Mechanical Engineering, Technion-Israel Institute of Technology
32000 Haifa
President/Chair: Prof. R. (Reuven) Segev
Contact: Prof. M.B. (Miles) Rubin
Representatives in IUTAM: Prof. M.B. (Miles) Rubin, Prof. R. (Reuven) Segev

Italy (1949)
Associazione Italiana di Meccanica Teorica ed Applicata
Piazza Leonardo da Vinci 32, I-20133 Milano
President/Chair: Prof. S. (Stefano) Lenci
Secretary: Prof. S. (Sandra) Carillo
Contact: Prof. S. (Stefano) Lenci
Representatives in IUTAM: Prof. D. (Davide) Bigoni, Prof. A. (Alessandro) Bottaro, Dr. E. (Enrico) De Bernardis, Prof. G. (Giuseppe) Rega

Japan (1951)
The National Committee for Theoretical and Applied Mechanics
Science Council of Japan, 7- 22-34 Roppongi, Minato-ku, 106-8555 Tokyo
President/Chair: Prof. K. (Koichi) Hishida
Secretary: Prof. M. (Masaharu) Kameda
Contact: Prof. K. (Kikuo) Kishimoto
Representatives in IUTAM: Prof. K. (Koichi) Hishida, Prof. K. (Kikuo) Kishimoto, Prof. N. (Naoshi) Nishimura, Prof. O. (Osamu) Sano

Korea, Republic of (2012/1989)
Korean Committee for Theoretical and Applied Mechanics
c/o The Korean Society of Mechanical Engineers
Room 702, KSTC New Bld., 635-4, Yeogsam-dong, Kangnam-ku, 135-703 Seoul
President/Chair: Prof. J.Y. (Jung Yul) Yoo
Contact: Prof. S.J. (Sang Joon) Lee
Representative in IUTAM: Prof. H.J. (Hyung Jin) Sung

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
Representative 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. G.J.F. (GertJan) van Heijst
Secretary: Prof. D.H. (Dick) van Campen
Representatives in IUTAM: Prof. G.J.F. (GertJan) van Heijst, Prof. P. (Patrick) Onck

New Zealand (1979)
The Royal Society of New Zealand
Committee on Mathematical & Information Sciences
P.O. Box 598, 6140 Wellington
Contact: Prof. R. (Rosalind) Archer
Representative in IUTAM: Prof. R. (Rosalind) Archer

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

Poland (1952)
Committee for Mechanics of the Polish Academy of Sciences
ul. Pawinskiego 5B, 02-106 Warsaw
President/Chair: Prof. T. (Tadeusz) Burczynski
Contact: Prof. T. (Tadeusz) Burczynski
Representatives in IUTAM: Prof. T. (Tadeusz) Burczynski, Prof. H. (Henryk) Petryk

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. J. (Jose) Cesar de Sa
Contact: Prof. C.A.B. (Carlos) Pina
Representative 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
President/Chair: Prof. H. (Horia) Ene
Representative in IUTAM: Prof. H. (Horia) Ene

Russia (1992/1956)
Russian National Committee on Theoretical and Applied Mechanics
Prospekt Vernadskogo 101 : 1, Moscow 119526
President/Chair: Prof. I.G. (Irina) Goryacheva
Secretary: Prof. V. (Vladimir) Karev
Representatives in IUTAM: Prof. F.L. (Felix) Chernousko, Prof. I.G. (Irina) Goryacheva, Prof. V.A. (Vladimir) Levin, Prof. N.F. (Nikita) Morozov

Saudi Arabia (1988)
King Abdulaziz City for Science and Technology
Directorate of Technology and International Cooperation
P.O. Box 6086, 11442 Riyadh
President/Chair: Dr. M.I. (Mohammed ibn Ibrahim) Al-Suwaiyel
Contact: Mr. F.S. (Fahad) Huraib, Dr. M.I. (Mohammed ibn Ibrahim) Al-Suwaiyel
Representative 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. N. (Nenad) Filipovic
Secretary: Prof. D. (Damir) Madjarevic
Representative in IUTAM: Prof. N. (Nenad) Filipovic

Slovenia (1994)
Slovene Mechanics Society
Faculty of Mechanical Engineering, University of Maribor
Smetanova 17, 2000 Maribor
President/Chair: Prof. J. (Janko) Slavič
Secretary: Prof. J. (Jure) Marn
Representative in IUTAM: Prof. J. (Janko) Slavič

South Africa (1994)
National Research Foundation (NRF)
South African Association for Theoretical and Applied Mechanics (SAAM)
South African ICSU Secretariat, P.O. Box 2600, 0001 Pretoria
President/Chair: Dr. S. (Sebastian) Skatulla
Contact: Dr. S. (Sebastian) Skatulla
Representative in IUTAM: Dr. S. (Sebastian) Skatulla

Spain (2018/1950)
Sociedad Española de Mecánica Teórica y Aplicada (SEMTA)
ETSI, Camino de los descubrimientos s/n, 41092, Sevilla
President/Chair: Prof. P. (Pilar) Ariza
Representative in IUTAM: Prof. P. (Pilar) Ariza

Sweden (1950)
Swedish National Committee for Mechanics
Lund University, Avdelning för Hållfasthetslära, Box 118, SE-22100 Lund
President/Chair: Prof. A. (Anders) Klarbring
Secretary: Prof. H. (Hakan) Hallberg
Representatives in IUTAM: Prof. D. (Dan) Henningson, Prof. S. (Staffan) Lundström, Prof. P. (Per) Stahle

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. J. (Jürg) Dual, 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. M.H. (Mehmet) Omurtag
Secretary: Prof. M.A. (Mehmet Ali) Tasdemir
Contact: Prof. E.S. (Erdogan) Suhubi
Representative in IUTAM: Prof. E.S. (Erdogan) Suhubi

UK (1948)
The Royal Society, UK Panel for IUTAM
6 Carlton House Terrace, SW1Y 5AG London
President/Chair: Prof. N.A. (Norman) Fleck
Secretary: Prof. R. (Rich) Kerswell
Representatives in IUTAM: Prof. A. (Alan) Cocks, Prof. N.A. (Norman) Fleck, Prof. A. (Anne) Juel, Prof. R. (Rich) Kerswell

Ukraine (1995)
National Committee of Ukraine on Theoretical and Applied Mechanics
S.P.Timoshenko Institute of Mechanics, 3 Nesterov Str., 03680 Kyiv
President/Chair: Prof. A.N. (Alexandr) Guz
Secretary: Prof. J.J. (Jeremiah) Rushchitsky
Representative in IUTAM: Prof. A.N. (Alexandr) Guz

USA (1949)
The U.S. National Committee for Theoretical and Applied Mechanics of the National Academies of Science, Engineering and Medicine
500 Fifth Street NW, Washington, DC 20001
President/Chair: Prof. K. (Krishnaswamy) Ravi-Chandar
Secretary: Prof. L. (Linda) Franzoni
Representatives in IUTAM: Prof. K. (Krishnaswamy) Ravi-Chandar, Prof. H. (Horacio) Espinosa, Prof. L. (Linda) Franzoni, Prof. B. (Beverley) McKeon, Prof. G. (Gareth) McKinley

Viet Nam (1990)
Vietnamese Association of Mechanics (VAM)
Hoi Co Hoc Vietnam, 264 Doi Can, Hanoi
President/Chair: Prof. N. (Nguyen) Tien Khiem
Secretary: Prof. T. (Tran) Van Lien
Contact: Prof. H. (Hung) Nguyen-Xuan
Representative in IUTAM: Prof. H. (Hung) Nguyen-Xuan

Affiliated Organizations

CISM (1970)
International Centre for Mechanical Sciences
Palazzo del Torso, Piazza Garibaldi, I-33100 Udine, Italy
Rectors of CISM: Prof. Elisabeth Guazzelli,
Prof. Alfredo Soldati and Prof. Wolfgang A. Wall
President/Chair: Mario Pezzetta
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. F. (Frédéric) Dias

ICHMT (1972)
International Centre for Heat and Mass Transfer
Mechanical Engineering Department E-104, Middle East Technical University, Dumlupınar Bulvarı No:1, 06800 Çankaya Ankara, Turkey
President/Chair: Prof. T.W. (Terrence) Simon
Secretary: Prof. I. (Ilker) Tari
Contact: Prof. I. (Ilker) Tari
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. H. (Hiroshi) Watanabe
Secretary: Prof. G. (Gerald) Fuller
Contact: Prof. G. (Gerald) Fuller
Representative of ICR in IUTAM: Prof. L.G. (Gary) Leal
Representative of IUTAM in ICR: Prof. G. (Gareth) McKinley

IAVSD (1977)
International Association for Vehicle System Dynamics
Institute of Mechanics and Mechatronics, TU Wien, Getreidemarkt 9, 1060, Vienna, Austria
President/Chair: Prof. T. (Tim) Gordon
Secretary: Prof. M. (Manfred) Plöchl
Representative of IAVSD in IUTAM: Prof. M. (Mats) Berg
Representative of IUTAM in IAVSD: Prof. R. (Robert) Seifried

EUROMECH (1978)
European Mechanics Society
4 impasse Nikola Tesla, CS 40006, 13453, Marseille Cedex 13, France
President/Chair: Prof. M.G.D. (Marc) Geers
Secretary: Prof. J. (Jacques) Magnaudet
Representative of EUROMECH in IUTAM: Prof. P. (Patrick) Huerre
Representative of IUTAM in EUROMECH: Prof. N.A. (Norman) Fleck

ISIMM (1978)
International Society for the Interaction of Mechanics and Mathematics
President/Chair: Prof. G. (Giuseppe) Saccomandi
Secretary: Prof. G. (Giuseppe) Tomassetti
Representative of ISIMM in IUTAM: Prof. A. (Alain) Goriely
Representative of IUTAM in ISIMM: Prof. F.L. (Felix) Chernousko

ICF (1978)
International Congress on Fracture
Research Institute for Strength and Fracture of Materials, Tohoku University, Sendai, Japan
President/Chair: Prof. R.M. (Robert) McMeeking
Secretary: Prof. A.T. (Toshimitsu) Yokobori, Jr.
Representative of ICF in IUTAM: Prof. L. (Leslie) Banks-Sills
Representative of IUTAM in ICF: Prof. J.B. (Jean-Baptiste) Leblond

ICM (1982)
International Conference on the Mechanical Behaviour of Materials
President/Chair: Dr. R. (Raj) Das
Secretary: Prof. Y. (Yoshihiko) Uematsu
Representative of ICM in IUTAM: Prof. S.W. (Soo Woo) Nam
Representative of IUTAM in ICM: Prof. C. (Christian) Niordson

AFMC (1982)
Asian Fluid Mechanics Committee
Center for Atmospheric and Oceanic Sciences
Indian Institute of Science, 560012 Bangalore, India
President/Chair: Prof. S. (Song) Fu
Representative of AFMC in IUTAM: Prof. G.S. (Ganapati Shankar) Bhat
Representative of IUTAM in AFMC: Prof. F. (Frédéric) Dias

IACM (1984)
International Association for Computational Mechanics
International Center for Numerical Methods in Engineering,
Edificio C-1, Gran Capitán s/n, E-08034 Barcelona, Spain
President/Chair: Prof. A. (Antonio) Huerta
Secretary: Prof. J. (John) Dolbow
Representative of IACM in IUTAM: Prof. P. (Pierre) Ladevèze
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CACOFD (1992-2010)
Caribbean Congress of Fluid Dynamics
(the acronym CACOFD has been changed into LACCOTAM in 2010 – see LACCOTAM below)

IABEM (1994)
International Association for Boundary Element Methods
President/Chair: Prof. N. (Naoshi) Nishimura
Representative of IABEM in IUTAM: Prof. N. (Naoshi) Nishimura
Representative of IUTAM in IABEM: Prof. N. (Naoshi) Nishimura

ISSMO (1996)
International Society for Structural and Multidisciplinary Optimization
Civil Engineering Department, Johns Hopkins University, 3400 N. Charles St., MD 21218 Baltimore**,** USA
President/Chair: Prof. W. (Wei) Chen
Secretary: Prof. H.A. (Alicia) Kim
Contact: Prof. N. (Niels) Olhoff
Representative of ISSMO in IUTAM: Prof. J.K. (James) Guest
Representative of IUTAM in ISSMO: Prof. N. (Niels) Olhoff

HYDROMAG (1996)
International Association for Hydromagnetic Phenomena and Applications
Applied Mathematics Research Centre, Coventry University,
Priory Street, Coventry, CV1 5FB, UK
President/Chair: Prof. A. (Alban) Pothérat
Contact: Prof. A. (Alban) Pothérat
Representative of HYDROMAG in IUTAM: Prof. A. (Alban) Pothérat
Representative of IUTAM in HYDROMAG: Prof. H.K. (Keith) Moffatt

IIAV (1997)
International Institute of Acoustics and Vibration
Dept. of Mechanical Engineering, Auburn University,
201 Ross Hall, Auburn, AL 36849 USA
President/Chair: Prof. E. (Eleonora) Carletti
Secretary: Mr. R.M. (Rupert) Thornely-Taylor
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. M. (Mark) Hamilton
Secretary: Prof. A. (Antonino) Di Bella
Contact: Prof. A. (Antonino) Di Bella
Representative of ICA in IUTAM: Prof. A. (Andrew) Norris
Representative of IUTAM in ICA: Prof. A. (Andrew) Norris

ICTS (2002)
International Congresses on Thermal Stresses
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

BICTAM (2010)
Beijing International Center for Theoretical and Applied Mechanics
Institute of Mechanics, Chinese Academy of Sciences,
15 Beisihuanxi Road, 100190 Beijing, China
President/Chair: Prof. J. (Jiachun) Li
President/Chair: Prof. D. (Daining) Fang
Representative of BICTAM in IUTAM: Prof. D. (Daining) Fang
Representative of IUTAM in BICTAM: Prof. N. (Narinder) Gupta

LACCOTAM (2010)
Latin American and Caribbean Conference on Theoretical and Applied Mechanics
The Department of Math and Computer Science, The University of the West Indies, St. Augustine, Trinidad, West Indies
President/Chair: Prof. H. (Harold) Ramkissoon
Secretary: Dr. D. (Donna) Comissiong
Contact: Prof. H. (Harold) Ramkissoon
Representative of LACCOTAM in IUTAM: Dr. S.R. (Sreedhara Rao) Gunakala
Representative of IUTAM in LACCOTAM: Prof. A.P.S. (Atila) Freire

IASCM (2014)
International Association for Structural Control and Monitoring
President/Chair: Prof. H. (Hui) Li
Secretary: Prof. S. (Sami) Masri
Representative of IASCM in IUTAM: Prof. S. (Sami) Masri
Representative of IUTAM in IASCM: Prof. R. (Robert) Seifried

IMSD (2014)
International Association for Multibody System Dynamics
President/Chair: Prof. J. (Jorge) Ambrosio
Secretary: Prof. J. (Javier) Cuadrado
Representative of IMSD in IUTAM: Prof. P. (Peter) Eberhard
Representative of IUTAM in IMSD: Prof. W. (Werner) Schiehlen

WCB (2016)
World Council of Biomechanics
President/Chair: Prof. P. (Peter) Hunter
Secretary: Prof. L. (Lynne) Bilston
Representative of WCB in IUTAM: Prof. P. (Peter) Hunter
Representative of IUTAM in WCB: Prof. T.J. (Timothy) Pedley

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Prof. Q.-P. (Qing-Ping) Sun	China-Hong Kong	
Prof. H.J. (Hyung Jin) Sung	Republic of Korea	
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Prof. A. (Alban) Pothérat	UK	HYDROMAG

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*Year indicates end of term

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Prof. P.F. (Paul) Linden	UK	2022	
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Prof. T.J. (Tianjian) Lu	China	2020	
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Prof. V. (Valery) Matveenko	Russia	2020	
Prof. R.M. (Robert) McMeeking	USA	2020	Secretary of XCCC
Prof. S. (Sanjay) Mittal	India	2022	
Prof. H. (Henryk) Petryk	Poland	2020	
Prof. M.V. (Maria Vittoria) Salvetti	Italy	2020	
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Prof. G. (Gábor) Stépán	Hungary	2020	Member of XCCC
Prof. S. (Shu) Takagi	Japan	2022	
Prof. J. (Jens) Walther	Denmark	2020	
Prof. W.-C. (Wei-Chung) Wang	China-Taipei	2022	
Prof. J.X. (Jianxiang) Wang	China	2022	
Prof. H. (Hiroshi) Yabuno	Japan	2020	

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.

Symposia Panel for Fluid Mechanics:			
Member	***Country***	***Year****	***Remarks***
Prof. R. (Rama) Govindarajan	India	2022	
Prof. E. (Elisabeth) Guazzelli	France	2020	
Prof. A. (Ann) Karagozian	USA	2022	
Prof. H. (Hua) Liu	China	2020	
Prof. D. (Detlef) Lohse	Netherlands	2020	Chair
Symposia Panel for Solid Mechanics			
Member	***Country***	***Year****	***Remarks***
Prof. L. (Leslie) Banks-Sills	Israel	2022	
Prof. A. (Alexander) Belyaev	Russia	2020	
Prof. H. (Huajian) Gao	USA	2020	Chair
Prof. J.-B. (Jean-Baptiste) Leblond	France	2020	
Prof. T.J. (Tianjian) Lu	China	2022	

*Year indicates end of term

Donations in 2019

Donations given to IUTAM Symposia are recorded under the heading “Financial Support” of the Reports of Symposia held in 2019.

IUTAM Representation in ISC and its Scientific Committees

Acronym	*Organization/Scientific Committee*	*Representative of IUTAM*
ISC	International Science Council	Prof. N. Aubry
CODATA	Committee on Data	Prof. F. Chinesta
COSPAR	Committee on Space Research	Prof. G. Ravichandran
SCOR	Scientific Committee on Oceanic Research	*To be nominated*

Reports of the IUTAM Symposia held in 2019

19-1 IUTAM Symposium on Phase Transformations in Shape Memory Materials: Modeling and Applications

Austin, TX USA, April 28 – May 2, 2019

a) Scientific Committee

Symposium Co-Chair: Chad M. Landis, University of Texas at Austin
Symposium Co-Chair: Dimitris Lagoudas, Texas A&M University
Symposium Co-Chair: Stelios Kyriakides, University of Texas at Austin

Members:
Ferdinando Aurichio, University of Pavia, Italy
Etienne Patoor, Universite de Metz, France
Henryk Petryk, IUTAM Representative, Polish Academy of Sciences, Poland
John Shaw, University of Michigan, USA
Petr Sitnner,Academy of Sciences, Institute of Physics, Czech Republic
QingPing Sun, Hong Kong University of Science and Technology, Hong Kong
Shuichi Miyazaki, University of Tsukuba, Japan

b) Short summary of scientific progress achieved

The symposium brought together researchers who through the use of experiment, theory and numerical modeling work to understand the complex nonlinear phenomena that govern shape memory alloy (SMA) material and structural behavior. This included mechanicians, materials scientists, applied physicists, and numerical modelers. This diversity of backgrounds resulted in the cross-fertilization of ideas and approaches that are now fostering significant advances to the field.

The symposium was originally scheduled to occur in 2018, but was moved to a start date of April 2019. The organization of the symposium started in 2018. We formed the scientific and organizing committees and prepared a list of over 130 potential participants. Invitations to submit an abstract were sent and the symposium was advertised at professional conferences and on online media. Most of the positive responses to the invitations were accepted.

We had 49 registered participants from 8 different countries. We organized the primary technical content of the symposium over 3 days in a single session to enhance interactions among participants. Additionally, there was an opening reception on the evening prior to the sessions, a banquet on the second evening of the symposium, and a round table discussion on the morning after the sessions to close the symposium. The program, including abstracts is available at this website, https://research.ae.utexas.edu/mssm/events/IUTAM2019/index.html. The symposium

took place at the AT&T Conference Center on the campus at the University of Texas at Austin. The presentations covered a wide range of issues associated with the mechanics and materials science of shape memory alloys including experimental mechanics, microstructural characterization, computational mechanics, and constitutive modeling across time and length scales. Each speaker had 30 minutes for their presentation and questions. A poster session was also organized and held just prior to the banquet.

Overall, we consider the symposium to have been a success as the participants uniformly provided enthusiastic complementary remarks on the technical content, the facilities, and the social interactions.

c) Countries represented and number of participants

We had 49 registered participants in total from 8 different countries. Participants had affiliations in France, Germany, China, South Korea, Czech Republic, Poland, Italy, and USA.

d) Publication of Proceedings of the Symposium

Proceedings of the symposium have not been published. However, a select number of papers are being pulled together into a special issue of the International Journal of Solids and Structures with four of the participants acting as guest editors. The special issue is expected to be on line in 2020. The website for the symposium can be found here, https://research.ae.utexas.edu/mssm/events/IUTAM2019/index.html.

e) Financial support

No financial support was provided by IUTAM. A grant for travel support from the National Science Foundation CMMI Division, grant #1927658, was used to offset the travel costs and registration fees for the younger participants of the Symposium. Registration fees were used to cover printing, meeting room, and food costs. Other sponsors include Elsevier, Texas A&M University and The University of Texas at Austin.

f) Scientific program

Sunday April 28, 2019

3:30-6:00pm Registration
6:00-7:30 Reception

Monday April 29, 2019

7:30-8:15am Registration
8:15-8:30 Welcome
8:30-9:00 *Scientific understanding of interfacial plasticity in shape memory alloys*, Huseyin Sehitoglu, University of Illinois
9:00-9:30 *Mechanics of phase transformation in nickel-titanium shape memory*

	alloys at macro-, micro- and atomistic scales, Reza Mirzaeifar, Virginia Tech
9:30-10:00	*Simulations of coupled transformation and plasticity in NiTi*, Petr Sedlak, Czech Academy of Sciences
10:00-10:30	Break
10:30-11:00	*The effect of various model features on predicting the macro-scale magneto-mechanical behavior of magnetic shape memory alloys*, Heidi P. Feigenbaum, Northern Arizona University
11:00-11:30	*Local and global approaches to the modeling of magnetic shape memory alloys*, Björn Kiefer, TU Bergakademie Freiberg
11:30-12:00	*Effect of microstructural length scales in the multi-ferroic transformations in metamagnetic shape memory alloys*, Yuhao Wang, Texas A&M
12:00-1:30pm	Lunch
1:30-2:00	*Shape memory alloy actuation technology for adaptive low boom supersonic transports*, James Mabe, Texas A&M
2:00-2:30	*Finite element and experimental structural analysis of endodontic application made of Cu-based single crystal SMA considering a micromechanical behavior model*, Tarak Ben Zineb, Université de Lorraine
2:30-3:00	*Experimental investigations of microstructure-transformation interactions in Nitinol*, Samantha Daly, UCSB
3:00-3:30	Break
3:30-4:00	*Microstructures in modulated martensites – experimental observations and theoretical models*, Hanus Seiner, Czech Academy of Sciences
4:00-4:30	*Modeling branching microstructure and measuring interfacial energy in shape memory alloys*, Paul Plucinsky, University of Minnesota
4:30-5:00	*Unveiling shape memory alloy micromechanics with internal, in situ measurements of the local microstructure*, Ashley Bucsek, University of Minnesota
5:00-5:30	*Insights on deformation mechanisms of shape memory ceramics by multiscale scale modeling*, Mohsen Asle Zaeem, Colorado School Of Mines

Tuesday April 30, 2019

7:30-8:30am	Registration
8:30-9:00	*Additive manufacturing of shape memory alloys: key challenges and lessons learned*, Mohammad Elahinia, University of Toledo
9:00-9:30	*Engineering the transformation hysteresis by precipitation in NiTi and NiTiHf*, Ibrahim Karaman, Texas A&M
9:30-10:00	*Transformation-plasticity coupling in superelastic NiTi characterized by in-situ DIC, resistometry, IR thermography and DMA*, Ludek Heller, Nuclear Physics Institute of the Czech Academy of Sciences
10:00-10:30	Break
10:30-11:00	*Rational design of shape memory alloys with low functional fatigue*

	properties, Sherry Chen, Hong Kong University of Science and Technology
11:00-11:30	*The multiaxial nature of thermomechanical constitutive relationships of shape memory alloys*, Aaron Stebner, Colorado School of Mines
11:30-12:00	*Recent advances on phenomenological and computational modeling of shape memory alloys*, Giulia Scalet, University of Pavia
12:00-1:30pm	Lunch
1:30-2:00	*Extension-twist responses of superelastic shape memory alloy tubes*, John Shaw, University of Michigan
2:00-2:30	*Response of pseudoelastic NiTi under combined tension and internal pressure*, Stelios Kyriakides, University of Texas at Austin
2:30-3:00	*Fracture toughness and crack growth behavior in NiTi and NiTiHf shape memory alloys*, Behrouz Haghgouyan, Texas A&M
3:00-3:30	Break
3:30-4:00	*Commercialization of NiTiNOL in large joint fusion: Basic Science to Clinical Results*, Ken Gall, Duke University
4:00-4:30	*Prediction of low cyclic fatigue of NiTi structures using reduced techniques based on multi-scale modeling*, Luc Saint-Sulpice, ENIB
4:30-5:30	Poster Presentations
7:00-9:00pm	Banquet

Wednesday May 1, 2019

7:30-8:30am	Registration
8:30-9:00	*Ultrahigh compressive fatigue life and fatigue mechanisms of superelastic NiTi in solid-state cooling technology*, Qingping Sun, Hong Kong University of Science and Technology
9:00-9:30	*Phase-field approach to microstructure evolution in SMA: size effects and rate-independent dissipation*, Henryk Petryk, Polish Academy of Sciences
9:30-10:00	*Mesoscale simulation of shape memory alloy thin film devices*, Frank Wendler, Friedrich-Alexander-University of Erlangen-Nürnberg
10:00-10:30	Break
10:30-11:00	*A fully-coupled simulation tool for elastocaloric air-cooling devices*, Felix Welsch, Saarland University
11:00-11:30	*Kinetics of phase boundaries in bistable chains in the isothermal and adiabatic regimes*, Prashant K. Purohit, University of Pennsylvania
11:30-12:00	*Characterization and actuation of nematic elastomers*, Victoria Lee, Caltech
12:00-1:30pm	Lunch
1:30-2:00	*Effect of phase transformation on the stability of pseudoelastic NiTi tubes under bending*, Karlos Kazinakis, University of Texas at Austin
2:00-2:30	*A three-dimensional constitutive model for shape memory alloys considering the evolutionary material response and two-way shape memory effect at stress-free conditions*, Lei Xu, Texas A&M

2:30-3:00	*Towards high power density solid/liquid metal composite actuators*, Darren Hartl, Texas A&M
3:00-3:30	Break
3:30-4:00	*Bayesian materials discovery: Application on the discovery of precipitation hardened NiTi shape memory alloys through micromechanical modeling*, Alexandros Solomou, Texas A&M
4:00-4:30	*Macroscopic constitutive model tailored for polycrystalline NiTi shape memory alloys with localized phase transformation*, Miroslav Frost, Czech Academy of Sciences
4:30-5:00	*A finite strain constitutive model for polycrystalline shape memory alloys accounting for pseudoelasticity, one way shape memory effect, orientation, reorientation, "ferroelasticity", and latent heat effects*, Theocharis Baxevanis, University of Houston
5:00-5:30	*A new framework for phenomenological constitutive models for SMAs*, Chad M. Landis, University of Texas at Austin

Thursday May 2, 2019

9:00-11:30am Round-table Discussion

Report composed by Chad M. Landis and Stelios Kyriakides

19-2 IUTAM Symposium on Physics and Mechanics of Sea Ice
Espoo, Finland, June 3 – June 7, 2019

a) Scientific Committee
Jukka Tuhkuri, Aalto University, Finland (chair); John Dempsey, Clarkson University, USA; Robert Gagnon, National Research Council, Canada; Sveinung Løset, Norwegian University of Science and Technology, Norway; Peter Sammonds, University College London, UK; Vernon Squire, University of Otago, New Zealand; Hajime Yamaguchi, University of Tokyo, Japan; Robert McMeeking, University of California Santa Barbara (IUTAM representative).

b) Short summary of scientific progress achieved
The symposium was the fourth IUTAM Symposium on Physics and Mechanics of Sea Ice. The previous ones have been held in 1979 (Denmark), 1989 (Canada) and 2000 (USA). With global warming dramatically changing the sea ice environment, and with an increase in activi-ties in ice covered seas, it was very timely to have an IUTAM meeting on sea ice again.

The objective of the symposium was to bring together scientist who have made significant contributions in the study of sea ice to discuss the recent achievements and ideas for future work. The symposium focused on the following five topics: (1) fracture of ice, (2) thermody-namics of sea ice ridges, (3) global and local ice loads on ships and marine structures, (4) computational ice engineering and ice mechanics, and (5) physical and engineering problems related to ice and waves. About five presentations were given on each topic and the presenta-tions reflected the different perspectives in the research on mechanics of sea ice.

Fracture of ice has been studied for decades but remains a challenge. We are still struggling to understand the effects of temperature, loading rate, and scale. However, advancements have been achieved in understanding the time dependent fracture of ice, small scale crushing, strength of ice under cyclic loading, and ice-ice friction in different scales. It was agreed that high quality experiments both in laboratories and in the field are still needed to give us an-swers in these fundamental questions.

Both the mechanical and thermal processes related with sea ice ridges are complicated. Ridges act as energy sinks in large scale sea ice models and impose large loads on Arctic ships and offshore structures. After forming, ridges consolidate – during spring and summer, ridges decay. The recent work includes experimental studies on the temporal development of ridge properties, including porosity, heat and salt fluxes in ridges, freeze bonds, and numerical modelling of ridge loads on cylindrical marine structures.

Sea ice research is important for naval architects and marine engineers, as the loads from sea ice are large and often dominate the structural design. Although a large number of measure-ments have been conducted, and we know that the ice-structure contact is concentrated on a small area, we still do not know how the ship velocity and the ice thickness affect the ice load on a ship; we do not know well enough the link between ice loads and ice conditions. Numer-ical simulations are getting more and more detailed, interesting models are under develop-ment and are used both in research and in engineering work. The recent advancements in-clude multiscale modelling of ice strength, fast 3D simulations using physically based model-ling, inclusion of hydrodynamics in the models (still a major challenge), and the use of simula-tions to create data for statistical ice load studies

One of the main goals of the symposium was to foster discussions on wave-ice interaction. There is a wealth of literature on analytic methods in wave-ice interaction from the oceano-graphic perspective and, with global warming, the importance of the topic increasing. How-ever, our knowledge on coupled wave-ice effects on ships and offshore structures is much more limited. It is believed that a close collaboration between disciplines could provide re-search results that are significant both for oceanography and engineering. In general, in order to understand wave-ice dynamics, we need to understand what the ice cover does to the waves and what the waves do to the ice cover. In more detail, the current research includes studies on floe-floe collision induced wave attenuation, rheologies for marginal ice zone, and viscous effects in wave-ice dynamics. It was discussed if it is worth trying to reach a perfect model, to study the fundamental physics, or to admit that different models are needed to answer different questions. The question remains open.

c) Countries represented and number of participants

The symposium had in total 42 participants from 13 countries. The speakers represented Canada, Finland, Japan, The Netherlands, Norway, Poland, Russia, UK, USA; the other partici-pants represented, in addition, China, Lebanon, Pakistan, and Sri Lanka.

d) Publication of proceedings of the Symposium

Proceedings of the symposium will be published in the IUTAM Bookseries by Springer.

e) Financial support

The symposium was financially supported by IUTAM (4000$), the Federation of Finnish Learned Societies (5000€), City of Espoo (1000€), and Aalto University.

f) Scientific program

Monday, June 3

09:00 – 09:30 Registration
09:30 – 10:00 Opening Addresses. Dean Gary Marquis, Professor Jukka Tuhkuri
10:00 – 11:00 *The Fracture of Ice.* John Dempsey, Clarkson University, USA

11:00 – 11:30 Coffee
11:30 – 12.30 *Consistent Ice-Crushing Physics at Small and Large Scales: From Ice Skating to Ice-Induced Vibration of Structures.* Robert Gagnon, National Research Council Canada
12:30 – 13.30 Lunch
13:30 – 14:30 *Fatigue of Sea Ice: Classical and Non-Classical Behavior.* Andrii Murdza, Erland M. Schulson and Carl E. Renshaw, Dartmouth College, USA
14:30 – 15:30 *Strength of Ice in Brittle Regime - Multiscale Modelling Approach.* Kari Kolari and Reijo Kouhia, VTT Technical Research Center of Finland and Tampere University of Technology, Finland
15:30 – 16:00 Coffee
16:00 – 17:00 *A Statistical and Mechanical Analysis of Ice Friction Experiments using Acoustic Emissions.* Katerina Stavrianaki, Mark Shortt and Peter Sammonds, University College London, UK
17:30 – 20:30 Get Together, Nuuksio Natural Park

Tuesday, June 4

09:00 – 10:00 *The Role of Broken Ice in Multi-scale Deformation*. Sally Scourfield, Ben Lishman and Peter Sammonds, University College London, UK
10:00 – 11:00 *Ice Fracture*. Wenjun Lu, Norwegian University of Science and Technology
11:00 – 11:30 Coffee
11:30 – 12.30 *Ice Action on Ship Hull*. Kaj Riska, TU Delft, Netherlands
12:30 – 13.30 Lunch
13:30 – 14:30 *Full Scale Measurements - A Challenging Tool to Determine Design Ice Loads for Ships*. Pentti Kujala, Aalto University, Finland
14:30 – 15:30 *Ice structure interaction with floaters*. Sveinung Løset, Norwegian University of Science and Technology
15:30 – 16:00 Coffee
16:00 – 17:00 Technical visit to the Aalto Ice Tank

Wednesday, June 5

09:00 – 10:00 *Safer Operations in Changing Ice-Covered Seas: Approaches and Perspectives*. Yevgeny Aksenov, Stefanie Rynders, Danny Feltham, Lucia Hosekova, Robert Marsh, Nicolaus Skrilis, Laurent Bertino and Tim Williams, National Oceanography Centre, University of Reading, University of Southampton, UK and Nansen Environmental and Remote Sensing Center, Norway
10:00 – 11:00 *Sea ice forecast studies for ice navigation support in the Arctic*. Hajime Yamaguchi, Noriaki Kimura and L.W.A. De Silva, The University of Tokyo, Japan
11:00 – 11:30 Coffee

11:30 – 12.30 *Discrete-element modeling of wave-induced floe–floe collisions and collision-induced wave attenuation*. Agnieszka Herman, University of Gdansk, Poland
12:30 – 13.30 Lunch
13:30 – 14:30 *Wave-in-Ice Models and Experimental Observations*. Hayley Shen, Clarkson University, USA
14:30 – 15:30 *Diving into the Physics of Wave-Ice interaction: recent evidences of complex viscous dynamics*. Jean Rabault, Graigory Sutherland, Aleksey Marchenko and Atle Jensen, University of Oslo, Norway, Environment and Climate Change Canada and The University Centre in Svalbard, Norway
15:30 – 16:00 Coffee
18:00 – 22:00 Symposium Dinner

Thursday, June 6

09:00 – 10:00 *Scale Effects during Ice-Structure Interactions and Implications for Design*. R.S. Taylor, R. Hossain and I. Gribanov, Memorial University of Newfoundland, Canada
10:00 – 11:00 *Ridge Load on the Monopile – a Comparison Between FEM-CEL – Simulations and ISO 19906*. Jaakko Heinonen, VTT Technical Research Center of Finland
11:00 – 11:30 Coffee
11:30 – 12.30 *Impact of granular behaviour of fragmented sea ice on marginal ice zone dynamics*. Stefanie Rynders, Yevgeny Aksenov, Daniel Feltham and George Nurser, National Oceanography Centre and University of Reading, UK
12:30 – 13.30 Lunch
13:30 – 14:30 *Consolidation of ice ridges*. Knut Høyland, Norwegian University of Science and Technology
14:30 – 15:30 *The Influence of Gravity Drainage on the Formation and Salinity Development of Freeze-Bonds in Saline Ice*. Mark Shortt and Peter Sammonds, University College London, UK
15:30 – 16:00 Coffee
16:00 – 17:00 Thermo-Hydro Dynamics of Sea Ice Ridges. Aleksey Marchenko, The University Centre in Svalbard, Norway

Friday, June 7

09:00 – 10:00 *Application of Physically-Based Modeling to Ice Structure Interaction and Investigation of Better Fluid Force Treatment*. Akihisa Konno, Kogakuin University, Japan
10:00 – 11:00 *Physics-Based Modelling of Ice Actions and Action Effects on Marine Structures*. Raed Lubbad. Presented by Sveinung Løset, Norwegian University of Science and Technology
11:00 – 11:30 Coffee

11:30 – 12.30 *Statistics of Ice Loads on Inclined Marine Structures based on Numerical Experiments*. Arttu Polojärvi, Janne Ranta and Jukka Tuhkuri, Aalto University, Finland

12:30 – 13.30 Lunch

Report composed by Jukka Tuhkuri

19-3 IUTAM Symposium on Computational Modelling of Instabilities and Turbulence in Separated Two-Phase Flows

Dublin, Ireland, June 10 – June 12, 2019

Website: https://maths.ucd.ie/cfd2019/index.html

a) Scientific Committee

Lennon Ó Náraigh, University College Dublin (Chair)
Hang Ding, University of Science and Technology of China
Jacques Magnaudet, Institut de Mecanique des Fluides de Toulouse (IUTAM representative)
Peter Spelt, Universite Claude Bernard Lyon and Laboratoire de Mecanique des Fluides et d'Acoustique
Gretar Tryggvason, Johns Hopkins University, Baltimore
Stéphane Zaleski, Universite de Pierre et Marie Curie, Paris

b) Short summary of scientific progress achieved

The Symposium dealt with the fluid mechanics of two-phase flows – a fundamental physical process that lies at the heart of a range of manufacturing industries, ranging from oil-gas transport, chemical processing, combustion, to the cooling of microelectronic devices. The Symposium dealt in particular with the mathematical modelling and simulation of two-phase flows – a theoretical approach which is crucial for the design and optimization of industrial processes involving multiphase flow.

The Symposium welcomed contributions from researchers working on applications, fundamental numerical methodologies, and experiment. Each presenter was able to make connections between these three important aspects.

Three key outcomes of the Symposium were apparent to the Chair. First, that the theoretical modelling of contact lines is more-or-less “settled”, with researchers now more focused on applications and reproducing experimental scenarios using established theoretical models. Second, that novel applications of multiphase flow are appearing, many of which involve phase change. The correct modelling of interfacial conditions involving phase change is not yet complete. The Symposium gave new motivation to the researchers present to consider this topic in the future. A third and related outcome was the emergence of a new theme in multiphase flow research – namely multiphase flow coupled to heat transfer. This will be of vital importance in applications in the near future, as we begin a new drive to energy efficiency and carbon-neutral societies.

A final observation made by numerous participants was how welcoming the Symposium was to early-stage researchers – in particular, the short-talk-plus-poster session devoted to PhD students.

c) Countries represented and number of participants

Listed in alphabetical order, the following countries and regions were represented at the Symposium: Brazil, China, Denmark, France, India, Ireland, Japan, Poland, United Kingdom, United States of America, Taiwan.

Overall, there were 38 participants:

- 26 Experienced Researchers, who gave full-length presentations
- 12 Early-stage researchers, who gave a short talk and a poster presentation.

The short-talk-plus-poster format was very helpful for the early-stage researchers, as for some of them it was their first time presenting in English. The Symposium gave a supportive opportunity to these researchers to develop their presentation skills.

d) Publication of Proceedings of the Symposium

Three full-length articles arising from the Symposium will be published shortly (as of March 2020) in a special edition of *Fluid Dynamics and Materials Processing*.

e) Financial support

The Symposium received generous financial support from a number of sources, which enabled many of the participants to be supported in their attendance. A key backer of the Symposium was the Horizon 2020 programme ThermaSMART, coordinated by the University of Edinburgh, in which the Symposium Chair is one of the co-investigators. Several members of the ThermaSMART Consortium were invited to the Symposium and made presentations. In view of the ThermaSMART contribution to the Symposium budget, the registration fee in respect of ThermaSMART members was waived. There was a similar waiver for key invited speakers and members of the Scientific Committee. The grant from IUTAM helped to cover the accommodation expenses of some of the participants, including early-stage researchers.

A detailed financial breakdown:

Income			
Registration (Regular)	Fee=€200	Attendees#=19	€3800
Registration (Subsidised)	Fee=€0	Attendees#=19	€0
Science Foundation Ireland Funding			€6400
Irish Research Council New Foundations			€3800
UCD Seedfunding			€2000

IUTAM funding	€3,899
ThermaSMART – Horizon 2020	€5,338
UCD College of Science	€1000
UCD School of Mathematics and Statistics	€1000
UCD Foundation	€3000
Extra attendees at Symposium Banquet	€150
Total Income	**€30,387**

f) Scientific Program

Monday 10th June

From 08:00 Breakfast, Registration
09:00-09:25 Opening Remarks

Morning Session: Droplets, Contact Lines, and Surfactants

09:25-09:50 *Numerical simulations of two-phase flows with surfactants using a level-set method*, Presenter: Peter Spelt, LMFA, University of Lyon, France; Authors: Peter Spelt, Yedhir Mezache, Marie Le Merrer, Francois Detcheverry, Anne-Laure Biance

09:50-10 :15 *Drop impact onto thin immiscible liquid films*, Presenter: Alidad Amierfazli, Department of Mechanical Engineering, York University, Canada; Authors: H. Chen, A Mozafari and Alidad Amirfazli

10:15-10:40 *Secretive Instabilities in Evaporating Binary Mixtures: Pools and Sessile Drops*, Presenter: Prashant Valluri, School of Engineering, The University of Edinburgh, Edinburgh, United Kingdom; Authors: AGL Williams, RK Nazareth, PJ Sáenz, G Karapetsas, OK Matar, K Sefiane and P Valluri

10:40-11:05 *Classification and some new aspects of the dripping drops experiments*, Author: An-Bang Wang, Institute of Applied Mechanics, National Taiwan University, Taipei; Authors: An-Bang Wang and Pei-Hsun Tsai

11:05-11:30 Tea / Coffee

11:30-11:55 *A Geometric Diffuse-Interface Method for Droplet Spreading*, Presenter: Lennon Ó Náraigh, School of Mathematics and Statistics, University College Dublin, Belfield, Dublin, Ireland; Authors: Darryl D. Holm, Lennon Ó Náraigh, Cesare Tronci

11:55-12:20 *Inertial Landau-Levich problem: sheets, films and drops on a rotating drum*, Presenter: Jean-Phillipe Matas, Laboratoire de Mécanique des Fluides et d'Acoustique, Université Claude Bernard Lyon 1, France; Authors: J. John Soundar Jerome, Mickael Bourgoin and Jean-Philippe Matas

12:20-12:45 *Fluid-structure interaction with dynamic wetting: numerical schemes and applications*, Presenter: Hang Ding, Department of Modern Mechanics, University of Science and Technology of China, Hefei, China; Authors: Hang Ding and Hao-Ran Liu

12:45-13:00 Wrap-up by Session Chair

13:00-14:00 Hot Lunch

Afternoon Session: Compressible Flows

14:00-14:25 *Pressure-based algorithm for compressible-incompressible interfacial flows*, Author and Presenter: Fabian Denner, Otto-von-Guericke-Universitat Magdeburg

14:25-14:50 *SCB: An efficient and simple parallel code to simulate a 3D shock induced bubble collapse*, Author and Presenter: Eric Gonclaves, Université Poitiers

14:50-15:15 *Developing a compressible Euler numerical solver for two phase gas/water flows in conservative form*, Author and Presenter: Stephen J. Shaw, Xi'an Jiaotong-Liverpool University

15:15-15:30 Wrap-up by Session Chair

15:30-16:00 Tea/Coffee

18:00-20:00 Reception in Royal Irish Academy

Tuesday 11th June

From 08:00 Breakfast

Broberg Session: Short Presentations by Early-Stage Researchers (09:00-11:00)

09:00 *A review of turbulence closures for wave-current interactions in the mixed-layer*, Presenter: Clément Calvino, School of Mathematics and Statistics, University College Dublin, Ireland; Authors: Clément Calvino, Tomasz Dabrowski, Frederic Dias

Evaporation kinetics and deposition from nano suspension drops on the viscoelastic substrates, Presenter: Yuhong Chen, School of Engineering, The University of Edinburgh, Edinburgh, United Kingdom; Authors: Yuhong Chen, Alexandros Askounis, Khellil Sefiane, Vasileios Koutsos, Prashant Valluri, Yasuyuki Takata, Stephen K. Wilson

Stability of a gravity driven particle-laden falling film, Presenter: Darish Jeswin Dhas, Indian Institute of Technology Madras, Chennai, India; Authors: Darish Jeswin Dhas S, Anubhab Roy

Chaotic Orbits of a Tumbling Ellipsoid, Presenter: Erich Essmann, School of Engineering, The University of Edinburgh, Edinburgh, United Kingdom; Authors: Erich Essmann, Pei Shui, Rama Govindarajan, Prashant Valluri

GPU Algorithms for Fluid Mechanics, Presenter: Andrew Gloster, School of Mathematics and Statistics, University College Dublin, Belfield, Dublin, Ireland; Authors: Andrew Gloster and Lennon Ó Náraigh

Dynamics of a single gas bubble under forced acoustic oscillations of very low frequency, Presenter: Davide Masiello, School of Engineering, The University of Edinburgh, Edinburgh, UK; Authors: Davide Masiello, Ying Zheng, Rama Govindarajan, Prashant Valluri

10:00 *Adaptive interface-Mesh un-Refinement based SI-LSM for Two-Phase Flow Computations on a Cartesian Grid*, Presenter: Kuntal Patel, Nirma University and Indian Institute of Technology – Bombay, India; Authors: Kuntal Patel, Javed Shaikh, Absar Lakdawala and Atul Sharma
Effect of Non-Uniform Circumferential Heat Fluxes and Orientation on Flow Boiling in Microchannels – A Numerical Investigation, Presenter: Jarryd Potgieter, University of Pretoria, South Africa and The University of Edinburgh, United Kingdom; Authors: J Potgieter, M A Moghimi Ardekani, J P Meyer, P Valluri
A hybrid numerical model (CFD-DEM) for proppant transport in dynamically propagating hydraulic fractures in shale gas reservoirs, Presenter: Yatin Suri, School of Engineering, Robert Gordon University, Aberdeen, United Kingdom; Authors: Yatin Suri, Sheikh Zahidul Islam, Mamdud Hossain
Proposed experimental investigation of microchannel flow boiling heat transfer with non-uniform circumferential heat fluxes at different gravitation orientations, Presenter: Marius Vermaak, University of Pretoria, South Africa and The University of Edinburgh, United Kingdom; Authors: Marius Vermaak, J P Meyer, K Sefiane, P Valluri
Simulation of shock-particles interaction using conservative sharp interface methods, Presenter: Yi Ren, Department of Modern Mechanics, University of Science and Technology of China, Hefei, China; Authors: Yi Ren, Yi Shen and Hang Ding
Three-dimensional conservative sharp interface methods for the simulation of compressible multiphase flows, Presenter: Yi Shen, Department of Modern Mechanics, University of Science and Technology of China, Hefei, China; Authors: Yi Shen, Yi Ren and Hang Ding

11:00-12:30 Tea/Coffee

ThermaSMART Session on Heat Transfer

11:30-11:55 *A Formulation for High-Fidelity Simulations of Pool Boiling in Low Gravity*, Presenter: Jungho Kim, Department of Mechanical Engineering, University of Maryland, USA; Authors: Akash Dhruv, Elias Balaras, Amir Riaz, Jungho Kim

11:55-12:20 *Nucleate pool boiling: At the interface of spatiotemporally resolved laser/infrared experiments and advanced numerical tools*, Presenter: Victor Voulgaropoulus, Department of Chemical Engineering, Imperial College London, London, UK; Authors: Victor Voulgaropoulos, Mirco Magnini, Edward R. Smith, Hannah Moran, Omar K. Matar, Christos N. Markides

12:20-12:45 *On the phase-change interface conditions for violent separated liquid-vapor Flows*, Presenter: Matthieu Ancellin, CMLA, ENS Paris-Saclay,

France; Authors: Matthieu Ancellin, Laurent Brosset, and Jean-Michel Ghidaglia

12:45-12:55 Wrap-up by Session Chair

13:00-14:00 Hot Lunch

Afternoon Session

14:00-14:25 *Challenges in the modelling of high-speed mixing layers*, Author and Presenter: Stéphane Zaleski, Institut Jean Le Rond d'Alembert, Sorbonne Université & CNRS, Paris, France

14:25-14:50 *Schlieren Imaging of Two-Phase Flows*, Presenter: Kevin Nolan, School of Mechanical and Materials Engineering, University College Dublin, Belfield, Dublin, Ireland; Authors: Kevin Nolan and Rudi O'Reilly Meehan

14:50-15:15 *Interface-resolved numerical simulations of a buoyant bubble in homogeneous isotropic turbulence*, Presenter: Aurore Loisy, LMFA, CNRS, Ecole Centrale de Lyon, Université de Lyon, Ecully, France; Authors: Aurore Loisy and Aurore Naso

15:15-15:40 *Internal Flows in Pure Water Drops on a Local Hot-Spot: Onset and Growth of Thermocapillary Instabilities*, Presenter: Yutaku Kita, Kyushu University, Fukuoka, Japan; Authors: Yutaku Kita, Huacheng Zhang, Alexandros Askounis, Yasuyuki Takata, Khellil Sefiane

15:40-16:00 Tea/Coffee

16:00-16:25 *Towards Sub-grid Scale Break-up Modeling for Simulating Turbulent Spray Atomization*, Presenter: Olivier Desjardins, Sibley School of Mechanical and Aerospace Engineering, Cornell University, USA; Authors: Robert Chiodi and Olivier Desjardins

16:25-16:50 *Falling liquid films in interaction with a confined counter-current gas*, Presenter: Gianluca Lavalle, Laboratoire LIMSI, CNRS, Univ. Paris-Sud, Univ. Paris-Saclay, Orsay, France; Authors: G. Lavalle, Y. Li, S. Mergui, N. Grenier, G. Dietze

16:50-17:15 *Vortex ring formation regimes in multiphase flows*, Presenter: Daniel Fuster, Sorbonne Université, Centre National de la Recherche Scientifique, Institut Jean Le Rond D'Alembert, Paris, France; Authors: Daniel Fuster and Maurice Rossi

17:15-17:25 Wrap-up by Session Chair

18:15 Departure from UCD Bus Terminus to Symposium Banquet in Johnny Foxes (Seated by 19:30)

23:00 Departure from Johnny Foxes

Wednesday 12th June

From 08:00 Breakfast

Morning Session: New Methodologies

09:30-09:55	*Computational Studies of Gas-Liquid Multiphase Flows Undergoing Massive Topology Changes*, Presenter: Gretar Tryggvason, Johns Hopkins University; Authors: Gretar Tryggvason and Jiacai Lu
09:55-10:20	*ALE-FE Method for Two-Phase Flows with Dynamic Boundaries*, Presenter: Gustavo Anjos, Federal University of Rio de Janeiro, COPPE-UFRJ, Brazil; Authors: Anjos, G.R., Mangiavacchi N., Lucena, R.
10:20-10:45	*Modified Ghost fluid method with acceleration correction (MGFM/AC)*, Presenter: Tiegang Liu, LMIB and School of Mathematics and Systems Science, Beihang Univerity, Beijing, P.R. China; Authors: Tiegang Liu and Chengliang Feng
10:45-11:10	*Global sensitivity analysis of the one-dimensional two-fluid model for stratified flows*, Presenter: Davide Picchi, Stanford University, Department of Energy Resources Engineering, Stanford, USA; Authors: Davide Picchi and Pietro Poesio
11:10-11:40	Tea/Coffee
11:40-12:05	*Pore-scale Imaging of Intermittency in Steady-state Two-phase Flow*, Presenter: Branko Bijeljic, Department of Earth Science and Engineering, Imperial College, London, United Kingdom; Authors: Branko Bijeljic, Martin J. Blunt, Ying Gao and Qingyang Lin, Ali Raeini
12:05-12:30	*Formation, dissolution and properties of surface nanobubbles: Insight from molecular dynamics simulation*, Presenter: Panagiotis E. Theodorakis, Institute of Physics, Polish Academy of Sciences, Warsaw, Poland; Authors: Zhizhao Che and Panagiotis E. Theodorakis

Report composed by Lennon Ó Náraigh

19-4 IUTAM Symposium on Vortex Dynamics in Science, Nature and Technology

La Jolla, USA, June 24 – June 28, 2019

Symposium organizer: Stefan Llewellyn Smith, University of California San Diego, USA

a) Scientific Committee

Stefan Llewellyn Smith (chair), University of California San Diego, USA; Darren Crowdy, Imperial College London, UK; Yasuhide Fukumoto, Kyushu University, Japan; GertJan van Heijst, Eindhoven University, Netherlands; Stéphane Le Dizès, IRPHE, France; Paul Newton, University of Southern California, USA; Renzo Ricca, University of Milano−Bicocca, Italy; Gary Leal (IUTAM Representative), University of California Santa Barbara, USA

b) Short summary of the scientific progress achieved

b.1) Short summary of the theme

Vorticity was introduced by Helmholtz in 1858, and was a major step forward in overcoming the limitations of classical irrotational fluid mechanics. It has been of critical importance in fluid mechanics ever since. Kelvin's theory of vortex atoms sought a fundamental theory of matter from vorticity. Prandtl's boundary-layer theory, which definitely resolved the 19th century paradoxes of fluid mechanics, depends crucially on the dynamics of vorticity. In the 21st century, vortex dynamics brings together a vibrant community in a growing range of areas, including biomechanics, astrophysics, oceanography, atmospheric sciences, aeronautics, acoustics, condensed matter and computational physics, for example. Experts in each of these domain-specific areas do not often attend the same specialized conferences, yet could greatly benefit from cross-fertilization of ideas. Continued and new advances make a meeting in vortex dynamics timely, one which will aim to attract a wider audience to the Symposium with an emphasis on applications to complement the strong fundamental developments that have been a feature of previous meetings.

Ever-increasing computational power has led to high-resolution simulations in fluid dynamics probing the structures of vortices and their interactions. Recent developments in complex variable theory have led to new exact solutions of the Euler equations describing vortices. Laboratory techniques such as PIV and LDV have revealed the internal structures of vortices in a variety of experimental flow configurations. Formal correspondences between general relativity in n+1 dimensions and fluid mechanics in n dimensions have led to links between the two. These are just some examples of recent developments ready to reach beyond their originators.

This symposium brought together researchers from different fields, with an emphasis on new techniques, applications and fields of research. Theoretical, computational, experimental and observations approaches were included, with the goal of bringing together different communities and encouraging interdisciplinary interactions.

b.2) Short summary of the progress made

The meeting showed the vitality of vortex dynamics. Recurring topics included the topology of vortex evolution and interactions such as collision and reconnection, the inclusion of physical effects such as compressibility, buoyancy and electromagnetic fields. Other important physical phenomena such as hydrodynamic instability were approach through the lens of vortex dynamics, and topics from aerodynamics, combustion, oceanography and astrophysics and planetary physics were presented. Naturally, high-performance computations underlay a number of the presented topics, but novel experiments as well as theoretical developments using new tools in complex variable, machine learning and other areas were prominent.

Three poster prizes are awarded by a committee chaired by Prof. Newton (University of Southern California) to Scott Carlson, Todd Christopher and Vicky Verma (all University of California San Diego).

c) Countries represented and number of participants

The symposium had 64 participants from 12 countries (Austria 1, Canada 3, Denmark 3, France 2, India 1, Japan 7, Mexico 2, Netherlands 1, Russia 1, South Korea 2, United Kingdom 3, United States 38).

d) Publication of proceedings of the Symposium

None are planned. The abstracts were uploaded on the website and continue to be at the URL http://iutam2019.ucsd.edu.

e) Financial support

Financial support was received from the following sources, who are gratefully acknowledged.
1) Department of Mechanical and Aerospace Engineering, University of California, San Diego ($3,000)
2) Jacobs School of Engineering, University of California San Diego ($2,000)
3) Scripps Institution of Oceanography, University of California San Diego ($2,000)
4) IUTAM (used to support junior participants) ($5,000).

f) Scientific program (Speaker's name underlined)

Monday, June 24, 2019

10:20 AM – 10:40 AM: Welcome by Dr. Douglas Bartlett (Deputy Directory for Research, Scripps Institution of Oceanography) and Stefan Llewellyn Smith

10:40 AM – 11:20 AM (invited): *Helical vortices and Vortex Ring State in the wake of a rotor under normal and yawed inflow*, Thomas Leweke, IRPHE and Hugo Umberto Quaranta, Airbus Helicopters
11:20 AM – 11:40 AM: *Analysis of Kármán's vortex street by the phase reduction theory*, Makoto Iima, Hiroshima University
11:40 AM – 12:00 PM: *Topology of exotic wakes*, Morten Brøns, Technical University of Denmark, Anne Ryelund Nielsen, Technical University of Denmark, Puneet Matharu, University of Manchester, Matthias Heil, University of Manchester
1:20 PM – 1:40 PM: *Vortex patterns in the two-dimensional wake of a transversely oscillating cylinder in uniform flow*, Emad Masroor, Virginia Tec, Wenchao Yang, Queen's University, Mark A. Stremler, Virginia Tech
1:40 PM – 2:00 PM: *Effect of a Wall on Spatially Developing Trailing Vortices in the Far-Wake of a Delta Wing*, Sarah E. Morris and C. H. K. Williamson, Cornell University
2:00 PM – 2:20 PM: *The Effect of Non-Uniform Stratification on Late-Wake Vortices*, Devin T. Conroy, Laura K. Brandt, and James W. Rottman, Leidos, Inc.
2:20 PM – 2:40 PM: *Spatio-temporal symmetry-breaking of the flow past an oscillating cylinder*, Puneet Matharu, Andrew Hazel, Matthias Heil, University of Manchester
3:00 PM – 3:20 PM (review): *Vortex reconnection and turbulence cascade*, Fazle Hussain, Jie Yao, Texas Tech University
3:40 PM – 4:00 PM: *Reconnection and instability during vortex ring collisions*, JiaCheng Hu and Sean D. Peterson, University of Waterloo
4:00 PM – 4:20 PM: *Thermodynamic Changes during Compressible Vortex Reconnection*, Hamid M. M. Daryan, University of Waterloo, Fazle Hussain, Texas Tech Universit, Jean-Pierre Hickey, University of Waterloo

Tuesday, June 25, 2019
9:00 AM – 9:40 AM (invited): *The life of vortex knots and the conservation of helicity*, William Irvine, University of Chicago
9:40 AM – 10:00 AM: *Exploring Vortex Unknotting with Superfluid Models*, Dustin P. Kleckner, University of California Merce and William T. M. Irvine, The University of Chicago
10:00 AM – 10:20 AM: *Topology of vortices: pre-reconnection then turbulence*, Robert M. Kerr, University of Warwick
10:40 AM – 11:00 AM: *Role of vortex dynamics in drag control schemes in turbulent boundary layers*, Jie Yao, Fazle Hussain, Texas Tech University
11:00 AM – 11:20 AM: *Vortex interaction as a function of contact angle: from merger to reconnection*, Oscar Velasco Fuentes, CICESE
11:20 AM – 11:40 AM: *Hamiltonian Description of Vortex Systems*, Leonid I. Piterbarg, University of Southern California
11:40 AM – 12:00 PM: *Effect of Compressibility on Darrieus-Landau Instability of a Premixed Flame Front and Role of Vorticity Production*, Yasuhide Fukumoto, Kyushu University, Keigo Wada, Kyushu University and Snezhana I. Abarzhi, The University of Western Australia
1:00 PM –2:40 PM: Poster session

Vortex Interactions in Two-Dimensional Turbulence, Scott Carlson, Patrick J. R. Folz, Keiko K. Nomura, University of California San Diego
Rossby Wave-Zonal Flow Turbulence in a Tangled Magnetic field, Chang-Chun Chen and Patrick H. Diamond, University of California, San Diego
Vortex dynamic models with buoyancy, C. Chang and S. G. Llewellyn Smith, University of California San Diego
Hollow Vortex in a Corner, Todd Christopher and Stefan G. Llewellyn Smith, University of California San Diego
Helical Contour Dynamics, Tianyi Chu and Stefan G. Llewellyn Smith, University of California San Diego
Subcritical turbulence spreading and avalance birth, Robin Heinonen and Patrick H. Diamond, University of California San Diego
Existence of a Translating Pair of Counter-Rotating Vortex Patches, Tae Eun Kim and Saleh Tanveer, Ohio State
Spectrum of Key Flow for Vortex Birth, Katsuyuki Nakayama, Aichi Institution of Technology
Hairpin Vortices in Transitional Channel Flow, Raghuram Srinivasan and O. N. Ramesh, Indian Institute of Science Bangalore
Submesoscale vortices at a mixed layer front and their interaction with turbulence, Vicky Verma, Hieu T. Pham and Sutanu Sarkar, University of California San Diego

3:00 PM – 3:20 PM: *Nonlinear Waves over Patches of Vorticity*, Christopher W. Curtis, San Diego State Universit, Henrik Kalisch, University of Bergen
3:20 PM – 3:40 PM: *Optimum power extraction from an infinite vortex array*, Mikael A. Langthjem, Yamagata University
3:40 PM – 4:00 PM: *Numerical Study of the Viscous Lamb Dipole*, Robert Krasny, University of Michiga and Ling Xu, North Carolina A&T State University
4:00 PM – 4:20 PM: *Large scale vortices appearing in the 2D stationary Navier–Stokes flows at large Reynolds numbers*, Sun-Chul Kim, Chung-Ang University

Wednesday, June 26, 2019
9:00 AM – 9:40 AM (invited): *The sole measure of aerodynamic forces in steady far field*, Luoqin Liu, University of Twente and Jiezhi Wu, Peking University
9:40 AM – 10:00 AM: *Vortex Shedding Models for an Accelerated Plate and Insect Flight*, Sung-Ik Sohn, Gangneung-Wonju National University
10:00 AM – 10:20 AM: *Scaling laws of the leading-edge vortices of rotary wings*, Dmitry Kolomenskiy, Japan Agency for Marine-Earth Science and Technology, Di Chen, Chiba University and Shanghai Jiao Tong University, Ryo Onishi, Japan Agency for Marine-Earth Science and Technology and Hao Liu, Shanghai Jiao Tong University and Chiba University
10:40 AM – 11:00 AM: *Evaluating near-singular integrals in vortex flows and Stokes flow*, Monika Nitsche, University of New Mexico
11:00 AM – 11:20 AM: *Vortex Dynamics Computed by Lagrangian Methods*, Ling Xu, North Carolina A&T State University and Robert Krasny, University of Michigan

11:20 AM – 11:40 AM: *A fresh perspective on the planar three-vortex problem*, Mark A. Stremler, Virginia Tech and Vikas S. Krishnamurthy, University of Vienna
11:40 AM – 12:00 PM: *Vorticity topology of merging of two, three and four vortices at low Reynolds numbers*, Morten Andersen, Roskilde University, Cédric Schreck, Ecole Nationale Supérieure de Mécanique et Aérotechnique, Marc John Bordier Dam, Roskilde University, Jesper Schmidt Hansen, Roskilde University, Morten Brøns, Technical University of Denmark

Thursday, June 27, 2019
9:00 AM – 9:40 AM (invited): *Classifying flow patterns using neural networks*, Eva Kanso, University of Southern California
9:40 AM – 10:00 AM: *Evolution of Vortex Dipole Disturbances in Channel Flow*, A. Leonard, California Institute of Technology
10:00 AM – 10:20 AM: *Stuart-type vortices on a rotating sphere*, Vikas S. Krishnamurthy and Adrian Constantin, University of Vienna
10:40 AM – 11:00 AM: *Theoretical Results on Compressible Vortex Streets*, Darren G. Crowdy, Imperial College London, Vikas S. Krishnamurthy, University of Vienna
11:00 AM – 11:20 AM: *Two-dimensional instability of smooth compressible vortices*, Stéphane Le Dizès, IRPHE, Luis Parras, Universidad de Málaga
11:20 AM – 11:40 AM: *Topological bifurcations of vortex pair interactions*, A. R. Nielsen, Technical University of Denmark, M. Andersen, Roskilde University, J. S. Hansen, Roskilde University and M. Brøns, Technical University of Denmark
11:40 AM – 12:00 PM: *Dynamics of electron vortices and shear layers subject to applied strain flows*, Noah C. Hurst, James R. Danielson, Daniel H. E. Dubin, Clifford M. Surko, University of California, San Diego
1:20 PM – 2:00 PM (invited): *Anisotropic effects on stability of periodic array of vortices*, Yuji Hattori, Tohoku University
2:00 PM – 2:20 PM: *Vorticity production and transport in plasma and magnetohydrodynamic Richtmyer-Meshkov flows*, N. Shen, California Institute of Technology, D. I. Pullin, California Institute of Technology, V. Wheatley, University of Queensland, D. Bond, University of Queensland and R. Samtaney, King Abdullah University of Science and Technology
2:20 PM – 2:40 PM: *Linear Stability of Inviscid Vortex Rings to Axisymmetric Perturbations*, Bartosz Protas, McMaster University
3:00 PM – 3:20 PM: *Prediction and control of boundary-layer transition induced by steady crossflow vortices*, Makoto Hirota, Tohoku University, Yuki Ide, Japan Aerospace Exploration Agency, Yuji Hattori, Tohoku University
3:20 PM – 3:40 PM: *Vorticity generation in rotating cylindrical shear flows*, Sutirtha Sengupta, Pascale Garaud, University of California, Santa Cruz
3:40 PM – 4:00 PM: *Vorticity-based estimation of separated flows*, Jeff D. Eldredge and Darwin Darakananda, University of California Los Angeles
4:00 PM – 4:20 PM: *On the structure of fire whirls*, Wilfried Coenen, Adam D. Weiss, Prabakaran Rajamanickam, Antonio L. Sánchez, and Forman A. Williams, University of California San Diego

Friday, June 28, 2019

9:00 AM – 9:40 AM (invited): *Long-Lived Planetary and Astrophysical Vortices*, Philip S. Marcus, University of California Berkeley

9:40 AM – 10:00 AM: *Polygonal Patterns of Cyclonic Vortices at the Poles of Jupiter*, Andrew P. Ingersoll and Cheng Li, California Institute of Technology

10:00 AM – 10:20 AM: *A Candidate for the On-Off Switch for Inviscid Shear Instability*, Timothy E. Dowling, University of Louisville

10:40 AM – 11:00 AM: *Influence of diurnal thermal forcing on transient rip-current induced tracer exchange nearshore*, Derek J. Grimes, Scripps Institution of Oceanography, Falk Feddersen, Scripps Institution of Oceanography, Nirnimesh Kumar, University of Washington, Sarah N. Giddings, Scripps Institution of Oceanography

11:00 AM – 11:20 AM: *Interaction between lenticular anticyclones in a linearly stratified rotating fluid*, Anne Cros, Universidad de Guadalajara, Arturo Orozco Estrada, Universidad de Guadalajara, Universidad de Guadalajara, Raúl C. Cruz Gómez, Patrice Le Gal, IRPHE

11:20 AM – 11:40 AM: *Lagrangian analyses of trench mesoscale eddies in the ocean*, S. V. Prants, Pacific Oceanological Institute of the Russian Academy of Sciences, Vladivostok

11:40 AM – 12:00 AM: *An Investigation of Two-dimensional Vortex Pair Configurations in a Stably Stratified Fluid*, Laura K. Brandt, Leidos, Inc., James W. Rottman, Leidos, Inc., Devin T. Conroy, Leidos, Inc. and Keiko K. Nomura, University of California San Diego

Report composed by Stefan Llewellyn Smith

19-5 IUTAM Symposium on Fluid-Structure Interaction in Honour of Michael Paidoussis
Montreal, Canada, August 12 – August 14, 2019

Web site: http://fsi.symposium.mcgill.ca/index.html

a) Scientific Committee
Symposium Chair: Dr. Marco Amabili, McGill University, Montreal, Canada
Symposium Co-Chair: Dr. Kostas Karazis, Framatome Inc, Lynchburg, USA

Members:
Emmanuel de Langre, Ecole Polytechnique, Palaiseau, France
Earl Dowell, Duke University, Durham, USA
Paulo Batista Goncalves, Pontificia Catholic University, Rio de Janeiro, Brazil
Shigehiko Kaneko, University of Tokyo, Tokyo, Japan
Tomomichi Nakamura, Osaka Sangyo University, Osaka, Japan
Roger Ohayon, CNAM, Paris, France
David Weaver, McMaster University, Hamilton, Canada

IUTAM Representative:
Timothy Pedley, Cambridge University, Cambridge, UK

b) Short summary of scientific progress achieved
The IUTAM Symposium was able to attract scientific figures of great relevance from different continents. The specific areas covered were: hydro-elasticity, flow excitation and flow-induced vibrations, cardiovascular biomechanics, structural elements immersed in liquid or conveying fluid, flutter and divergence instabilities, micro and nano systems, and acoustics and noise.

The Symposium was held to celebrate the achievements of Professor Michael P. Paidoussis. Professor Paidoussis is the Founding Editor of the well-known Journal of Fluids and Structures published by Elsevier, Fellow of the Royal Society of Canada and Fellow of the Canadian Academy of Engineering. Presently he is the Thomas Workman Emeritus Professor at McGill University. He was the honorary chairman of the 24th ICTAM in 2016 (Montreal). During the conference banquet, professor Aouni Lakis, who was the first PhD student of professor Paidoussis, gave an informal talk about the life and achievements of professor Paidoussis. Letters and videos from colleagues who were not able to attend the Symposium were presented.

Drawing up the program, we organized the order of participants' presentations according to the scientific field, industrial applications (aerospace, mechanical, nuclear, biomedicine and naval engineering) and organizational logistic possibilities.

The state of the art of research in various subfield of fluid-structure interaction was presented; for example, dynamic stability of cylindrical structures immersed in axial and cross flow and panel flutter. Important results emerged in the field of cardiovascular biomechanics. The most sophisticated and up-to-date experimental and numerical approaches were presented.

For further advancement in this field, it is necessary to have a mix of theoretical and numerical modeling, backed by experimental investigations. The Symposium brought together the theoreticians, the experimentalists, and the specialists from different fields in order to exchange ideas on important and burning issues in the field of Fluid-Structure Interaction.

c) Countries represented and number of participants
56 researchers from 12 countries (Brazil (2), Canada (30), China (4), Denmark (1), Germany (1), India (3), Japan (3), Portugal (1), Russia (2), Switzerland (1), The Netherlands (1), U.S.A. (7)) attended the conference. Of the total attendance, 20 participants were either graduate students or post-doctoral researchers.

d) Publication of Proceedings of the Symposium
A Book of Abstracts has been published and distributed to all participants.

e) Financial support
The Symposium had no financial support. The Symposium registration for participants was divided in regular registration and student registration. The regular registration amounted to 600CAD for early registration and 700CAD for late registration. The student registration amounted to 450CAD for early registration and 550CAD for late registration. This fee included also lunches, coffee breaks, the social program, a guided tour of Montreal, and the conference dinner. A very discounted rate was applied to students who did not participate in social activities, city tours and dinner.

f) Scientific program (the name of the presenter is underlined)
Monday, August 12
9:20 AM: Opening Ceremony. Prof. Marco Amabili, McGill University, Montreal, Canada

Chairman Session: Prof. David Weaver, McMaster University, Hamilton, Canada
9:40 AM: *Aeroelasticity of Curved Structures and its applications* (Aouni. A. Lakis) Polytechnique Montreal, Montreal, Canada
10:00 AM: *From squared with sharp corners up to circular: Review of experimental results on the influence of the cross-sectional shape of smooth and rough 2D cylinders in cross-flow at high Reynolds numbers* (Nils P. van Hinsberg) Institute of Aeroelasticity, German Aerospace Center, Germany

10:20 AM: *Stochastic Stability and Dynamics of a Two-dimensional Structurally Nonlinear Airfoil in Turbulent Flow* (N. Sri Namachchivaya) University of Waterloo, Waterloo, Canada
10:40 AM: *Semi-analytical techniques in modeling transient fluid-shell interaction* (Serguei Iakovlev) Dalhousie University, Halifax, Canada

Chairman Session: Prof. Shigehiko Kaneko, Waseda University, Tokyo, Japan
11:40 AM: *Spatio-temporal dynamics of circular cylinders undergoing vortex induced vibrations in presence of stochastic noise* (M.S. Aswathy, Sunetra Sarkar) Indian Institute of Technology Madras, Chennai, India
12:00 PM: *Coral Strategy for Nutrient Capture using Vortex-Induced Vibrations* (Mouad Boudina, Frederick P. Gosselin, Stephane Etienne) Polytechnique Montreal, Montreal, Canada
12:20 PM: *Some Proximity Interference Effects for Two Surface-Mounted Finite-Height Cylinders* (D. Sumner, H.K. Reitenbach) University of Saskatchewan, Saskatchewan, Canada
12:40 PM: *Wind tunnel investigations of wind-induced response of three coupled cylinders* (J. B. Frandsen, T. Schnipper, S.O. Hansen) Svend Ole Hansen ApS, Copenhagen, Denmark

Chairman Session: Prof. Aouni Lakis, Polytechnique Montreal, Montreal, Canada
2:00 PM: *Non-linear dynamics of articulated pipes discharging fluid subjected to a parametric excitation* (Mojtaba Kheiri, Igor M.Loureno, Guilherme R. Franzini, Renato M. M. Orsino, Celso P. Pesce) Concordia University, Montreal, Canada
2:20 PM: *Dynamics of a hanging cantilevered pipe discharging fluid with a partially confined external flow over its upper portion* (Ahmed R. Abdelbaki, Mohammad Tavallaeinejad, Arun K. Misra, Michael P. Paidoussis) McGill University, Montreal, Canada
2:40 PM: *A coupled CSM-CFD study of the dynamics of a cantilever pipe subjected concurrently to internal and external axial flows* (Farhang Daneshmand, T. Liaghat, M.P. Paidoussis) McGill University, Montreal, Canada
3:00 PM: *Nonlinear resonant response of partially fluid-filled cylindrical tanks* (Frederico M. A. Silva, Mayco V. Sousa, Paulo B. Goncalves) Pontifical Catholic University, Rio de Janeiro, Brazil
3:20 PM: *Dynamics and stability of imperfectly-supported flexible cylinders in axial flow* (Seyyede Shahrzad Tabatabaei, Mojtaba Kheiri) Concordia University, Montreal, Canada

Chairman Session: Prof. Jannette B. Frandsen, Svend Ole Hansen ApS, Copenhagen, Denmark
4:20 PM: *Aeroelastic oscillations of a pitching flexible wing with structural and aerodynamic nonlinearities* (Brandon Robinson, Dominique Poirel, Chris Pettit, Mohammad Khalil, Abhijit Sarkar) Carleton University, Ottawa, Canada
4:40 PM: *An experimental investigation of the dynamics of an inverted flag with a rigid splitter plate* (Mohammad Tavallaeinejad, Manuel Flores Salinas, Ahmed R. Abdelbaki,

Mathias Legrand, Ruxandra Mihaela Botez, Michael P. Paidoussis) McGill University, Montreal, Canada
5:00 PM: *Nonlinear transonic panel flutter oscillations in unsteady flow* (Vasily Vedeneev, Anastasia Shishaeva, Andrey Aksenov) Lomonosov Moscow State University, Moscow, Russia
5:20 PM: *Flutter and Limit Cycle Oscillations of Plates in Supersonic Flow* (Kevin A. McHugh, Maxim Freydin, Earl H. Dowell) Duke University, North Carolina, USA
5:40 PM: *The stability of leading-edge vortices in samara-inspired rotors: A novel solution for gust resistance* (Adnan M. El Makdah, Laura Sanders, Kai Zhang, David E. Rival) Queen's University, Kingston ON, Canada

Tuesday, August 13
Chairman Session: Prof. Paulo Batista Gonçalves, Pontificia Catholic University, Rio de Janeiro, Brazil
9:00 AM: *Nonlinear Vibration of a nuclear fuel rod supported by spacer grids and immersed in water* (M. Amabili, P. Balasubramanian, G. Ferrari, Giulio M. Franchini, K. Karazis) McGill University, Montreal, Canada
9:20 AM: *An equivalent mechanical model for liquid sloshing in a rigid cylindrical tank with multiple annular baffles* (Ying Sun, Marco Amabili , Ding Zhou) Nanjing Tech University, Nanjing, China
9:40 AM: *Estimation of frequency-dependent fluidelastic coupling coefficients over untested frequency ranges for performing time domain analysis* (Jose Antunes, Philippe Piteau, Xavier Delaune, Romain Lagrange) Universidade de Lisboa, Lisboa, Portugal
10:00 AM: *Large Amplitude Flapping of an Inverted Elastic Foil: Application to Energy Harvesting* (Rajeev K. Jaiman) University of British Columbia, Vancouver, Canada
10:20 AM: *Recent results on in flow fluidelastic vibration of tube arrays caused by cross flow* (Tomomichi Nakamura) Osaka Sangyo University, Osaka, Japan

Chairman Session: Dr. Kostas Karazis, Framatome Inc, Lynchburg, USA
11:40 AM: *Examination of Oscillating Frequency in Combustion Oscillation Using Acoustic Impedance as Acoustic Boundary Conditions* (Akane Uemichi, Kan Mitani, Shigehiko Kaneko) Tokyo University of Agriculture and Technology, Tokyo, Japan
12:00 PM: *Seismic response of liquid storage tank with elastomeric bearing isolations on soil foundation* (Xun Meng, Ding Zhou , Jiadong Wang and Jue Wang) Nanjing Tech University, Nanjing, China
12:20 PM: *Nonlinear vibrations of a reduced scale fuel assembly supported by spacer grid* (M. Amabili, K. Karazis, L. Faedo, G. Ferrari, G.M. Franchini, Francesco Giovanniello) McGill University, Montreal, Canada

Chairman Session: Prof. Peter Oshkai, University of Victoria, Victoria, Canada
2:00 PM: *An Efficient Numerical Approach for Simulating Flows and FSI Problems* (Shu Dong Yu) Ryerson University, Toronto, Canada
2:20 PM: *Computational Fluid-Structure Interaction Framework: Stabilized Methods for Fluid Mechanics Coupled with Isogeometric Analysis for Thin Shell Structures* (Artem Korobenko, Yuri Bazilevs) University of Calgary, Calgary, Canada

2:40 PM: *Selection of optimal physics-based model and modelling error for a nonlinear fluid-structure interaction system* (Philippe Bisaillon, Rimple Sandhu, Mohammad Khalil, Chris Pettit, Dominique Poirel and Abhijit Sarkar) Carleton University, Ottawa, Canada
3:00 PM: *OpenIFEM - an Open Source Modular Software for Fluid-Structure Interactions using the Immersed Finite Element Method (IFEM)* (Lucy T. Zhang, Jie Cheng, and Feimi Yu) University, Kingston ON, Canada
3:20 PM: *Inference of model sparsity in nonlinear fluid-structure interaction systems using noisy wind-tunnel data* (Rimple Sandhu, Mohammad Khalil, Chris Pettit, Dominique Poirel and Abhijit Sarkar) Carleton University, Ottawa, Canada

Chairman Session: Prof. Jose Antunes, Universidade de Lisboa,Portugal
4:20 PM: *Modeling of a Cardiovascular System to Investigate Factors Affecting Hypertension* (Shigehiko Kaneko) Waseda University, Tokyo, Japan
4:40 PM: *On the use of ultrasound for fluid-structure interaction studies of the ascending aorta* (Sonja Pejcic, Mohammad Reza Najjari, Kai Zhang, Gianluigi Bisleri, David E. Rival) Queen's University, Kingston, Canada
5:00 PM: *Dynamics and fluid-structure interaction of Dacron vascular prostheses* (Eleonora Tubaldi, Giovanni Ferrari, Prabakaran Balasubramanian, Marco Amabili) University of Arizona, Arizona, USA
5:20 PM: *Dynamic and viscoelastic response of the human descending thoracic aorta in fluid circulatory loop* (M. Amabili, P. Balasubramanian, Isabella Bozzo, I.D. Breslavsky, G. Ferrari, C. Pogue) McGill University, Montreal, Canada
5:40 PM: *Cavitation noise from marine propellers: experimental measurements and uRANS solutions* (D. W. McIntyre, M. Rahimpour, G. Tani, F. Miglianti, M. Viviani, Z. Dong , P. Oshkai) University of Victoria, Victoria , Canada

Wednesday, August 14
Chairman Session: Prof. Marwan Hassan, University of Guelph, Ontario, Canada
9:00 AM: *Vortex-induced vibration of a flexibly-supported cylinder in the proximity of a stationary parallel cylinder* (M. Riazat, R. Ghoreishi, B. Vermeire, M. Kheiri) Concordia University, Montreal, Canada
9:20 AM: *Effect of chordwise flexibility on propulsive performance of high inertia oscillating foils* (Waltfred Lee, Dylan Iverson, Mostafa Rahimpour, Takahiro Kiwata, Peter Oshkai) University of Victoria, Victoria, Canada

Chairman Session: Prof. David Sumner, University of Saskatchewan, Saskatchewan, Canada
11:00 AM: *Characterizing the dynamics of a free pitching flexible cantilever NACA0012 airfoil at transitional Reynolds numbers* (C. Itwar Barrett, D. Poirel) Royal Military College of Canada, Kingston ON, Canada
11:20 AM: *Simultaneous measurements of flutter characteristics and flow field within a linear cascade at low Reynolds numbers* (Dipanjan Barman, J. Prahallada, Raghuraman N. Govardhan) Indian Institute of Science, Bangalore, India

11:40 AM: *Flutter-limited drag reduction by reconfiguration* (Mohammad Tari, Frederick P. Gosselin, Eric Laurendeau) Polytechnique Montreal, Montreal, Canada
12:00 PM: *Estimation of pressure force exerted on a flexible beam by a passing self-propelling vortex using an analytical solution of pressure Poisson equation* (Oleg Goushcha, Y. Andreopoulos, P. Ganatos) Manhattan College, Riverdale, USA

Report composed by Marco Amabili

19-6 IUTAM Symposium on Laminar Turbulent Transition
London, UK, September 2 – September 6, 2019

a) Scientific Committee
Carlo Cossu (LHEEA - CNRS, Nantes, France)
Jeffery Crouch (The Boeing Corporation, USA)
Rama Govindarajan (International Centre for Theoretical Sciences, India)
Dan Henningson (Royal Institute of Technology (KTH), Sweden)
Yury Kachanov (Institute of Theoretical and Applied Mechanics, Russia)
Marcello Medeiros (Universidade de Sao Paolo, Brazil)
Tim Pedley (IUTAM Representative, Cambridge University, UK)
William Saric (Texas A & M University, USA)

b) Short summary of scientific progress achieved
We have received unprecedented interest in the IUTAM Transition 2019. We received nearly 200 abstract submissions. The conference included also 67 contributing talks and 78 poster presentations. We ran plenary sessions, individual talks and poster networking sessions. The scientific programme covered a range of fundamental topic areas, including:

- Global analysis of instabilities and receptivities for complex configurations;
- Nonlinear dynamical-systems approaches to minimal seeds and transition to turbulence;
- Influence of multi-physics phenomena on transition: reactive flows, non-Newtonian material behaviour, interfacial flows, flows with interacting structures;
- Novel experimental measurement and evaluation techniques for transition in complex flows;
- Roughness-induced transition; transition from steps, gaps, junctions and other geometric imperfections;
- Transition in hypersonic flows; prediction of thermal loads;
- Active and passive control of flows undergoing transition; transition delay;
- Transition mechanisms in natural and controlled environments; receptivity techniques and studies;
- Late stages of transition and the breakdown to fully developed turbulence;
- Transient growth problems and bypass mechanisms and their role in the transition process.

***Outcomes*:**

- We received very positive feedback from attendees on the well organised and attended meeting.

- Symposium was well attended by early-career academics, post-graduate students, industry representatives, senior members of the community and invited guests.
- 175 registered delegates of which 40% are PhDs.
- Evening reception (Monday, 2nd September) and conferenced dinner (on the 5th September) provided networking opportunities for attendees to discuss future collaborations.

c) Countries represented and number of participants

The conference was attended by 175 participants representing 15 countries (Australia, Belgium, Brazil, China, France, Germany, India, Italy, Israel, Japan, Netherlands, Poland, Sweden, USA, UK).

d) Publication of Proceedings of the Symposium

Following the theme of previous IUTAM Transition symposia, papers will publish in a peer-reviewed conference proceedings. The IUTAM Transition 2019 proceedings will be published by Springer. Details:

- 70 paper submissions were received;
- Regular papers may be up to 10 pages long;
- Papers by plenary speakers may be up to 15 pages.

e) Financial support

The Symposium fee for participants amounted to £500 (student rate £250) for early registration and £600 for late registration (student rate £300). This fee included: welcome pack, lunches, refreshment breaks, evening reception, and conference dinner. Financial support was also received from several sources and all were acknowledged at the IUTAM meeting:

- Air Force Office of Scientific Research – for providing funds of $7,500 (£5892.98) to cover the cost of the main plenary lectures.
- EPSRC Grant (EP/R029423/1) – PRISM: Platform for Research In Simulation Methods for an administrative time contribution.
- Imperial College London – for offering the conference venue at a competetive rate.

f) Scientific program

IUTAM Transition 2019 secured a full set of nine internationally renowned invited plenary and keynote speakers spanning a range of topic areas:

- Stefania Cherubini, Politechnico di Bari, Italy
- Jeffrey Crouch, The Boeing Company, USA
- Mujeeb Malik, NASA Langley Research Center, USA
- Tom Mullin, Oxford University, UK
- Helen Reed, Texas A&M University, USA

- Tamer Zaki, Johns Hopkins University, USA
- Andre Cavalieri, Instituto Tecnologico de Aeronautica, Brazil
- Xiaolin Zhong, University of California, Los Angeles, USA
- Maksim Ustinov, TsAGI Central Aerohydrodynamic Institute, Russia

Five of the invited speakers are from the USA and one from Brasil. The rest is from Europe. The conference included also 67 contributing talks and 78 poster presentations. The detailed programme of the conference is presented below. The abstracts for the conference posters can be found on the following page: https://ssl.linklings.net/conferences/iutam-transition/iutamtransition2019_proceedings/views/by_sub_type.html

Monday, September 2nd 2019

7:45am-8:45am Registration, Arrival & Coffee (Main Foyer)
8:45am-9:00am Opening
Chair: Spencer J Sherwin (Room 200)

9:00am-9:45am Plenary: Mujeeb Malik (NASA Langley Research Center, USA)
"40 Years of Transition Research at NASA – A Personal Perspective"
Chair: Peter Schmid (Room 200)

10:00am-12:00pm Contributed Talks: *High Speed I*
Chair: Hermann Fasel (Room 200)
• "Subcritical Laminar-Turbulent Transition on Blunt Cones at Hypersonic Speeds" Pedro Paredes (National Institute of Aerospace, NASA Langley Research Center) and Meelan M. Choudhari and Fei Li (NASA Langley Research Center)
• "Numerical Investigation of the Nonlinear Transition Stages in a High-Enthalpy Hypersonic Boundary Layer on a Right Cone" Michelle Bailey, Christoph Hader, and Hermann Fasel (University of Arizona)
• "Controlled Stationary/Traveling Cross-flow Mode Interaction in Mach 6 Boundary Layer" Alexander Arndt, Thomas Corke, and Eric Matlis (University of Notre Dame) and Michael Semper (U.S. Air Force Academy, Colorado Springs)
• "Sensitivity of Three-Dimensional Boundary Layer Stability and Transition to Thermochemical Modelling" Heather L. Kline (National Institute of Aerospace) and Chau-Lyan Chang and Fei Li (NASA Langley Research Center)
• "Nonlinear PSE Transition Predictions in Hypersonic Boundary Layers with Finite Rate Chemical Reactions" Ludovico Zanus, Fernando Miró Miró, and Fabio Pinna (von Karman Institute for Fluid Dynamics)
• "Sensitivity of Hypersonic Shear Flows to Finite-Rate Chemistry Effects and Surface Roughness" Athanasios Margaritis (Imperial College London), Taraneh Sayadi (Sorbonne University), Olaf Marxen (University of Surrey), and Peter Schmid (Imperial College London)

12:00pm-1:15pm Lunch & Posters (Main Foyer)

1:15pm-1:45pm Keynote: Xiaolin Zhong (University of California, Los Angeles, USA) "Numerical Simulation Studies of Hypersonic Boundary-Layer Instability Mechanism"
Chair: Xuesong Wu (Room 200)

2:00pm-4:00pm Contributed Talks: *Roughness*
Chair: Jacob Cohen (Room 200)
• "Destabilisation of Stationary and Travelling Crossflow Disturbances Due to Forward and Backward Facing Steps over a Swept Wing" Emma Cooke, Shahid Mughal, and Spencer Sherwin (Imperial College London) and Richard Ashworth and Stephen Rolston (Airbus)
• "BiGlobal Stability Analysis of a Swept-Wing Boundary Layer with Forward and Backward Facing Steps" Thibaut Appel (Airbus Central Research & Technology, Imperial College London); Emma Cooke (Imperial College London); Richard Ashworth (Airbus Central Research & Technology); and Shahid Mughal (Imperial College London)
• "Effects of 3D Roughness Patch on Transition in High-Speed Boundary Layers" Meelan M. Choudhari and Fei Li (NASA Langley Research Center) and Pedro Paredes (National Institute of Aerospace, NASA Langley Research Center)
• "Receptivity from Surface Imperfections" Michael Gaster (City University, London)
• "Influence of superhydrophobic surfaces on the laminar-to-turbulent transition in a channel flow" Francesco Picella and Jean-Christophe Robinet (ENSAM/DynFluid) and Stefania Cherubini (DMMM/politecnico di Bari)
• "Transition in a Swept-boundary Layer Subject to Surface Roughness and Free-stream Turbulence" Luca De Vincentiis, Dan Henningson, and Ardeshir Hanifi (KTH Royal Institute of Technology)

4:00pm-4:30pm Break & Posters (Main Foyer)

4:30pm-6:50pm Contributed Talks: *Linear Stability*
Chair: Vassilis Theofilis (Room 200)
• "Optimal Force and State Reconstruction" Eduardo Martini (Instituto Tecnológico de Aeronáutica; Institute Pprime, Université de Poitiers); Andre Cavalieri (Instituto Tecnológico de Aeronáutica); Peter Jordan (Institute Pprime, Université de Poitiers); Lutz Lesshafft (Laboratoire d'Hydrodynamique, CNRS, Ecole polytechnique); and Aaron Towne (University of Michigan)
• "Global Stability Analysis of the JAXA H-II Transfer Vehicle Re-Entry Capsule" Andrea Sansica, Atsushi Hashimoto, and Yuya Ohmichi (Japan Aerospace Exploration Agency)
• "Overview of the PDE-Based Amplification Factor Transport Model as an Engineering Tool for Transition Prediction in Complex Aerodynamic Flows" James Coder (University of Tennessee).
• "Reduced order model of shock-boundary layers interactions" Guillaume Chauvat (Linné FLOW Centre; KTH Royal Institute of Technology); Peter J. Schmid (Imperial College London); Daniel J. Bodony (University of Illinois at Urbana-Champaign);

Vassilis Theofilis (University of Liverpool); and Ardeshir Hanifi (Linné FLOW Centre, KTH Royal Institute of Technology)
• "Global Stability of Fluid-Structure Interaction Problems" Prabal Singh Negi, Ardeshir Hanifi, and Dan Henningson (Department of Mechanics, Linné Flow Center and Swedish e-Science Research Center (SeRC), KTH Royal Institute of Technology)
• "Numerical Investigations of Laminar to Turbulent Transition on an Oscillating Airfoil Boundary Layer" Duncan M. Ohno, Jonas P. Romblad, Marwan Khaled, and Ulrich Rist (Institute of Aerodynamics and Gas Dynamics, University of Stuttgart)
• "Transient growth and self-sustained turbulence in Couette-Poiseuille flow" Benoit Semin (CNRS, ESPCI); Lukasz Klotz (ESPCI); Alexandr Pavlenko (Institute of Theoretical and Applied Mechanics); Tao Liu (ESPCI, Universite Paris Diderot); and José Eduardo Wesfreid (CNRS, ESPCI)

Tuesday, September 3rd 2019
8:30am-9:00am Arrival & Coffee (Main Foyer)

9:00am-9:45am Plenary: Tom Mullin (The Mathematical Institute, University of Oxford) "Transition and Decay in Poiseuille, Couette and Couette-Poiseuille flow"
Chair: Marcello A. F. Medeiros (Room 200)

10:00am-12:00pm Contributed Talks: *Receptivity*
Chair: Stefan Hein (Room 200)
• "Distributed Excitation of Crossflow Waves Due To Scattering of Freestream Vortices on Surface Waviness" Yury S. Kachanov, Vladimir I. Borodulin, and Andrey V. Ivanov (Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Novosibirsk, 630090)
• "Boundary-Layer Receptivity to Entropy Waves in Subsonic and Transonic Flows" Anatoly I. Ruban, Marina A. Kravtsova, and Sharad Keshari (Imperial College London)
• "Linear and nonlinear stability of forced planar liquid jets" Simon Schmidt and Kilian Oberleithner (Technische Universität Berlin)
• "Acoustic receptivity of Tollmien-Schlichting waves to localised surface roughness" Marco Placidi (University of Surrey) and Michael Gaster and Chris Atkin (City, University of London)
• "On the Effects of the Acoustic Wave Angle of Incidence in Subsonic Acoustic Receptivity" Henrique Raposo (Airbus, Imperial College London); Shahid Mughal (Imperial College London); and Richard Ashworth (Airbus)
• "Receptivity of unsteady compressible Gortler vortices to free-stream vortical disturbances" Samuele Viaro and Pierre Ricco (University of Sheffield)

12:00pm-1:15pm Lunch & Posters (Main Foyer)

1:15pm-1:45pm Keynote: Maksim Ustinov (Central Aerohydrodinamic Institut) "Progress in Development of Amplitude Method of Transition Prediction on Swept Wing"
Chair: Yury Kachanov (Room 200)

2:00pm-4:00pm Contributed Talks: *Flow Control*
Chair: George Papadakis (Room 200)
• "Experimental Investigation of Spanwise Periodic Surface Heating for Control of Crossflow-Dominated Laminar-Turbulent Transition" Hans Peter Barth and Stefan Hein (DLR, Institute of Aerodynamics and Flow Technology)
• "Real-time feedback control of TS waves" Jonathan Morrison (Imperial College), Hari Vemuri (Bristol University), Richard Bosworth (Oliver Wyman), and Eric Kerrigan (Imperial College)
• "Nonlinear Optimal Control in Shear Flows using Deep Reinforcement Learning" Onofrio Semeraro, Michele Alessandro Bucci, Alexandre Allauzen, and Guillaume Wisniewski (Laboratoire d'informatique pour la mécanique et les sciences de l'ingénieur (LIMSI) - CNRS); Laurent Cordier (Institut Pprime, CNRS, Universite' de Poitiers, ENSMA); and Lionel Mathelin (Laboratoire d'informatique pour la mécanique et les sciences de l'ingénieur (LIMSI) - CNRS)
• "Nonlinear Optimal Control of Transition due to a Pair of Vortical Perturbations using a Receding Horizon Approach" George Papadakis (Imperial College) and Dandan Xiao (University of Nottingham)
• "Active Attenuation of a Trailing Vortex Inpsired by Stability Analysis" Louis Cattafesta and Ross Richardson (Florida State University); Adam Edstrand (Florida State University, Sandia National Laboratory); Yiyang Sun (Florida State University, University of Minnesota); Kunihiko Taira (Florida State University, UCLA); and Peter Schmid (Imperial College)
• "Delay of bypass transition via data-driven reduced order modeling and control theory" Pierluigi Morra (KTH Royal Institute of Technology), Kenzo Sasaki (Instituto Tecnologico de Aeronautica), Ardeshir Hanifi (KTH Royal Institute of Technology), André V. G. Cavalieri (Instituto Tecnologico de Aeronautica), and Dan S. Henningson (KTH Royal Institute of Technology)

4:00pm-4:30pm Break & Posters (Main Foyer)

4:30pm-6:50pm Contributed Talks: *Experiments*
Chair: Thomas Corke (Room 200)
• "Experimental Investigation of Crossflow Instabilities" Tariq Saeed (Imperial College, Arup) and Jonathan Morrison (Imperial College)
• "Investigation on the freestream turbulence amplification approaching the attachment-line of swept circular cylinders using multi-component LDA" Isabella Fumarola (City University London)
• "Instabilities and transition on a rotating cone – old problems and new challenges" Kentaro Kato (Linné Flow Centre / KTH Mechanics, Royal Institute of Technology); Antonio Segalini and P. Henrik Alfredsson (Linné Flow Centre/KTH Mechanics, Royal Institute of Technology); and R. J. Lingwood (Department of Mechanical and Aerospace Engineering/Brunel University London; Linné Flow Centre/KTH Mechanics, Royal Institute of Technology)

• "Interaction of free-stream turbulence and discrete roughness on boundary-layer transition" Shumpei Hara, Santhosh Babu Mamidala, and Jens Henrik Mikael Fransson (KTH-Royal Institute of Technology)
• "Reynolds number dependence on very-large-scale features in transitional and turbulent channel flows" Masaharu Matsubara, Yu Imanishi, Yuya Tanada, Sattaya Yimprasert, Yutaro Endo, and Tatsuya Tsumura (Shinshu University)
• "On the importance of free-stream turbulence length scale in boundary-layer transition" Jens Henrik Mikael Fransson (KTH-Royal Institute of Technology)
• "Experimental characterization of the effects of two-dimensional surface defects on the laminar-turbulent transition of a sucked boundary layer" Jeanne Cam-Tu Methel (ONERA, ISAE-SUPAERO); Maxime Forte and Olivier Vermeersch (ONERA); and Grégoire Casalis (ISAE-SUPAERO)

Wednesday, September 4th 2019
8:30am-9:00am Arrival & Coffee (Main Foyer)

9:00am-9:45am Plenary: Stefania Cherubini (Polytechnical University of Bari)
"Unraveling Transition and Turbulence Using Nonlinear Optimization"
Chair: Yongyun Hwang (Room 200)

10:00am-12:20pm Contributed Talks: *High Speed II*
Chair: Olaf Marxen (Room 200)
• "Numerical / experimental investigations of the effect of transpiration cooling on second mode instabilities in hypersonic, conical flows" Viola Wartemann, Giannino Ponchio Camillo, and Alexander Wagner (DLR)
• "Roughness-Induced Laminar-Turbulent Transition in the Boundary Layer of a Capsule-Like Geometry at Mach 20 Including Non-Equilibrium" Christian Stemmer and Antonio Di Giovanni (Technical University of Munich)
• "Influence of High-Temperature Effects on the Stability of the Wake Behind an Isolated Roughness Element in Hypersonic Flow" Iván Padilla Montero, Fernando Miró Miró, and Fabio Pinna (von Karman Institute for Fluid Dynamics)
• "Instability analysis of under-expanded supersonic impinging jets" Shahram Karami (Monash Universuty), Vassilis Theofilis (University of Liverpool), and Julio Soria (Monash Universuty)
• "Effect of the streaky structures on the instabilities in supersonic boundary layers" Jianxin Liu (Tianjin University) and Xuesong Wu (Tianjin University, Imperial College London)
• "Direct Numerical Simulations (DNS) of "natural" transition in high-speed boundary layers using a broadband random forcing approach" Christoph Hader and Hermann Fasel (University of Arizona)
• "The Role of Receptivity in Prediction of High-Speed Laminar-Turbulent Transition" Ivan Egorov (Central aerohydrodynamic Institute, Moscow Institute of Physics and Technology); Alexander Fedorov (Moscow Institute of Physics and Technology); and Andrey Novikov (Central aerohydrodynamic Institute, Moscow Institute of Physics and Technology)

1:00pm-2:00pm Lunch & Posters (Main Foyer)

2:00pm onwards Free time for activities

Thursday, September 5th 2019
8:30am-9:00am Arrival & Coffee (Main Foyer)

9:00am-9:45am Plenary: Tamer Zaki (Department of Mechanical Engineering, Johns Hopkins University) "Tackling the Uncertainty of Transition Prediction in High-Speed Boundary Layers"
Chair: Spencer J Sherwin (Room 200)

10:00am-12:00pm Contributed Talks: *Dynamical Systems I*
Chair: Georgios Rigas (Room 200)
• "What can we learn from the Edge about bypass transition?" Miguel Beneitez (KTH Royal Institute of Technology); Yohann Duguet (LIMSI-CNRS, Campus Universitaire d'Orsay, Université Paris-Saclay); and Philipp Schlatter and Dan S. Henningson (KTH Royal Institute of Technology)
• "The minimal seed for wall-bounded transition in the frequency domain" Georgios Rigas (Caltech), Denis Sipp (ONERA), and Tim Colonius (Caltech)
• "Nonlinear optimal disturbances in compressible shear flows" M. J. Philipp Hack, Zhu Huang, and Tim Flint (Center for Turbulence Research, Stanford University)
• "Amplitude-Dependent Three-Dimensional Neutral Modes in Plane Poiseuille-Couette Flow at Large Reynolds Number" Rishi Kumar and Andrew Walton (Imperial College London)
• "Distributed VWI arrays and the emergence of self-similarity in turbulent shear flows" Philip Hall (Monash Uni.)
• "Transition in Rotating Plane Couette Flow, Revisited" Masato Nagata (Tianjin University, Kyoto University); Baofang Song (Tianjin University); and Darren P. Wall (Kyushu University)

12:00pm-1:15pm Lunch & Posters (Main Foyer)

1:15pm-1:45pm Keynote: Andre Cavalieri (Instituto Tecnológico de Aeronáutica (ITA)) "Linear instability mechanisms in turbulent flows"
Chair: Ardeshir Hanifi (Room 200)

2:00pm-4:00pm Contributed Talks: *Linear Stability II*
Chair: Leonardo Alves (Room 200)
• "Use of instabilities for optimal laminar separation delay" Michael Karp and M. J. Philipp Hack (Center for Turbulence Research, Stanford University)
• "Transient growth analysis of the flow around an elastically mounted circular cylinder" Daiane I. Dolci and Bruno S. Carmo (University of São Paulo)
• "Instabilities in laminar shock boundary layer interactions" Nathaniel Hildebrand, Anubhav Dwivedi, Sidharth GS, and Joseph Nichols (University of Minnesota); Mihailo

Jovanovic (University of Southern California); and Graham Candler (University of Minnesota)
• "On a new non-modal instability in a two-dimensional disk-type flow" Tim Gebler, Judith Kahle, and Dominik Plümacher (Chair of Fluid Dynamics, Technische Universität Darmstadt) and Martin Oberlack (Chair of Fluid Dynamics, Technische Universität Darmstadt; Graduate School of Excellence Computational Engineering, Technische Universität Darmstadt)
• "Instability of tilted shear flow in a strongly stratified and viscous medium" Yongyun Hwang and Lloyd Fung (Department of Aeronautics, Imperial College London)
• "Taking advantage of randomness to empower resolvent analysis" Jean Helder Marques Ribeiro and Chi-An Yeh (University of California, Los Angeles) and Kunihiko Taira (University of California, Los Angeles; Florida State University)

4:00pm-4:30pm Break & Posters (Main Foyer)

4:30pm-6:30pm Contributed Talks: *Dynamical Systems II*
Chair: Pierre Ricco (Room 200)
• "Time-evolving network analysis of two-dimensional turbulence" Chi-An Yeh and Muralikrishnan Gopalakrishnan Meena (University of California, Los Angeles) and Kunihiko Taira (University of California, Los Angeles; Florida State University)
• "Study of Transition to Turbulence using Discrete Directed Percolation Model" Kouta Watanabe, Hideki Shiiba, and Yoshio Ishii (SOKA University)
• "Spatially localized states and their dynamics in transitional plane Couette flow" Anton Pershin, Cedric Beaume, and Steven Tobias (University of Leeds)
• "On Subharmonic Resonance and Other Nonlinear Mechanisms in Wavepackets in Boundary Layers" Marcello A. F. Medeiros, Fernando H. T. Himeno, Marlon S. Mathias, and Andrés G. Martinez (University of Sao Paulo)
• "Nonlinear evolution of multiple helical modes on subsonic circular jets with a large radius: a weakly nonlinear critical-layer theory" Zhongyu Zhang (Tianjin University) and Xuesong Wu (Tianjin University, Imperial College London)
• "On the role of actuation for the control of streaky structures in boundary layers" André V. G. Cavalieri and Kenzo Sasaki (Instituto Tecnológico de Aeronáutica) and Pierluigi Morra, Ardeshir Hanifi, and Dan S. Henningson (Royal Institute of Technology)

7:00pm-10:00pm Conference Banquet
Location: Senior Common Room (see page 23)

Friday, September 6th 2019
8:30am-9:00am Arrival & Coffee (Main Foyer)

9:00am-11:00am Contributed Talks: *General Stability Analysis*
Chair: Pedro Paredes (Room 200)
• "Receptivity of a hypersonic blunt cone boundary layer to slow acoustic wave: role of entropy-layer disturbance" Caihong Su (Tianjin University) and BingBing Wan (China Aerodynamics Research and Development Center)

• "Receptivity of inviscid mode in supersonic boundary layers due to interaction of freestream acoustic waves and wall roughness" Ming Dong (Department of Mechanics, Tianjin University)
• "Global stability analysis and DNS of a swept airfoil section in subsonic flow" Neil D. Sandham and Nicola De Tullio (University of Southampton)
• "Experimental Study of Distributed Receptivity Coefficients at Excitation of Crossflow Waves by Freestream Vortices" Vladimir I. Borodulin, Andrey V. Ivanov, and Yury S. Kachanov (Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Novosibirsk, 630090)
• "Effect of discrete widely spaced suction on a transitioning flow at high suction rates" Barry Crowley and Chris Atkin (City University London)

11:00am-11:30am Coffee & Posters (Main Foyer)

11:30am-1:00pm Closing Plenaries: Helen Reed (Texas A&M University) & Jeffrey Crouch (Boeing Company)
"Progress in Stability and Transition Research"
"Predicting laminar-turbulent transition influenced by surface-induced flow distortions"
Chair: William Saric (Room 200)

Report composed by Anna Radomska, Peter Schmid and Spencer Sherwin

19-7 IUTAM Symposium on Viscoplastic Flows: from Theory to Application (VPF8)
Cambridge, UK, September 16 – September 20, 2019

a) Scientific Committee

Scientific Programming Committee
Prof. Gareth McKinley (MIT, USNC/TAM, Co-Chair)
Prof. Ian Wilson (University of Cambridge, Co-Chair)
Prof. Nadine Aubry (Northeastern University, IUTAM Representative)
Prof. Ian Frigaard (University of British Columbia)
Prof. Elisabeth Guazzelli (CNRS, Paris-Diderot. VII)
Dr. Miguel Moyers-Gonzales (University of Canterbury)

Local Organizational and Programming Committee
Dr. Ed Brambley (University of Warwick)
Prof. Stuart Dalziel (University of Cambridge)
Prof. Ian Frigaard (University of British Columbia)
Dr. Duncan Hewitt (University College London)
Dr. Jerome Neufeld (University of Cambridge)
Rubens Rosario Fernandes (University of Cambridge)
Prof. Gareth McKinley (MIT, USNCTAM, Co-Chair)
Prof. Ian Wilson (University of Cambridge, Co-Chair)
Prof. Stephen Wilson (University of Strathclyde)

b) Short summary of scientific progress achieved

The workshop was attended by 66 delegates from approximately 30 countries. The field of viscoplastic flows has evolved significantly through a series of biannual and closely-related workshops that have been held over the past 15 years. Significant progress was achieved in the following areas:

(i) The range of fields involving the flow of viscoplastic fluids was extended beyond those reported in previous workshops to include high speed processing of consumer goods, bodies swimming (through flagellar and cilial motion) in complex fluids, and the physics of soft matter. Traditional topics such as geophysical flows and flow assurance issues in oil/gas exploration (e.g. fracking fluids, drilling muds etc.) remained of great interest.

(ii) The need to include elastic deformation systematically into elasto-visco-plastic constitutive laws was discussed at length, both to explain a growing number of experimental observations in materials such as Carbopol (a model “ideal yield stress material”) and to allow multiscale modelling bridging fundamental interactions based on elastoplastic deformations of microstructural elements with process-scale phenomena such as yielding, flow and wall slip.

(iii) Yielding Criteria; starting with the classical Von Mises criterion, extended to incorporate specific microstructural features for real systems (e.g. the presence of jammed/emulsion microstructures, fibrous substrates etc).

(iv) Many real systems exhibit power-law-like creep (so called "Andrade creep") below yield, and several attempts to include these effects in flow considerations were reported. There are strong tie-ins to related phenomena in metallic glass systems and other classical plasticity fields, and it is hoped to connect these communities more closely in the future.

(v) Several fast and reliable numerical techniques for solving viscoplastic flow problems are now available and were reviewed in several presentations. Some are freely available, and there was repeated discussion of possible "benchmark" flow problems for codes to be validated against.

The program and scheduling of talks was kept deliberately flexible in the spirit of promoting discussions between technical sessions. The final program is appended to this report. One innovation was that poster presenters were encouraged to present short (~ 5 minute) "sound-bites" to advertise the key content of their posters to the meetings. The poster presenters were a mixture of students and established researchers: this provided a good mechanism for "ice-breaking" and integrating newcomers to the field, and promoted in-depth discussions at the poster sessions.

By broad agreement of participants, it was agreed that the next in this sequence of workshop should be held in August/September 2021, with the location tentatively agreed to be the suburban Chicago/Illinois area and co-organizers Profs. Simon Rogers & Randy Ewoldt (both from UIUC).

The workshop finished with an interactive wrap-up session which identified key topics to address in the intervening two years. These topics included:

- particle transport through elastoviscoplastic (EVP) materials; e.g. bubbles in gels, barite sag in drilling fluids, sedimentation in harbour muds.
- development, validation and extension of TEVP (thixotropic elasto-visco-plastic) constitutive models for capturing full range of material deformation histories encountered in real yield stress materials.
- improved characterization protocols for measuring material properties of actual yield stress fluids; e.g. normal stress differences, large amplitude oscillatory shear flow, mitigating and understanding wall-slip effects.
- comparison of different numerical codes and algorithms for determining yield surface loci, and flow properties beyond yield; this would include both large scale features (e.g. yield surfaces, plug regions), and more subtle local scale phenomena (e.g. flow recirculations, wake asymmetries).
- ice sheet transport, large-scale convective motions, skin-formation and depth-resolved measurements of variations in material properties.

- further exploration and understanding of intermittent/delayed yielding, stop/start of convection, finite stopping time problems.

c) Countries represented and number of participants

There were 66 delegates (46 male; 20 female) at the symposium: 8 delegates withdrew in the month leading up to the symposium. Delegates came from (in alphabetical order) institutions in Austria, Brazil, Canada, Cyprus, Ecuador, France, Greece, Israel, Netherlands, Russia, Sweden, Switzerland, New Zealand, UK and the USA, with large contingents from Brazil, Canada and France. Nationalities represented were at least twice this number but this data was not collected formally.

Thanks to sponsorship from the UK Fluids Network and Schlumberger Cambridge Research, the organisers were able to offer Early Researcher bursaries to 17 PhD students, research fellows and newly established lecturers.

d) Publication of Proceedings of the Symposium

Presenters submitted abstracts in advance of the symposium and retain copyright of the material presented at the symposium. All presenters have been invited to submit manuscripts describing work which has not been previously published to *J. Non-Newtonian Fluid Mechanics*, for inclusion in a virtual special issue of JNNFM on VPF8. This continues the pattern followed with previous workshops in this series. Scientific & Program Committee members Gareth McKinley, Duncan Hewitt and Ian Wilson will serve as the guest editors for the special issue.

e) Financial support

Regrettably, no financial support was provided from IUTAM. Sponsorship from UK Fluids Network and Schlumberger Cambridge Research totalling £GBP 4000 allowed the organisers to award 17 Early Researcher Bursaries. The conference registration fee did not exceed the IUTAM guideline.

f) Scientific program

The meeting lasted 4½ days. Most delegates arrived on the 15th September and stayed for the whole workshop. The detailed program schedule, with linked abstracts, is available at the conference archive site at

www.ceb.cam.ac.uk/research/groups/rg-p4g/vpf8-conference-2019

Particular features of the program included

(i) A set of short oral presentations linked to poster presentations, early in the workshop. The posters were printed by the organisers so presenters did not have to bring them to the workshop. Short oral presentations were given by a mixture of Early Career Researchers and established researchers. This proved to be a very effective exercise.

(ii) Short technical visits on one afternoon to the University of Cambridge's Bachelor Laboratory in the Department of Applied Mathematics and Theoretical Physics, and to Schlumberger Cambridge Research, as well as walking visits to sights in Cambridge city centre.

(iii) A joint session on Suspensions, organised in collaboration with the Stokes 200 conference (www.stokes200.weebly.com) held at Pembroke College, Cambridge from 16-18 September. Delegates from that conference joined the Symposium.

List of VPF8 Presentations:

Monday 16 September 2019

Session A Single phase flow

9:15-9:40 *Velocity profiles within thin viscoplastic surges: elucidating the transition layer*, Guillaume Chambon[1], Perrine Freydier[2], Jean-Paul Vila[3]
[1]Univ. Grenoble Alpes, IRSTEA, ETNA Research Unit, Grenoble, France
[2]FAST, Univ. Paris Sud, CNRS, Univ. Paris Saclay, Orsay, France
[3]Institut de Mathématiques de Toulouse, Univ. Toulouse, CNRS, INSA, Toulouse, France

9:40-10:05 *Transient buoyancy-driven flows of viscoplastic fluids: A critical review of the theory & experimental observations***,** Ida Karimfazli, A. Ahmadi, K. Jadhav, P. Rossi; Department of Mechanical, Industrial & Aerospace Engineering, Concordia University, Montreal, Canada

10:05-10:30 *Viscoplastic fluid displacement flows in axially rotating pipes*, Seyed Mohammad Taghavi, Shan Lyu; Department of Chemical Engineering, Université Laval, Quebec, Canada

10:30-10:55 *Oscillatory Rayleigh-Benard convection in elasto-viscoplastic Carbopol gels*, Christel Metivier[1], Mohamed Darbouli[2], Frederic Brochard[2], Albert Magnin[3]
[1]Laboratoire d'Energétique et de Mecanique Theorique et Appliquée, UMR 7563 (Université de Lorraine, CNRS), France
[2]Institut Jean Lamour - Université de Lorraine, France
[3]Laboratoire Rheologie et Procedes - Université Grenoble Alpes, France

11:15-11:40 *Lubrication solution of Herschel-Bulkley flow in an asymmetric channel*, Georgios Georgiou[1], Pandelitsa Panaseti[1], Iasonas Ioannou[2]
[1]Department of Mathematics and Statistics, University of Cyprus
[2]Department of Mechanical and Process Engineering, ETH Zurich, Switzerland

11:40-12:05 *Flow of a yield stress-fluid over cavity and viscoplastic boundary layers: following the quest*, Paul Vigneaux[1], Guillaume Chambon[2], Arthur Marly[1], Li-Hua Luu[2], Pierre Philippe[2]
[1]UMPA, ENS de Lyon, France
[2]IRSTEA Grenoble, France

12:05-12:30 *Viscoplastic slender-body theory*, Duncan Hewitt[1], Neil J. Balmforth[2], Rohit Supekar[3]
[1]Department of Mathematics, University College London, UK
[2]Department of Mathematics, University of British Columbia, Canada
[3]Massachusetts Institute of Technology, USA

Session B Poster session: 5 minute short talks followed by extended discussion

14:30-14:36 *The flow of a yield-stress fluid through vein-like geometries*, Tirion Roberts, Simon Cox; Aberystwyth University, UK

14:36-14:42 *Flow of yield-stress fluids in confined geometries*, Thalia Magyar, Tamie Poepping, John R de Bruyn; Department of Physics and Astronomy, University of Western Ontario, Canada

14:42-14:48 *Chaos in a melting pot*, Rawad Himo, Teo Burghelea, Cathy Castelain; University of Nantes, Laboratoire de Thermique et Energie de Nantes (LTeN), France

14:48-14:54 *Viscoplastic water entry*, Maziyar Jalaal, Dave Kemper, Detlef Lohse; Physics of Fuids Group, University of Twente, The Netherlands

14:54-15:00 *Modelling the cleaning of a yield stress soil by impinging water jets*, Rubens Rosario, Ian Wilson; Department of Chemical Engineering and Biotechnology, University of Cambridge, UK

15:00-15:06 *Vertical heterogeneity in a drilling fluid measured using T-bar rheometry*, Elizabeth Jamie, Gerald Meeten; Schlumberger Cambridge Research, Cambridge, UK

15:06-15:12 *Design and fabrication of bespoke vane geometries for accurate rheometric measurements of yield stress fluids*, Crystal Owens[1], Emad Chaparian[2], John Hart[2], Gareth McKinley[1]

[1]Department of Mechanical Engineering, Massachusetts Institute of Technology, USA

[2]Linné FLOW Centre, Department of Mechanics, KTH Royal Institute of Technology, Sweden

15:12-15:18 *Rheological Investigation for the BMP-Elasto-visco-plastic model (BMP-EVP)*, Miguel Moyers-Gonzalez[1], Octavio Manero[2]

[1]School of Mathematics and Statistics, University of Canterbury, New Zealand

[2]Institute of Materials Research, UNAM, Mexico

15:18-15:*24 Critical yield stress of particles setting in a Bingham fluid: a direct numerical method and some theoretical results*, Jose A. Iglesias[1], Gwenael Mercier[2], Ian A. Frigaard[3], Otmar Scherzer[3], Emad Chaparian[4]

[1]Johann Radon Institute, Austrian Academy of Sciences, Linz, Austria

[2]Computational Science Center, University of Vienna, Austria

[3]Department of Mechanical Engineering, University of British Columbia, Vancouver, Canada

[4]KTH Royal Institute of Technology, Stockholm, Sweden

15:24-15:30 *Shear banding in elastoviscoplastic materials*, Clara Despard, Suzanne Fielding; Department of Physics, University of Durham, UK

15:30-15:36 *Elucidating studies of purging viscoplastic fluid from pipes*, Ian Wilson, R.R. Fernandes, X.S. Tan, E.J. Wong; Department of Chemical Engineering and Biotechnology, University of Cambridge, UK

Tuesday 17th September

Session C Flow Phenomena

9:00-9:25 *Arrested phase separation and gel collapse in oil-continuous drilling fluids*, Andrew Clarke, Elizabeth Jamie, Louise Bailey, John Staniland; Schlumberger Cambridge Research, Cambridge, UK

9:25-9:50 *Simulating the flow of aqueous foams in porous media*, Simon Cox; Department of Mathematics, Aberystwyth University, UK
9:50-10:15 *Understanding mudpots: Dynamics of bursting bubbles in viscoplastic medium*, Vatsal Sanjay, Maziyar Jalaal, Detlef Lohse; Physics of Fluids Group, University of Twente, The Netherlands
10:15-10:40 *Viscoplastic fluid impacting a body of water: predicting wave features from the fluid properties*, Zhenzhu Meng[1], Hu Yating[2], Christophe Ancey[1]
[1]Environmental Hydraulics Laboratory, École Polytechnique Fédérale de Lausanne, Switzerland
[2]State Key Laboratory of Hydrology, Water Resources and Hydraulic Engineering, Hohai University, Nanjing, China
11:10-11:35 *LIFT of Viscoplastic Fluids*, Maziyar Jalaal, Martin Klein, Detlef Lohse; Physics of fuids Group, University of Twente, The Netherlands
11:35-12:00 *Retraction of viscoplastic drops*, Hiranya Deka[2], Jean-Lou Pierson[2], Edson Soares[1,2]
[1]LABREO, Department of Mechanical Engineering, Universidade Federal do Espirito Santo, Brazil
[2]bIFPEN, Solaize, 69360, France
12:00-12:25 *Flat and toroidal drops in compressional flow*, Avinoam Nir, Olga. M. Lavrenteva, Bernard K. Ee, Irina Smagin; Department of Chemical Engineering, Technion, Haifa, Israel
12:25-12:50 *Dynamics of yield-stress droplets: Morphology of impact craters*, Jerome Neufeld[1], G Fortune[2], M Zia[2], SB Dalziel[2], M Landeau[2]
[1]BP Institute, University of Cambridge, UK
[2]DAMTP, University of Cambridge, UK

Session D Calculation
16:15-16:40 *Stability of BMP shear flows in the yield stress limit*, Ian Frigaard, Alondra Renteria; Department of Mathematics, University of British Columbia, Vancouver, Canada
16:40-17:05 *Stable and accurate Lattice-Boltzmann method for yield stress fluid flow simulations*, Alan Lugarini, Admilson Teixeira Franco; Research Center for Rheology and Non-Newtonian Fluids, Federal University of Technology – Paraná, Curitiba, Brazil
17:05-17:30 *A multigrid optimization algorithm for a class of variational inequalities arising in non-Newtonian flow*, Sofía López-Ordóñez, Sergio Gonzalez-Andrade; Research Center on Mathematical Modeling (MODEMAT) and Departamento de Matematica - Escuela Politecnica Nacional Ladron de Guevara, Ecuador
17:30-17:55 *Neural networks approximation to the solution of viscoplastic problems*, Ekaterina Muravleva; Skolkovo Institute of Science and Technology, Moscow, Russia
17:55-18:20 *Numerical simulation of the Herschel-Bulkley flow with temperature dependent parameters: A SSN approach*, Sergio Gonzalez-Andrade; Research Center on Mathematical Modeling (MODEMAT) and Departamento de Matematica - Escuela Politecnica Nacional Ladron de Guevara, Ecuador

Wednesday 17 September

Session E Rheology and Flow

9:00-9:25 *Yielding, liquid-like behaviour and shear banding in waxy oil*, Diogo Andrade, Philippe Coussot; Laboratoire Navier (ENPC-IFSTTAR-CNRS), Université Paris-Est, France

9:25-9:50 *Structural breakup and recovery in natural mud after steady pre-shearing*, Ahmad Shakeel, Alex Kirichek, Claire Chassagne; Faculty of Civil Engineering and Geosciences, Department of Hydraulic Engineering, Delft University of Technology, The Netherlands

9:50-10:15 *Rheology of graphene oxide suspensions of Carbopol®*, Monica Naccache[1], Lorena R. da C. Moraes[1], Ricardo Jorge E. Andrade[2]
[1]Department of Mechanical Engineering, Pontifícia Universidade Católica-RJ - Rio de Janeiro, Brazil
[2]MackGraphe, Mackenzie Presbyterian University, São Paulo, Brazil

10:15-10:40 *Elastic instabilities and non-linear dynamics of yield stress fluids in cross-slot extensional rheometers*, John Tsamopoulos, S. Varchanis, S. Haward, C. Hopkins, G. Ioannou, A. Kordalis, Y. Dimakopoulos; Fluid Mechanics and Rheology Laboratory, Department of Chemical Engineering, University of Patras, Greece

11:10-11:35 *Investigation of the yielding transition in concentrated colloidal systems via Rheo-XPCS*, Gavin J. Donley, JD Park, Matthew A. Wade, Suresh Naranayan; Department of Chemical and Biomolecular Engineering, University of Illinois at Urbana-Champaign, USA

11:35-12:00 *The effect of shear history on waxy oil flow curves*, Cezar Otaviano Ribeiro Negrao, Amanda Legnani, Tainan G. M. Santos, Diogo E.V. Andrade; Centre for Rheology and Non-Newtonian Fluids – CERNN, Federal University of Technology – Paraná – UTFPR, Curitiba, Brazil

12:00-12:25 *Experimental decomposition of strain and stress in elastoviscoplastic soft materials*, Simon A. Rogers, Gavin J. Donley; Department of Chemical and Biomolecular Engineering, University of Illinois at Urbana-Champaign, USA

12:25-12:50 *Carbopol: From a simple to a thixotropic yield stress fluid?*, Volfango Bertola[1], E. Younes[2], T. Burghelea[2]
[1]Laboratory of Technical Physics, School of Engineering, University of Liverpool, UK
[2]Université de Nantes, CNRS, Laboratoire de Thermique et Energie de Nantes, France

Session F: Suspensions (with Stokes 200 conference)

16:00-16:25 *Swimming in yield-stress fluid*, Niel Balmforth; Department of Mathematics, University of British Columbia, Canada

16:25-16:50 *Particle migration and stability in yield-stress fluid internal flows*, Emad Chaparian, Luca Brandt, Outi Tammisola; Linné Flow Centre and SeRC, Mechanics Department, KTH Royal Institute of Technology, Stockholm, Sweden

16:50-17:15 *Particle migration in pressure-driven flows of apparent yield-stress fluids and regularized yield-stress materials*, Paulo de Souza Mendes[1], Ivan Siqueira[2]
[1]Department of Mechanical Engineering, PUC-Rio, Rio de Janeiro, Brazil
[2]Department of Chemical and Biomolecular Engineering, Rice University, Houston, USA

17:15-17:40 *Numerical investigation of particle migration in rheometric flows of suspensions*, Nezia de Rosso, Cesar Negrao; Centre for Rheology and Non-Newtonian Fluids – CERNN, Federal University of Technology – Paraná – UTFPR, Curitiba, Brazil
17:40-18:05 *Interaction between a falling sphere and the structure of a non-Newtonian yield-stress fluid*, Nicolo Sgreva[1], Anne Davaille[1], Ichiro Kumagai[2], Kei Kurita[3]
[1]Laboratoire FAST, CNRS/Univ. Paris-Sud/Univ. Paris-Saclay, Orsay, France
[2]School of Science and Engineering, Meisei University, Hino, Tokyo 191-8506, Japan
[3]Earthquake Research Institute, University of Tokyo, Tokyo, Japan

Thursday 18 September
Session G: Yield stress fluid physics

9:00-9:25 *Elastic network collapse at the solid-liquid transition of soft-jammed systems*, Philippe Coussot, E. N'Gouamba, J. Goyon; Université Paris-Est, Laboratoire Navier (IFSTTAR-ENPC-CNRS), France
9:25-9:50 *Strain localisation during yielding in constitutive models of elastoviscoplastic flows*, Suzanne Fielding; Department of Physics, University of Durham, UK
9:50-10:15 *From yielding to shear jamming in a cohesive frictional suspension*, Morton M. Denn[1,2], Abhinendra Singh[1], Sidhant Pedneka[1,2,3], Jaehun Chun[3] and Jeffrey F. Morris[1,2]
[1]Benjamin Levich Institute, City College of New York, CUNY, USA
[2]Department of Chemical Engineering, City College of New York, CUNY, USA
[3]Pacific Northwest Laboratory, Richland, WA, USA
10:15-10:40 *Towards a constitutive relation for simple yield stress fluids*, Daniel Bonn, Guillaume Briand, Noushine Shahidzadeh, Morton Denn; Van der Waals-Zeeman Institute, Institute of Physics, University of Amsterdam, The Netherlands
11:10-11:35 *A new thermodynamically-consitent yield energy based viscoelastic-brittle constitutive equation*, Pierre Saramito[1], V. Dansereau[2], J. Weiss[2]
[1]Lab. J. Kuntzmann, CNRS and Univ. Grenoble-Alpes, France
[2]Institut des sciences de la Terre, CNRS and Univ. Grenoble-Alpes, France
11:35-12:00 *A new tensorial model for non-colloidal suspensions: from microstrucutre anisotropy to normal stress differences and jamming*, Oliver Ozenda[1], P Saramito[1], G. Chambon[2]
[1]Lab. J. Kuntzman, CNRS and Univ. Grenoble, France
[2]Institut des sciences de la Terre, CNRS and Univ. Grenoble, France
12:00-12:25 *Discussion on the prediction of the shear-banding phenomenon from models for time-dependent yield stress materials*, Roney Thompson[1], Paulo de Souza Mendes[2]
[1]Department of Mechanical Engineering, Pontifícia Universidade Católica, Rio de Janeiro, Brazil
[2]Department of Mechanical Engineering, Universidade Federal do Rio de Janeiro, Brazil

Friday 20 September
Session H Complex Flows
9:00-9:25 *Laminar mixing of viscoplastic fluids: Mission impossible?*, Teo Burghelea[1], E. Younes[1], Y. Moguen[2], K. El Omari[2], Y. Le Guer[2], C. Castelain[1]

[1]Université de Nantes, CNRS, Laboratoire de Thermique et Energie, Nantes, France
[2]Univ. Pau & Pays Adour/ E2S UPPA, Laboratoire des Sciences de l'Ingénieur Appliquées à la Mécanique et au Génie Electrique – Fédération IPRA, EA4581, F-64 000, Pau, France

9:25-9:50 *Axisymmetric squeeze flow of viscoplastic Casson and Herschel-Bulkley medium*, Larisa Muravleva; Lomonosov Moscow State University, Russia

9:50-10:15 *Fluidisation of yield-stress material under vibrations*, Ashish Garg, Anne Juel, Matthias Heil; Department of Mathematics, University of Manchester, UK

10:15-10:40 *Dynamics of an air bubble crossing a horizontal Newtonian-viscoplastic fluid interface*, Marjan Zare[1], K. Zhao[2], I.A. Frigaard[1,3], G. Lawrence[2]
[1]Department of Mathematics, University of British Columbia, Vancouver, Canada
[2]Department of Civil Engineering, University of British Columbia, Vancouver, Canada
[3]Department of Mechanical Engineering, University of British Columbia, Vancouver, Canada

11:10-11:35 *Microscopic flows of a simple yield stress material in the presence of wall slip*, Eliane Younes[1], V. Bertola[2], C. Castelain[1], T. Burghelea[1]
[1]Université de Nantes, CNRS, Laboratoire de Thermique et Energie de Nantes, France
[2]Laboratory of Technical Physics, School of Engineering, University of Liverpool, Liverpool, UK

11:35-12:00 *Convection in a silica colloidal dispersion dried from above: the importance of skin formation and foundering*, Anne Davaille, Gianluca Gerardi, Arnaud Salvador, Erika Di Giuseppe; Laboratoire FAST (CNRS / Univ. Paris-Sud), Orsay, France

12:00-12:25 *Removal of yield stress fluids from rectangular channels*, Ali Eslami, Seyed Mohammad Taghavi; Department of Chemical Engineering, Université Laval, Quebec, Canada

Report composed by Gareth McKinley and Ian Wilson

Reports of the IUTAM Summer Schools held in 2019

IUTAM-BICTAM Summer School on Violent Flows with a Free Surface

This summer school was held in Shanghai, China, from June 2-June 8, 2019. It was coordinated by Hua Liu (Shanghai Jiao Tong University, China) and Frederic Dias (University College Dublin, Ireland) and supported by Beijing International Center of Theoretical and Applied Mechanics (BICTAM).

1. Summary

Slamming, which is the violent impact between a liquid and a solid, has been known for a long time in the marine hydrodynamics community. More recently, applications ranging from the transport of liquefied natural gas (LNG) in LNG carriers to the transformation of wave energy with oscillating wave surge converters have led to a renewed interest in the fascinating topic of slamming. The main reason is that the extreme impact pressures generated during slamming can affect the integrity of the structures. In coastal engineering, there has been a need to protect areas of water, and land, from the wave action of the sea. Protective structures such as breakwaters and sea walls need to be sufficiently robust to withstand the most violent impacts of the waves. The initial stage of impact for a body entering a fluid has been the subject of much research over the past seventy years since the pioneering work of von Karman and Wagner on the hydrodynamics of an alighting seaplane. At the later stage of water entry, the violent deformation of the free surface and the evolution of the cavity generate significant changes of hydrodynamic load and motion of an air-to-sea body. Hydrodynamic flow with the violent impact is one of the most challenging topics in fluid mechanics because of the large span of spatial and temporal scales involved. The objective of this IUTAM-BICTAM Summer School is to teach hydrodynamics with a free surface and the solutions to the violent flows. The main topics include ship slamming, impact load, nonlinear wave-body interaction, wave impact, and overtopping.

Much research efforts have been devoted to understanding the mechanism of slamming, wave impact, and water entry/exit of a body and develop analytical solutions and numerical methods for the free surface hydrodynamics. One motivation for these studies is the aim to predict the impact loads on structures and the corresponding hydrodynamic flows with the violently deformed free surface. Six series of lectures have been focused on sloshing, slamming, impact load, wave impact, breaking wave, overtopping, cavitating flow, and hydroelasticity. The analytical solutions, numerical models, and experimental techniques were covered. A technical tour to the facilities at China Ship Scientific Research Center in Wuxi was arranged for all participants during the summer school.

2. The audience

The objective of this IUTAM-BICTAM Summer School is to provide an introduction to hydrodynamics with the free surface. The targeted audience for this Summer School was Ph.D. students, postdoctoral, and young researchers majoring in Fluid Mechanics, Applied Mathematics, Naval Architecture, and Ocean Engineering. There were 40 participants (in addition to 6 lecturers), including 30 Ph.D. students and 10 post-doc fellows/young scientists: 3 from USA, 2 from Ireland, 1 from Norway, 1 from Singapore, 1 from France, 1 from Korea, 1 from Japan, and 30 from China. Positive feedback from the audience was received about the courses, technical tour, and location.

3. The lecturers

Prof. Odd M. Faltinsen - Norwegian University of Science and Technology, Norway

6 lectures on: Sloshing and slamming

Why does sloshing involve violent free-surface flow?; resonance frequencies and modes of liquid motion; interaction between sloshing and body motions; viscous damping; nonlinear free surface effects; slamming; hydroelasticity effects; prediction of thermal and viscous damping; shallow liquid impact with gas cavity; challenges for numerical predictions and model tests.

Prof. Frederic Dias - University College Dublin, Ireland

6 lectures on: Extreme waves and slamming

Observation of violent flows with a free surface; wave breaking in the open ocean; wave breaking on wave energy converter; wave breaking in laboratory experiments; elementary loading processes; mathematical models for local flows; asymptotic solutions; numerical solutions; slamming of wave energy converters.

Prof. Yves-Marie Scolan - ENSTA Bretagne, France

6 lectures on: Hydrodynamic impact

Physical phenomenon and context; hypotheses of Wagner problem; methods of solution: 2D and 3D axisymmetric problems; local and global loads; water entry with complex motions; impact on waves; hydroelastic coupling; energy conservation; highly nonlinear fluid motion in a tank; flip-through phenomenon; two fluid system dynamics; forced motion of a sloshing tank.

Prof. Yuming Liu - Massachusetts Institute of Technology, USA

6 lectures on: Nonlinrear wave-body interaction

Strongly-nonlinear wave-wave and wave-body interactions; mathematical formulation; Boundary Integral Equation; Quadratic Boundary Element Method (QBEM); numerical issues and treatments; overturning/breaking wave impact on

ships/structures; fast PFFT algorithm to accelerate BEM solution.

Prof. Hua Liu - Shanghai Jiao Tong University, China
6 lectures on: Wave propagation and overtopping
Propagation of water waves in shallow water; fully nonlinear and highly dispersive wave model; breaking and runup on beaches; tsunami modelling; wave overtopping against coastal structures; numerical model of wave breaking and overtopping; water impact at high speed.

Prof. Kai Yan - China Ship Scientific Research Center, China
6 lectures on: Cavitating flow and hydroelasticity theory
Physics of cavitation and cavitating flows; bubbly dynamics; scaling law of cavitation and experimental methods; numerical models of cavitating flows; hydroelasticity theory and its applications in naval architecture and ocean engineering.

Report composed by Hua Liu

IUTAM-CISM Summer School on Growth and Remodeling in Soft Biological Tissue

This summer school was held at CISM, Udine, Italy, from July 8th – July 12th, 2019. It was coordinated by Christophe Eloy (Centrale Marseille, France) and Yoël Forterre (CNRS, Aix-Marseille University, France).

1. Summary

Plants offer some of the most elegant applications of Mechanics to be found in Nature. Wind-induced leaf fluttering, waves on wheat crops or seed dispersal by the wind are well-known illustrations of the interaction of plants with an external flow. Mechanics play also a central role in the physiology of plants. Terrestrial plants and trees are hydraulic machines that take water deep into the soil to raise it to the leaves through osmosis and evaporation. The motor of plant growth and movement results from a balance between the mechanical stresses in the cell wall and the water pressure inside. All these external and internal forces are perceived by plants and participate in their development and their morphogenesis. Understanding these functions is of crucial importance for a better management of agriculture or to forecast plants behavior in this period of rapid environmental changes.

The objective of this IUTAM-CISM International Summer School was to provide an introduction to Plant Biomechanics at all scales, from the cellular and tissue level to the whole plant and ecosystem level. Due to the interdisciplinary nature of the course topic, and, consequently, of the audience, a great attention has been paid on introducing biological and mathematical concepts at the basic level first, before going deeper in the description and eventually reach research topics. Lectures have combined concepts from plant biology, such as plant anatomy and physiology, with concepts from continuum mechanics, such as elasticity, plasticity, fluid mechanics, rheology, instabilities and modeling. Two one-hour slots have been allocated during the week for attendees to present their own research work through short talks.

The first two set of lectures dealt with the mechanics of plant growth and morphogenesis. It started with an introduction to plant cell anatomy and to the different mode of growth at the cellular level (tip growth, diffuse growth) before addressing growth in tissues and the role of incompatible stress on the emergence of growth patterns. The theoretical tools and concepts for modeling growing plant tissues were then introduced, from simple one spatial dimension (1D) models of cell and tissue expansion (Lockhart equation) to 3D continuum model accounting for anisotropy and growth to vertex-based model. The two next set of lectures addressed plant fluid mechanics. The first part focused on internal flows and the mechanisms of water transport in plants. The main water pathway (sap transport, sugar transport) and water drivers (evaporation, osmotic pressure) were described together with questions

about embolism and cavitation in conducting vessels. The second part dealt with how plants interact with an external fluid, with emphasizes on dimensional analysis. Plants in a static and moving fluid were discussed, including topics such as oscillation in a still fluid, drag reconfiguration with biomimetic applications and canopy instabilities under flow. The last block of lectures discussed plant biomechanics in the broader perspective of plant ecophysiology and evolution. The response and adaption of plants and trees to environmental physical perturbations such as wind, light and gravity were first discussed. The global biomechanical constraints that shaped plant structure and function through evolution were then addressed.

2. The audience

The objective of this summer school was giving an introduction to plant biomechanics, covering all the main aspects from the cellular to the ecosystem level. The targeted audience was in particular PhD students, postdocs and young investigators from the various areas of engineering, physics, applied mathematics, biology and Agricultural Sciences interested in plant biomechanics. In addition to the 6 lecturers, the summer school attracted an audience of altogether 35 participants, from 10 different countries: 1 from Austria, 17 from France, 2 from Germany, 2 from India, 1 from Japan, 6 from Israel, 2 from Italy, 1 from Netherland, 1 from UK, 2 from the USA. The gender ratio was balanced among participants (16f and 19m).

3. The lecturers

de Langre, Emmanuel - Ecole Polytechnique, Palaiseau, France

6 lectures on plant interactions with fluids: introduction to plants and ecological systems under flow from individuals to canopies, relevant dimensionless numbers, effect of plants on natural flows, plant motion and vibration mechanics, effect of wind on plants, fully coupled models of wind-plant interactions, aquatic plant-flow interaction, biomimetics, visual rendering of plant motion, interaction with other loads (snow).

Geitmann, Anja - McGill University, Ste-Anne-de-Bellevue, QC, Canada

5 lectures on the biology and mechanics of the plant cell: general concept of mechanical modeling in biology; anatomy and biology of plant cells; biochemistry of the cell wall; cell wall mechanics and rheology; cytoskeleton and intracellular transport; water relation (osmotic potential, turgor pressure); mechanics of plant cell growth; plant cell morphogenesis and differentiation; quantitative experimentation in cell mechanics.

Holbrook, Noel Michele - Harvard University, Cambridge, MA, USA

6 lectures on vascular transport in plants: cavitation and metastable water, cell wall reinforcement and xylem tension, pit membrane structure and embolism propagation,

water transport in roots and leaves, phloem loading and sieve tube structure, water movement between xylem and phloem.

Jensen, Oliver - University of Manchester, UK
6 lectures on theoretical tools and concepts for modeling growing plant tissues: constitutive models and elasto-visco-plasticity; mechanics of heterogeneous anisotropic materials; computational methods for multicellular tissues; the plant cell wall as a cross-linked fibre-reinforced material; growth via anisotropic cell elongation; upscaling from cells to tissues; applications to root growth.

Moulia, Bruno - PIAF-INRA, Clermont-Ferrand, France
6 lectures on plant response to environmental stimuli: from biomechanics to mechanobiology: growth kinematics and dynamics at the organ level, incompatible autostresses in fluid and solid phases as motors of plant growth and posture control, mechano- and gravi-sensing in plants, cellular mechanisms and global control (gravi- and photo-tropism), thigmomorphogenesis, modeling in biomechanics and mechanobiology.

Niklas, Karl - Cornell University, Ithaca, NY, USA
6 lectures on the evolution of plant biomechanics: plants shape/structure/function across evolution, from algae to land plants to wood; global physical constraints on plants (elasticity, hydrodynamic, diffusion), the unicellular to multicellular transition, the water to air transition, the non-vascular to vascular transition, the primary to secondary growth transition, scaling relations and allometry, genetic algorithm and modeling.

Report composed by Yoël Forterre

2019 Treasurer's Report

Statement of Change in Fund Balance	**U.S. Dollars**
Balance, 31 December 2018	620.769,08
Net revenues minus expenses for 2019	44.026,98
Balance, 31 December 2019	**664.796,06**

Statement of Cash Revenues Collected over Expenses Paid	
Revenues collected during 2019:	
Subscription dues	107.902,39
Interest income	625,38
Total	**108.527,77**
Expenses paid during 2019:	
IUTAM Symposia	17.945,81
Travel, Bureau	8.886,24
Travel, Executive Committee of Congress Committee	6.299,53
Travel, others	0,00
Contribution to ISC	4.413,66
Auditor's fee	2.704,39
Administration Website	2.361,98
Bank fees	383,27
Insurance	1.105,37
Office costs Secretary General	17.443,79
Total	**61.544,04**
Revenues minus expenses for 2019	**46.983,73**
Gain from exchange of currency	-2.956,75
Net revenues minus expenses for 2019	**44.026,98**

IUTAM Bank Accounts 2019

Running Accounts

Bank	Balance 31 Dec. 18	Withdrawals 2019	Deposits 2019	Balance 31 Dec. 19	Currency
Spar Nord Bank Aalborg 9236 457 73 07097*	491.225,65	109.691,04	63.255,10	537.661,59	USD
Spar Nord Bank Aalborg 9236 457 73 07089	3.342,72	15,53	0,00	3.327,19	EUR
Spar Nord Bank Aalborg 9236 457 22 92520	557,23	102,39	0,00	454,84	DKK
Nordea Bank Horsholm 6887 390 760 (Account is not used but required by the bank)	0,00	0,00	0,00	0,00	DKK
Nordea Bank Horsholm 0745 417 701	3.697,91	300,00	4.087,50	7.485,41	DKK

Savings Account

Bank	Balance 31 Dec. 18	Withdrawals 2019	Deposits 2019	Balance 31 Dec. 19	Currency
Nordea Bank Horsholm	817.500,00	0,00	0,00	817.500,00	DKK

Treasurer:
Professor Peter Eberhard, Institute of Engineering and Computational Mechanics, University of Stuttgart, Pfaffenwaldring 9, 70569 Stuttgart, Germany

Assistant Treasurer:
Professor Niels Olhoff, Department of Mechanical and Manufacturing Engineering, Aalborg University, Fibigerstraede 16, DK-9220 Aalborg East, Denmark

Payment of Dues Record 2019

Adhering Organization	*2015*	*2016*	*2017*	*2018*	*2019*
Armenia*			1		
Australia	3	3	3	3	3
Austria	1	1	1	1	1
Belgium	5	5	5	5	-
Brazil	3	3	3	3	3
Bulgaria	1	1	1	1	-
Canada	8	8	8	8	8
Chile	1	1	1	1	1
China/Beijing	8	8	12	12	12
China/Hong Kong	1	1	1	1	-
China/Taipei	3	3	3	3	3
Croatia	1	1	1	1	1
Czech Republic	1	1	1	1	1
Denmark	3	3	3	3	3
Egypt	1	-	-	-	-
Estonia	1	1	1	1	1
Finland	3	3	3	3	3
France	8	8	8	8	8
Georgia	1	1	1	1	-
Germany	8	8	8	8	8
Greece	1	1	1	1	1
Hungary	1	1	1	1	1
India	5	5	5	5	5
Ireland	1	1	1	1	1
Israel	3	3	3	3	3

Italy	8	8	8	8	8
Japan	8	8	8	8	8
Korea	1	1	1	1	1
Mexico	1	1	1	1	-
Netherlands	3	3	3	3	3
New Zealand	1	1	1	1	1
Norway	1	1	1	1	1
Poland	3	3	3	3	3
Portugal	1	1	1	1	-
Romania	1	1	1	1	1
Russia	8	8	8	8	8
Saudi Arabia	-	-	-	-	-
Serbia	1	1	1	1	1
Slovenia	1	1	1	1	1
South Africa	1	1	1	1	1
Spain	1	1	1	1	1
Sweden	5	5	5	5	5
Switzerland	3	3	3	3	3
Turkey	1	1	-	-	-
Ukraine	1	1	1	1	1
United Kingdom	8	8	8	8	8
United States	12	12	12	12	12
Vietnam	1	1	1	1	-

Note: For any particular year, a dash (–) indicates that dues had not been paid as of December 31, 2019. Dues are expressed in membership units of 1, 3, 5, 8 or 12, corresponding to category of membership from I through V, respectively.

* Armenia entered IUTAM as an Associate Adhering Organization in 2017.

Latvia's and Slovakia's memberships were suspended in 2014,
Argentina's and Morocco's memberships were already suspended earlier,
Cyprus was Associate Adhering Organization 2011-2018.

Peter Eberhard, Treasurer

Reports on Affiliated Organizations

AFMC (Asian Fluid Mechanics Committee)
https://acfm.iisc.ac.in

The main AFMC activity in the year 2019 was holding the 16th Asian Congress of Fluid Mechanics in Bengaluru, India during 13-17 December, 2019. It had a total number of 160 registered participants hailing from Australia, Bangladesh, China, Czech Republic, India, Japan, Sri Lanka and USA. The Congress technical program consisted of 7 plenary talks and 127 contributed papers including 19 posters (program details are available on website acfm.iisc.ac.in). The presentations ranged from fundamental aspects of fluid mechanics to its practical applications covering a variety of fields. Best paper and best poster awards were given to student participants. The 16th ACFM was well organized with excellent cooperation between AFMC and the local organizing committee led by Prof. K R Srinivas of Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru. AFMC met twice during the 16th Congress and took stock of the preparations for the 16th ACFM, listened to the report by AFMC Chairman Prof. G S Bhat, decided the venue of the 17th ACFM, other organizational matters of AFMC, including the election of next AFMC Chairman. Prof. Song Fu (China) will succeed Prof. G S Bhat as the AFMC Chairman after the end of 16th ACFM. 17th ACFM will be held in China, organized by Beijing Institute of Technology (BIT) and Chinese Society of Theoretical & Applied Mechanics (CSTAM) at a venue in Beijing-Zhangjiakou. Professor Qing Quan Liu, an AFMC member from China, is likely to be the local Organizer. Prof. Fu and Prof. Liu will fix the specific time and venue of 17ACFM soon.

Report composed by G. S. Bhat

BICTAM (Beijing International Center for Theoretical and Applied Mechanics)
www.bictam.org.cn

BICTAM promotes the development and application of mechanics and related interdisciplinary branches in the Asia-Pacific region and around the world via symposia, conferences, workshops, summer schools and publications in 2019. These programs mainly focused on advanced materials technology, violent flows with a free surface, biomechanics, computational methods in engineering, etc. Over 1000 researchers and graduate students participated in these programs.

Since July 2019, BICTAM has started "Sino-Italian Workshop" with the University of Rome Tor Vergata, Italy. Together with "Asia-Pacific Youth Symposium", "BICTAM Summer School", "BICTAM Master Lecture Series on Mechanics" and "Sino-Thai Bilateral Workshop", BICTAM stepped forward to provide chances for collaborations among scholars from different fields.

Summer School

IUTAM-BICTAM Summer School on Violent Flows with a Free Surface

The Summer School took place in Shanghai, China on June 2 to 8, 2019. The objective of the course is to provide an introduction to theory, method and application of hydrodynamics with the free surface. Main topics included ship slamming, impact load, water entry/exit, breaking wave and wave impact. The well-prepared courses were given by 6 domestic and international experts, delivering lectures related to their expertise. Over 40 participants including PhD students, postdoctoral and young researchers from 6 countries attended the short course.

Symposium

The 3rd International Symposium of Cavitation and Multiphase Flow

The symposium was held in Shanghai, China on April 19 to 22, 2019. It consisted of 11 plenary lectures, 29 keynote lectures and 80 parallel sessions. Lectures focused on all aspects of cavitation and multiphase flows, e.g., both fundamental and applied research with a focus on physical insights, numerical modeling and applications in engineering. Nearly 200 participants from 15 countries attended the symposium.

Conferences

CAMT2019–Congress in Advanced Materials Technology

The conference was held in Shanghai, China on April 19 to 21, 2019. It was intended to promote innovation and technology transfer in advanced materials technology. 157 scientific researchers and engineers from 75 universities, institutes and enterprises from China, Australia, Germany, the United Kingdom, Canada and other countries and regions gathered here. 31 distinguished plenary speeches on the topics of composite materials, nanomaterials, biomaterials and new materials manufacturing were presented during the conference by scientists from around the globe.

ZwickRoell Science Award & Academia Day

The 10th annual ZwickRoell Academia Day was held in Shanghai, China on June 13-14, 2019. The event provided an important platform for the intensive exchange between science and industry on the subject of intelligent materials testing. Winners

of the 2018 ZwickRoell Science Award were recognized at the event. Nearly 200 participants from 56 universities, institutes and enterprises attended the conference.

The 6th Asia-Pacific International Conference on Computational Methods in Engineering

The conference was held in Dalian, China on September 27-30, 2019, combined with the 12th Chinese National Conference on Computational Methods in Engineering and the 2nd Conference on Boundary Element and Dimension Reduction Methods. Topics of ICOME2019 included the theory and application of Boundary Element Method, Meshless Method and High Performance Finite Element Method. A total of 191 scholars and students from home and abroad attended the conference. The 7th ICOME will be held in 2023 at Xiamen University.

Workshops

Sino-Italian Workshop on Biomechanics

The first Sino-Italian Workshop on Biomechanics was held in Rome, Italy on July 1-3, 2019. It organized 10 technical sessions with a total of 39 lectures entitled "X-Mechanics: An Endless Frontier", "Some Mechanical 'Laws' in Cell Mechanosensing Behaviors", "Acoustics and Vibration of a Liquid-Filled Microtube", etc. A final round table session took place at the end of the workshop. The state-of-the-art of biomechanics, mainly but not exclusively in China and in Italy, was presented. Nearly 50 participants from 27 universities and institutes attended the workshop.

2019 Asian Workshop on Theoretical and Applied Mechanics

Proposed by BICTAM, the 2019 Asian Workshop on Theoretical and Applied Mechanics (AWTAM 2019) was held in Hangzhou, China on August 24-25, 2019. More than 80 participants from China (including Hong Kong and Macao), the United States, Japan, Singapore, Australia, South Korea, India, Vietnam, Thailand and other countries and regions conducted in-depth exchanges and discussions on the topics of solid mechanics, fluid mechanics, dynamics and control, biomechanics and mechanobiology, applied mechanics and engineering analyses, etc.

Report composed by Yewen Zhang

CISM (International Centre for Mechanical Sciences)
www.cism.it

1. Courses and Seminars

The regular programme of courses and seminars, planned for the Centre for 2019 by the Scientific Council, took place in two Scientific Sessions, the Christian Miehe session (May-July 2019) and the Olga Ladyzhenskaya session (September-November 2019). The topics, always at an advanced level, included different field of mechanics and related sciences, both at a basic and applied level. Besides one International Advanced Professional Training course was organized (September).

The Christian Miehe session
- Dynamics of Machining: Prediction and Suppression of Undesired Vibrations
- Micromechanics of Internal Stresses in Multiphase Materials
- Cohesive Granular Materials, Description and Flowing Properties
- CISM-ECCOMAS International Summer School on "Coherent Structures in Unsteady Flows: Mathematical and Computational Methods"
- Coupled Processes in Fracture Propagation in Geo-Materials: from Hydraulic Fractures to Earthquakes
- Mechanobiology and Tribology of the Skin - from Experimental Characterisation to Modelling
- CISM-AIMETA Advanced School on "Anisotropic Particles in Viscous and Turbulent Flows"
- 24th CISM-IUTAM International Summer School on "Plant Biomechanics"
- Advances in Dispersed Multi-Phase Flows: from Measuring to Modeling
- Pattern Formation in Advanced Materials: Energetics and Evolution

The Olga Ladyzhenskaya session
- Electromechanical Transducers: Principles and Technologies
- Transport Phenomena on Textured Surfaces: Fundamentals and Applications (postponed to 2020)
- The Art of Modeling in Computational Solid Mechanics
- Controlling Delayed Dynamics: Advances in Theory, Methods and Applications

The International APT course
- Vehicle Dynamics: Fundamentals and Ultimate Trends

2. Editorial Activities

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

The following books were published in 2019:

A. Müller – D. Zlatanov: “Singular Configurations of Mechanisms and Manipulators”
D. MacTaggart – A. Hillier: “Topics in Magnetohydrodynamic Topology, Reconnection and Stability Theory”

S. Pirozzoli – T. Sengupta: “High-Performance Computing of Big Data for Turbulence and Combustion”
M. Paggi – D. Hills: “Modeling and Simulation of Tribological Problems in Technology”
F. Crosilla – A. Beinat – A. Fusiello – E. Maset – D. Visintini: “Advanced Procrustes Analysis Models in Photogrammetric Computer Vision”
M. Le Bars – D. Lecoanet: “Fluid Mechanics of Planets and Stars”
C. Picu – J.-F. Ganghoffer: “Mechanics of Fibrous Materials and Applications”
M.S. Allen – D. Rixen – M. van der Seijs – P. Tiso – T. Abrahamsson – R.L. Mayes: “Substructuring in Engineering Dynmics”
P. De Matos Pimenta – J. Schröder: “Novel Finite Element Technologies for Solids and Structures”
T. Burghelea – V. Bertola: “Transport Phenomena in Complex Fluids”
L. Delorenzis – A. Düster: “Modeling in Engineering Using Innovative Numerical Methods for Solids and Fluids”

3. Scholarships

A number of scholarships, including free lodging and boarding or exemption from registration fee, was offered during the course 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.

4. International Participation

In 2019, 83 lecturers from 15 countries delivered lectures in the Christian Miehe and the Olga Ladyzhenskaya Sessions. The courses were attended by 439 participants coming from 21 countries.

Report composed by Bernhard Schrefler

EUROMECH (European Mechanics Society)
www.euromech.org

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 the 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 (30-50) 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 contact the appropriate Chairperson.

EUROMECH Conferences are broad in scientific scope. They include:

- European Fluid Mechanics Conference (EFMC), held every two years;
- European Mechanics of Materials Conference (EMMC), held every two years.
- European Nonlinear Oscillations Conference (ENOC), held every three years;
- European Solid Mechanics Conference (ESMC), held every three years;
- European Turbulence Conference (ETC), held every two years.

They are open to all those interested and generally have a number of participants between 250 and 1000, although in some cases the latter number has been exceeded substantially. 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 Conferences should register through the conference website or contact the Chairman or Secretary of the appropriate LOC.

Prizes and Fellowships

The EUROMECH Fluid Mechanics Prize and the EUROMECH Solid Mechanics Prize are awarded on the occasions of the Fluid and Solid Mechanics conferences for outstanding and fundamental accomplishments in mechanics. At those conferences, Fellowships are awarded to members who have contributed significantly to the advancement of mechanics and related fields. Also, Young Scientist Prizes are awarded at these conferences to the best oral presentations.

EUROMECH Colloquia in 2019

[600] *New challenges in finite element technology – from the perspective of mechanics and mathematics,* 12 – 14 March 2019, Aachen, Germany.

[602] *Composite manufacturing processes. Analyses, modelling and simulations,* 13 – 15 March 2019, Lyon, France.

[604] *Fluid and solid mechanics for tissue engineering,* 23 – 25 September 2019, Oxford, UK.

[605] *Damage and failure of engineering materials under extreme loading conditions,* 21 – 24 May 2019, Madrid, Spain.

[607] *Marine Aging of Polymers,* 28 – 29 August 2019, Brest, France.

EUROMECH Conferences in 2019

ETC12 - *17th European Turbulence Conference,* 3 – 6 September 2019, Turin, Italy.

9th *European Postgraduate Fluid Dynamics Conference*, 16-19 July 2019, Illmenau, Germany

For more details see www.euromech.org

Report composed by Jacques Magnaudet

HYDROMAG (International Association for Hydromagnetic Phenomena and Applications)
https://hydromag.wordpress.com

HYDROMAG is an international association of scientists and engineers active in these 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

https://hydromag.wordpress.com/

This WWW-site contains information on membership, forthcoming conferences and the electronic HYDROMAG newsletter.

Hydromag has been awarded the join organisation of a thematic session on EHD and MHD at the forthcoming ICTAM conference in Milan (2020). The session will be jointly chaired by Hydromag Committee members Prof. Alban Pothérat (Coventry University) and Prof. Laurent Davoust (Grenoble-Alpes University). Due to the

COVID19 pandemic, ICTAM has been postponed to 2021, and the session is now expected to take place then.

Additionally, the organisation of the next PAMIR conference in 2022 has been awarded to Coventry University (Chair A. Pothérat), and HYDROMAG will be associated to it, with a Poster Prize.

Report composed by Alban Pothérat

IABEM (International Association for Boundary Element Methods)
www.iabem.org

The International Association for Boundary Element Methods (IABEM) is an open community, where everybody working on boundary element methods or boundary integral equations is welcome independent of her/his scientific field. Consequently, there is no official membership or any fees. Details on IABEM can be found in http://www.iabem.org.

The main scientific activities of IABEM are found in the biannual IABEM symposia in addition to minisymposia in related conferences or workshops in the field of BEM.

Unfortunately, the next symposium, originally planned to be in Hong Kong, China in 8-10 April, 2020, has been relocated to Shenzhen, China in view of the political situation in Hong Kong, followed by postponement due to the coronavirus outbreak.

Report composed by Naoshi Nishimura

IACM (International Association for Computational Mechanics)
https://iacm.info

The following IACM Special Interest Conferences took place in 2019:

8th International Conference on Computational Methods in Marine Engineering - Marine 2019
13-15 May 2019 / Gothenburg, Sweden

IX International Conference on Adaptive Modeling and Simulation - ADMOS 2019
27-29 May 2019 / El Campello, Alicante, Spain

8th International Conference on Coupled Problems in Science and Engineering - COUPLED PROBLEMS 2019
3-5 June 2019 / Sitges, Spain

15th International Conference on Computational Plasticity. Fundamentals and Applications - COMPLAS 2019
4-6 September 2019 / Barcelona, Spain

2nd International Conference on Simulation for Additive Manufacturing – Sim-AM 2019 18-20 September 2019 / Munich, Germany

International Conference on Isogeometric Analysis - IGA2019
11-13 September 2019 / Pavia, Italy

6th International Conference on Particle-Based Methods. Fundamentals and Applications - PARTICLES2019
28-30 October 2019 / Barcelona, Spain

9th International Conference on Textile Composites and Inflatable Structures - Structural Membranes 2019 & IASS Conference - Form & Force 2019
7-10 October 2019 / Barcelona, Spain

WCCM XIV- ECCOMAS 2020 will have to be postponed to 2021 due to Covid-19:

The ***14th World Congress on Computational Mechanics*** jointly organized with the ***ECCOMAS 2020*** in Paris, France. Further details are available at: https://www.wccm-eccomas2020.org/frontal/

The following IACM Special Interest Conferences will take place this year:

3rd International Conference on Computational Engineering and Science for Safety and Environmental Problems - COMPSAFE 2020
8- 11 December 2020/ Kobe, Japan

2nd African Conference on Computational Mechanics - AFRICOMP 2020
30 November – 2 December / Cape Town, South Africa

The following IACM Special Interest Conferences will take place next year:

9th International Conference on Computational Methods in Marine Engineering - Marine 2021
2-4 June 2021 / Edinburgh, Scotland, UK

9th International Conference on Coupled Problems in Science and Engineering - COUPLED PROBLEMS 2021
13-16 June 2021 / Chia Laguna, Sardinia, Italy

International Conference on Adaptive Modeling and Simulation - ADMOS 2021
21-23 June 2021 / Gothenburg, Sweden

16th International Conference on Computational Plasticity. Fundamentals and Applications - COMPLAS 2021
7-10 September 2021 / Barcelona, Spain

10th International Conference on Textile Composites and Inflatable Structures - Structural Membranes 2021
13-15 September 2021 / Munich, Germany

7th International Conference on Particle-Based Methods. Fundamentals and Applications - PARTICLES 2021
4-6 October 2021 / Hamburg, Germany

FEF- IACM conference will take place next year:

21st International Conference on Finite Elements in Flow Problems - FEF 2021
17-21 October 2021 / Hangzhou, China

Report composed by Cristina Vizcaya

IASCM (International Association for Structural Control and Monitoring)

The *International Association of Structural Control and Monitoring* (IASCM) represents the diverse and interdisciplinary community of international researchers engaged in advancing the state-of-art in structural control and monitoring technologies. The mission of IASCM is to accelerate the advancement of the science and practice of structural control and monitoring, by means of education, research, and application of knowledge. This includes the response of large-scale structures to earthquakes, wind, and man-made forces.

The major activity of IASCM in 2019 consisted of helping in the organization of two events chaired by Prof. Vincenzo Gattulli, of the Department of Structural and Geotechnical Engineering, at Sapienza University of Rome:

- APESS 2019 - Asian-Pacific-Euro Summer School on Smart Structures Technology, July 15 – Aug 3, 2019. Similar to previous Asian-Pacific-Euro Summer Schools, APESS 2019 offered an intensive three-week program of coursework, laboratory exercises and lectures given by leading world experts in Civil Engineering and Smart Structures Technology. APESS 2019 was organized in conjunction with the 8th International Summer School on Smart Materials and Structures, held each year by the Department of Civil, Environmental and Mechanical Engineering of the University of Trento.
- ANCRiSST 2019 - 14th International Workshop on Advanced Smart Materials and Smart Structural Technologies, July 19-20, 2019. ANCRiSST 2019 aimed to assess current progress in smart materials and structures technology, developing synergies among researchers in various disciplines from different countries to facilitate joint research projects that are of such scope and magnitude that they cannot be carried out by the individual centers.

Report composed by Sami F. Masri

IAVSD (International Association for Vehicle Systems Dynamics)
www.iavsd.org

The 26th IAVSD Symposium (IAVSD 2019) was held at Gothenburg, Sweden, from 12th to 16th August 2019

The Symposium was organized by the Department of Mechanics and Maritime Sciences of Chalmers University of Technology together with the Chalmers Railway Mechanics (CHARMEC) and the Vehicle and Traffic Safety Centre at Chalmers (SAFER) with Assoc.Prof. M. Klomp as Chairperson of the Symposium and Prof. J. Nielsen and Assoc.Prof. F. Bruzelius as International Scientific Committee Chairs.

A total of 341 abstracts were submitted of which 130 were road related and 211 were rail related.

Total number of the oral and poster papers is 226. 141 papers were accepted for oral presentation including 59 road papers and 82 rail papers and a further 85 papers were accepted for poster presentation. Additionally there were five invited state-of-the-art presentations/papers:

1. Modelling, simulation and evaluation of ground vibration caused by rail vehicles
2. Train–track–bridge dynamic interaction: a state-of-the-art review

3. Trends in vehicle motion control for automated driving on public road
4. Uncertainty quantification in vehicle dynamics
5. Connected and automated road vehicles: state of the art and future challenges

   Papers 1-4 were published in a special issue of *Vehicle System Dynamics (VSD)* issued to all delegates at the symposium, paper 5 in a later issue of *VSD*.

366 delegates attended the symposium from 28 countries.

Several technical visits related to road (AstaZero, driving simulators at Chalmers, VTI and Volvo Cars) and railway vehicles (The West Link, SweMaint) were arranged, as well as a visit to the Port of Gothenburg.

10th International Munich Chassis Symposium, Munich, Germany, 25th and 26th June 2019

The symposium is organized by "Automobil Technische Zeitschrift" (ATZ) cooperating with IAVSD.

The increasing automation of driving functions and the electrification of powertrains present new challenges for the chassis with regard to complexity, redundancy, data security, and installation space. At the same time, the mobility of the future will also require entirely new vehicle concepts particularly in urban areas. The intelligent chassis must be connected, electrified, and automated in order to be best prepared for this future, which had been the main focus of the conference.

The 3rd IAVSD Workshop on Dynamics or Road Vehicles was held in Ann Arbor, USA, from 28th to 30th April 2019

The workshop was organized by University of Michigan researchers from the departments of Mechanical Engineering, Aerospace Engineering, Naval Architecture & Marine Engineering, Civil and Environmental Engineering, Electrical Engineering and Computer Science with 137 participants (from US, Europe and Asia), 47 students and 28 speakers.

The workshop brought together scientists and engineers from academia and industry in the field of Connected and Automated Vehicles to present and exchange their latest ideas and breakthroughs. A related Special Issue of *Vehicle System Dynamics* on Connected and Automated Vehicles is scheduled for 2020.

Report composed by Manfred Plöchl

ICA (International Commission for Acoustics)
www.icacommission.org

***1. ICA Governance*.** The ICA is composed of the acoustical societies from member countries plus international affiliate organizations which themselves have individual members distributed across the world and also organize international conferences every one or two years.

Since October 1, 2019, and following the elections held during the General Assembly in Aachen, Germany, the new board consists of the following members: The Executive Board members are President Mark Hamilton, Vice President Jeong-Guon Ih, Past President Michael Taroudakis, Secretary General Antonino Di Bella, and Treasurer Martin Ochmann. The other Board members are Manfred Kaltenbacher (Austria), Bruno Masiero (Brazil), Umberto Berardi (Canada), Jorge Arenas (Chile), Fenghua Li (China), Torsten Dau (Denmark), Jean-Dominique Polack (France), Akio Ando (Japan), Antonio Pedrero (Spain), and Jo Webb (United Kingdom).

The ICA is now composed of 46 Member Societies, 8 International Affiliate Members, and 6 Observer Members.

The 2019 ICA Board meetings were held in Aachen, Germany, on September 8 and 12. The meeting venues were Aachen University (September 8) and Eurogress Congress Center (September 12). Eurogress was the location of the 23rd International Congress on Acoustics, which was held September 9-13. The ICA General Assembly convened on September 11 at Eurogress, at which time the Board members were elected and financial matters were approved.

2. International Year of Sound 2020

The Year 2020 was declared by the ICA as an International Year of Sound (IYS 2020). The concept of an International Year of Sound (IYS) commenced in the board meetings from around 2010 and was formally approved at the time of the General Assembly in Buenos Aires in 2016.

The IYS 2020 is considered as a contribution to the UNESCO Charter of Sound and resolution 39C/59 on the importance of sound in today's world — promoting best practices and aiming at highlighting the importance of sound in all aspects of life on Earth. In this respect, the activities during the year will aim to raise the understanding of sound-related issues at the international, national and local levels. The motto of IYS 2020 is "Importance of Sound for Society and the World".

The organization of IYS 2020 involves a combination of centrally funded events such as the opening on 31 January in Paris, the production of a short film on the importance of sound in our life (sponsored by I-INCE), an international student competition (sponsored by Head Genuit Foundation), and events organized and funded by ICA Members and by La Semaine du Son, which is a partner Organization for the IYS 2020. The events are all focused on outreach and education to highlight all the aspects of acoustics.

The year 2019 was devoted to the preparation of all the IYS 2020 activities, including the creation of the official site of IYS 2020 (www.sound2020.org), which now includes a lot of information on activities, projects and products related to the IYS 2020. Overall, the website provides a location for consolidating resources and will be kept open several years after the end of the official celebration of IYS 2020.

The opening of IYS 2020 was held in Paris (31 January 2020) as originally planned. However, due to the spread of the Covid-19, the ICA made a decision in March that IYS would become a 2-year celebration of sound. The extension allows for both postponed events and new events and activities scheduled for 2021 to be included in the list of IYS events.

The ICA is grateful for the support received so far by IUTAM and hopes that it will assist by encouraging the entire IUTAM community to consider activities promoting IYS 2020 for its full 2-years duration.

***3. ICA Registration*.** The International Commission for Acoustics is now registered under Spanish Law. More specifically, it is now included in the "Spanish National Register of Associations: Section 1st – National Number 618394". The confirmation of registration was received by the Spanish Ministry for Home Affairs and the official start date was October 3, 2019. The official registration of the ICA became necessary following new requirements for all International Scientific Societies which have to declare a formal address for their office and obtain regular tax status.

The Registered Office of the Commission has now been established in Madrid, Calle Serrano 144, postal code E-28006, Spain, which is also the registered Office of the Spanish Acoustical Society (SEA). The new Internal Regulations were approved

during the ICA Board meeting and General Assembly held in Aachen in September 2019.

4. Symposium Support. The ICA allocates up to EUR 5,000 annually for sponsorship of specialty symposia in acoustics. In conjunction with the Acoustical Society of America (ASA), the ICA accepts applications for allocation of up to USD 2,000 for specialty symposia that comply with the conditions for the special ASA support.

There were eight applications for 2020 funding from the ICA/ASA Specialty Symposia sponsorship program. These applications were evaluated by a committee comprised of the ICA Executive Committee and the ASA Committee on International Research and Education (CIRE), and the funding allocations were approved by the ICA Board.

The symposia chosen to receive funding are:

- Annual Physics Symposium APS 2020 - International Year of Sound (India)
- 24th Conference on Acoustic and Biomedical Engineering (Poland)
- Baltic-Nordic Acoustic Meeting 2020 (Norway)
- 36th Symposium on HYDROACOUSTICS 2020 (Poland)
- Current trends on ocean sound and impacts on marine biodiversity (Portugal)
- ICUA2020 International Conference on Underwater Acoustics (UK)
- 67th Open Seminar on Acoustics (Poland)

Several of these symposia were postponed due to Covid-19.

5. ICA Congress. The 23rd International Congress on Acoustics (ICA 2019) took place in Aachen during September 9-13, 2019. It included the "4th EAA (European Acoustics Association) Euroregio" congress. With a total of 1,700 participants from 57 countries, including 590 students, the conference was a success. There were 1,300 conference contributions in 147 structured sessions that were presented as oral and poster presentations. In addition to the extensive scientific program, there were various additional events that included the activities of the EAA Young Acousticians Network (YAN), and many other groups of young researchers. Furthermore, there was a workshop on the subject of science communication with invited experts, and a contact fair with industry representatives on the subject of career paths for young academics and professionals in acoustics.

During the opening ceremony the ICA Early Career Award was presented to Prof. Jérémie Voix, President of the Canadian Acoustical Society, and a special award for

his long term contributions to ICA was also presented to Antonio Perez-Lopez, President of the Spanish Acoustical Society and outgoing treasurer of the ICA.

Before the ICA congress, during September 6-8, the EAA Summer School for young acousticians took place in Leuven, Belgium, with 114 participants. The three ICA Satellite Symposia,

- EAA Spatial Audio Signal Processing Symposium in Paris
- International Symposium on Room Acoustics in Amsterdam
- International Symposium on Musical Acoustics in Detmold

were well received by the participants. The month of September 2019 thus had many varied international events related to acoustics.

The Congress Co-Chairs were Prof. Michael Vorländer, former President of the ICA, and Prof. Janina Fels, each faculty members at RWTH Aachen University. More information on the Congress can be found on the website www.ica2019.org.

Report composed by Mark Hamilton and Michael Taroudakis

ICF (International Congress on Fracture)
www.icfweb.org

The 15th International Conference on Fracture will take place in Atlanta, Georgia, USA between June 13-18, 2021. Downtown Atlanta is the heart of the 9th largest metro area in the United States. Atlanta has flights offering non-stop service to more than 150 U.S. destinations and 60 international destinations and boasts many world-class attractions, making it the 7th most visited city in the U.S. The conference will be hosted at the Omni Hotel and the Georgia World Congress Center. Low cost housing will also be available in nearby Georgia Tech dormitories.

The conference is held every four years, and ICF15 will be returning to the continental United States after 32 years. It will focus on the latest interdisciplinary research in the field of fracture and is a must attend event for senior and young researchers, students, post-doctoral fellows, and industry professionals working in the field of fracture throughout the world. The web site may be found at www.icf15.org

The ICF15 program can accommodate up to 20 symposia. Select papers from the symposia will be published in special volumes of international journals with the symposium organizers serving as guest editors. Plenary lecturers have been selected.

They include David McDowell, Robert McMeeking, Robert Ritchie, Subra Suresh, R. Narasimhan, Tong-Yi Zhang, A.T. Yokobori, Claudio Ruggieri, Bill Curtin, David Wilkinson and Sylvie Pommier.

The ICF web site may be found at www.icfweb.org

Report composed by Leslie Banks-Sills

ICHMT (International Centre for Heat and Mass Transfer)
www.ichmt.org

ICHMT organized one international symposium and sponsored six in 2019. Details of these meetings can be found on the web site, http://www.ichmt.org.

Meetings Organized by ICHMT:

"*9th International Symposium on Radiative Transfer, RAD-19*", 3 – 7 June 2019, in Athens, Greece. The Symposium Chairmen were Prof. Brent Webb, Brigham Young University, USA and Dr. Denis Lemonnier, ISAE-ENSMA, France.

Meetings Co-Sponsored by ICHMT:

"*7th METTI Advanced School on Thermal Measurement and Inverse Techniques*", 29 September – 4 October 2019, Porquerolles island in Hyères, France. The symposium Chairman was Professor Denis Maillet, University of Lorraine, France.

"*5th International Workshop on Heat/Mass Transfer Advances for Energy Conservation and Pollution Control, IWHT-19*", 13-16 August, 2019, in Novosibirsk, Russia. The symposium Chairmen were Professor Aleksandr Pavlenko, Kutateladze Institute of Thermophysics, Russia and Prof. S.V. Alekseenko, Kutateladze Institute of Thermophysics, Russia.

"*14th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, HEFAT-2019*", 22-24 July, 2019, in Wicklow, Ireland. The symposium Chairman was Professor Josua Meyer, University of Pretoria, South Africa.

"*11th Mediterranean Combustion Symposium, MCS-11*", 16-20 June, 2019, in Tenerife, Spain. The symposium Co-Chairmen were Dr. Federico Beretta, Consiglio Nazionale delle Ricerche, Napoli, Italy; Prof. Nevin Selcuk, Middle East Technical

University, Ankara, Turkey; Prof. Mohy S. Mansour, American University in Cairo, Egypt and Prof. Andrea d'Anna, Università degli Studi di Napoli Federico II, Naples, Italy.

"*4th Thermal and Fluids Engineering Conference, TFEC-2019*", 14 – 17 April 2019, in Westin Las Vegas Hotel & Spa, Las Vegas, NV, USA. The Symposium Co-Chairman was Dr. Darrell W. Pepper, University of Nevada, USA.

"*The 12th International Conference on Thermal Engineering Theory and Applications, ICTEA-2019*", 23 – 26 February 2019, in Gandhinagar, Gujarat, India. The Symposium Co-Chairmen were Professor Surrendra Singh Kachhwaha, Pandit Deendayal Petroleum University, India and Professor Ziad Saghir, Ryerson University, Canada.

The organization of several future meetings have continued. These are:

"*10th International Symposium on Turbulence Heat and Mass Transfer, THMT-20*", 6 – 9 July 2020, in St. Petersburg, Russia. The Symposium Chairman is Professor D. Markovich, Kutateladze Institute of Thermophysics, Siberian Branch of Russian Academy of Sciences, Russia. The Symposium Co-Chairmen are Professor K. Hanjalic, Delft University of Technology, The Netherlands; Professor K. Suga, Osaka Prefecture University, Japan. Detailed information can be found on the Web site: http://www.thmt-20.org/

"*8th International Symposium on Advances in Computational Heat Transfer, CHT-20*", 16 – 20 August 2020, in Rio de Janeiro, Brazil. The Symposium Co-Chairmen are Professor Yogesh Jaluria, Rutgers University, USA and Professor Helcio R. B. Orlande, Federal University of Rio de Janeiro, UFRJ, Brazil. Detailed information can be found on the Web site: https://www.ichmt.org/cht-20

"*3rd International Symposium on Convective Heat and Mass Transfer, CONV-21*", 13-18 June, 2021, Çeşme, Turkey. The symposium Chairmen are Dr. Mourad Rebay, University of Reims, France and Dr. Alpaslan Turgut, Izmir, Turkey. Detailed information can be found on the Web site: https://www.ichmt.org/conv-21

"*4th International Symposium on Gas Turbine Heat and Mass Transfer, Turbine-21*", 6-11 August 2021. The symposium Chairmen are Professor Richard Goldstein, University of Minnesota, USA and Professor Terrence W. Simon, University of Minnesota, USA. Web site is under construction.

"*5th Thermal and Fluids Engineering Conference, TFEC-2020*", 5 – 8 April 2020, in New Orleans, LA, USA. The Symposium Co-Chairmen are Dr. Ting Wang,

University of New Orleans, USA and Dr. Michael W. Plesniak, The George Washington University, USA. Detailed information can be found on the Web site: https://www.astfe.org/tfec2020/

"*13th International Conference on Thermal Engineering Theory and Applications, ICTEA-2020*", 12 – 14 June 2020, in Baku, Azerbaijan. The Symposium Co-Chairmen are Professor Yusif Abdullayev, Baku Engineering University, Azerbaijan and Professor M.Ziad Saghir, Ryerson University, Canada. Detailed information can be found on the Web site: https://www.ictea.ca/

"*15th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, HEFAT-2020*", 20-22 July, 2020, in Amsterdam, Netherlands. The symposium Chairman was Professor Josua P. Meyer, University of Pretoria, South Africa.

Report composed by Tugba Gün

ICM (International Conference on the Mechanical Behaviour of Materials)
https://www.icm-13.com

The 13th International Conference on the Mechanical Behaviour of Materials (ICM-13) was held at Melbourne, Australia on 11-14 June 2019. The venue of ICM-13 was the Storey Hall, RMIT University, Melbourne. Totally 229 persons had attended the conference from 29 countries. The ICM Executive Committee Meeting was held on 13th June, and the president of the International Congress on Mechanical Behaviour of Materials (ICM) was changed from Prof. Detlef Löhe (the Karlsruhe Institute of Technology) to Prof. Raj Das (RMIT University). Prof. Tilmann Beck (University of Kaiserslautern) and Prof. Tomáš Kruml (Czech Academy of Sciences) were admitted to newly join the executive committee as the "Representatives of Each National Delegates". Based on the bid presentations, a voting was conducted on 12th June (Attendees: Prof. R. Das, Prof T. Beck, Prof. Z. Xia and Prof. Y. Uematsu), and Chile was selected as the location of the next conference, ICM-14, which will be chaired by Prof. E.S Flores of the University of Santiago. The tentative date and venue are July 2023 and the campus of the University of Santiago. The ICM Executive Committee is planning to add some new members for the committee from other additional countries as the "Representatives of Each National Delegates".

Report composed by Yoshihiko Uematsu

ICR (International Committee on Rheology)
http://icrheology.org/dat/index.html

The science of rheology is well-represented throughout the world. The major rheology meetings in North America, Europe, and Asia continue to attract greater numbers of registrants. The 2016 Congress in Kyoto attracted 800 participants from 42 countries. This healthy growth in the rheological community reflects the vital position of our science in addressing world-wide technological challenges in energy, the environment, and manufacturing.

The current roster of active member societies of the ICR can be found on the Committee's website (http://icrheology.org/dat/index.html) and includes representtation from 30 countries.

The XVIIIth International Congress on Rheology will be held at Rio de Janeiro, Brazil. It will take place from December 13 to 18, 2020 (http://icr2020.com), organized by Brazilian Society of Rheology. Chairman of the Organizing Committee is Prof. Paulo de Souza Mendes, PUC-Rio.

Beginning in 2023, the International Congresses on Rheology will be held on a 4 year cycle. This adjustment in scheduling was made to avoid overlap with the ICTAM meetings. The XIXTH International Congress on Rheology will be held in Athens, Greece in August, 2023

Report composed by Gerald G. Fuller

ICTS (International Congresses on Thermal Stresses)
http://ts2019.zju.edu.cn

The 12th International Congress on Thermal Stresses (TS 2019) was held in Hangzhou, China, on June 1-5, 2019. The TS 2019 was organized at Zhejiang University, one of the top universities in China, and was sponsored by International Union of Theoretical and Applied Mechanics (IUTAM) as well as the National Natural Science Foundation of China (NSFC), with significant support from Institute of Applied Mechanics and School of Aeronautics and Astronautics, Zhejiang University. Chair and general organizer of the Congress was Weiqiu Chen of Zhejiang University with Richard B. Hetnarski and Naotake Noda as Co-Chairs. Information about TS 2019 can be found on the website

http://ts2019.zju.edu.cn/index.asp?navid=1.

The TS 2019 received 133 abstracts and 62 full papers from 16 countries and regions. There were 154 participants, among them 106 from China (including Hong Kong and Taiwan), and 48 from other countries, including 6 from U.S.A, 2 from Australia, 15 from Japan, 8 from Poland, 2 from Sweden, 4 from India, 4 from Ukraine.

There were 6 plenary lectures presented by Daining Fang (China), Moncef Aouadi (Tunisia), Chee Lim (Hong Kong), Lars-Erik Lindgren (Sweden), Jan Taler (Poland), and Kumar Tamma (U.S.A.). The full papers representing the plenary lectures were published in a special issue of the Journal of Thermal Stresses, published before the start of the Congress. TS 2019 comprised 21 sessions, and the level of presentations was high. In addition, the social part of the Congress was excellent, and included the excursion by boat on the West Lake (a part of a National Park), a campus tour and a visit to the laboratories.

During the banquet, held at the Hangzhou Cuisine Museum, Diplomas of Recognition were presented to Michele Ciarletta and Vincenzo Tibullo, organizers of the previous, TS 2016, Congress which was held in Salerno, Italy. Also, Kumar Tamma Chair of the next, TS 2021, Congress, invited participants to attend, TS 2021. The TS 2021 Congress will be held in Minneapolis, U.S.A. Information may be found on the website: ts2021.umn.edu.

Report composed by Richard B. Hetnarski

IIAV (International Institute of Acoustics and Vibration)
www.iiav.org

The organizational structure of IIAV, the International Institute of Acoustics and Vibration, is: president, president-elect, two vice-presidents, secretary, and treasurer. The current officers are: President: Eleonora Carletti, Italy; President-Elect, Maria Heckl, UK; Vice-President for Professional Relations, Marek Pawelczyk, Poland; Vice-President for Communications, Hans Boden, Sweden; Secretary, Rupert Thornely Taylor, UK; Treasurer, Zhuang Li, USA. There are twenty directors from different countries. IIAV also has an Executive Director, Malcolm Crocker, USA. The president serves a two-year term, the vice-presidents serve overlapping four-year terms, and the directors serve overlapping four-year terms. IIAV cooperates with scientific and engineering societies and institutes around the world and lists 52 such affiliated organisations on its website at www.iiav.org .

The twenty-first and twenty-second IIAV elections were held in 2018-2019 in which all members voted on candidates for ten new director positions, each with five-year

terms starting on the years noted. These elected directors will replace the directors whose four-year terms have expired. The directors elected were: Lars Hakansson (Sweden) 2018; Akira Ikuta (Japan) 2018; Wim van Keulen (The Netherlands) 2018; Woon Siong Gan (Singapore), 2018; Serge Dos Santos (France) 2018; Joachim Boes (Germany) 2019; Andy Chung (Macau) 2019; Claes Hedburg (Sweden) 2019; Bert Roozen (Belgium) 2019; and Bor-Tsuen Wang (Taiwan) 2019. An IIAV Honorary Fellow award was made in 2018 to Prof. Toru Otsuru, Japan, in recognition of his scientific contributions in acoustics.

IIAV holds international congresses on sound and vibration annually in major cities all around the world. The Twenty-fifth International Congress on Sound and Vibration (ICSV25) took place in Hiroshima, Japan, 8-12 July 2018. ICSV25 was held in cooperation with the Japanese Acoustical Society. A total of 1029 abstracts from 52 different countries on all areas of acoustics, noise and vibration were received. The Twenty-sixth International Congress on Sound and Vibration (ICSV26) took place in Montreal, Canada, 7-11 July 2019. ICSV26 was held in cooperation with the Canadian Acoustical Association. A total of 1015 abstracts from 55 different countries on all areas of acoustics, noise and vibration was received.

Plenary lectures were presented by engineers and scientists from around the globe. During ICSV25 in Japan, the five lectures were: Community Noise – An Overview, Marion Burgess, Australia; The World of Sound, Malcolm Crocker, USA; 35 Years History of Modern Modal Analysis, Svend Gade, Denmark; Structural Health Monitoring and NDT, Len Gelman, USA; Mechanisms of Bone-Conduction Perception, Seiji Nakagawa, Japan; Acoustic Metamaterial, Jun Yang, China.
During ICSV26 in Canada the following plenary lectures were given: Variability in Spoken Word and Speech Recognition, Meghan Clayards, Canada; Acoustical Behavior of Bone-Implant Interface, Guillaume Haiat, France; Noise Transmission and Absorption of Lightweight Structures, Bilong Liu, China; Vibration of Lightweight, Compliant Gears, Robert Parker, USA; Porous Materials for Noise Control, Raymond Panneton, Canada.

The ICSV25 and ICSV26 technical proceedings were made available to all delegates at the congresses themselves on flash memories. ICSV25 and ICSV26 proceedings include all abstracts and the full texts of all the accepted papers and are now also available open-access to everyone on the IIAV website.

The International Journal of Acoustics and Vibration (IJAV), the quarterly refereed journal of IIAV, continues to receive a steady flow of good papers and to be published on schedule. The full papers of current and all back issues of IJAV are displayed on the IIAV website. Issues of IJAV have now been made open-access for all interested

scientists and engineers around the world to view starting with the first issue published in 2016. Each issue contains on average 15 to 20 full papers.

Report composed by Malcolm J. Crocker

IMSD (International Association of Multibody System Dynamics)
www.itm.uni-stuttgart.de/imsd

IMSD is a successor to the Joint International Conference on Multibody System Dynamics formed on May 26, 2010. It is the essential mission of the Association to establish biannual international conferences on multibody system dynamics that address computational mechanics, nonlinear dynamics and control design; to foster research on the dynamics of multibody systems and related fields; and to promote international cooperation between scientists and engineers in industry.

The IMSD conference is a biannual series that serves as a meeting point for the international multibody community and as an opportunity to exchange high-level, current information on the theory and applications of multibody systems. As a rapidly growing branch of engineering dynamics, Multibody System Dynamics is seeing more and more use, and is becoming increasingly important in the development of complex systems. The continual new challenges faced by the IMSD community demand productive conference forums where ideas are freely exchanged and a spirit of cooperation is encouraged.

Information about IMSD can be found at www.itm.uni-stuttgart.de/imsd including the activities, committees, bylaws, and more.

In 2019, the annual meeting of the IMSD International Steering Committee was held in conjunction with the ECCOMAS Multibody Dynamics Conference[1] from July 15-18 in Duisburg, Germany. Approximately 221 attendees from 27 different countries enjoyed 165 abstracts and presentations organized into 9 sessions:

- Biomechanics
- Contact and Constraints
- Mechatronics, robotics, and control
- Flexible multibody dynamics
- Formulations and numerical methods
- Optimization and sensitivity analysis
- Efficient simulation and real-time applications

[1] https://www.uni-due.de/eccomasmultibody2019/

- Education, validation and software development
- Applications in vehicle dynamics, aerospace and medical devices

IMSD continues to vigorously promote multibody system dynamics events worldwide, including the International Symposium on Co-Simulation and Solver Coupling in Dynamics[2], to be held June 28 – July 1, in Ferrol, Spain.

Our flagship biennial conference and the 6th in the series, IMSD 2020[3], will be held in New Delhi, India, from 1-5 November. IMSD 2020 is being held in conjunction with the 10th Asian Conference on Multibody Dynamics, and a large number of attendees are expected.

IMSD displays some information on the association at the end of each number of the Springer journal *Multibody System Dynamics* which is the official journal of IMSD. This journal is the leading publication organ in multibody system dynamics.

Notable members of the International Steering Committee for IMSD include:

Jorge Ambrosio, Chairman of IMSD
John McPhee, Vice-Chairman of IMSD
Javier Cuadrado, Secretary of IMSD
Peter Eberhard, Representative of IMSD in IUTAM GA
Werner Schiehlen, Representative of IUTAM in IMSD ISC

Report composed by Jorge Ambrósio, John McPhee, and Javier Cuadrado

ISIMM (International Society for the Interaction of Mechanics and Mathematics)
http://isimm.unipg.it

The International Society for the Interaction of Mechanics and Mathematics fosters the interaction of mathematics and mechanics. The Society was founded in 1977 in Kozubnik in Southern Poland. There had been a planning period before that time which had culminated in a meeting in Lecce, Apulia, Italy two years earlier. The main activities of the Society consist in the organization of the Symposium on Trend in Applications of Mathematics to Mechanics (STAMM), the publication of the book series Interaction of Mechanics and Mathematics Series (IMM) and, more recently, special issues gathering contributions from STAMM participants.

[2] http://lim.ii.udc.es/events/cosim2020/index.html
[3] http://imsdacmd2020.iitd.ac.in/

The 2019 activity of the ISIMM consisted in the publication of the special issue "Mathematics & Mechanics: Natural Philosophy in the 21st Century", on the International Journal of Nonlinear Mechanics (link), edited by Giuseppe Saccomandi, Anja Schlömerkemper, and Giuseppe Tomassetti. The articles in the special issue cover: instabilities and bifurcations in elasticity, with applications to composites and dielectric elastomers; growth and remodeling; elastic singularities in thin shells; liquid crystals; cavities filled with compressible fluids; shape deformation; stochastic response of elastic bodies; morphing of biological structures; homogenization of dielectric composites and graphene sheets. Mathematically this covers existence of weak solutions, stability analysis, metric's transport, and homogenization theory. In all these papers, new insights in mechanical problems are made possible with the aid of mathematics, or novel mathematical results are suggested by problems in mechanics.

As of January 1st, 2019 the Executive Committee is composed as follows

(i) Officers: G. Saccomandi (president), A. Visintin (vice-president), G. Tomassetti (secretary-treasurer).

(ii) Ordinary members: H-D. Alber, P. Colli, M. Kruzik, A. Miranville, A. Movchan, G. Mulone, E. Rocca, A. Schlömerkemper

Report composed by Giuseppe Tomassetti

ISSMO (International Society for Structural and Multidisciplinary Optimization)
www.issmo.net

1. Executive Committee Elections:
ISSMO held elections to elect new Members of the Executive Committee. Elections are held every four years, with only the standing President and Secretary-General ensured continuation on the new Executive Committee, typically in roles of Past President and Past Secretary-General.

Following a call for Nominations in which 15 candidates were identified, 341 electronic votes were recorded and 8 new EC members were identified. The new EC then appointed officers:

President: Wei Chen
Vice Presidents: Qing Li, Ming Zhou
Secretary General: H Alicia Kim
Treasurer: Erik Lund

Members: Pierre Duysinx, Xu Guo, Ole Sigmund
Past President: Gendong Cheng
Past Secretary General: James Guest

2. ISSMO Biennial World Congress on Structural and Multidisciplinary Optimization (WCSMO)

The ISSMO 2019 World Congress was held in Beijing, China, May 20-24.

Organizing Committee
Honorary-Chair: Gengdong Cheng, Yoon Young Kim, Gang Li, Hideyuki Azagami
Co-Chair: Xu Guo, Hai Huang

There were 623 registrants from 33 countries, with 475 oral presentations and 78 poster presentations.

The Conference Proceedings were published *Advances in Structural and Multidisciplinary Optimization, Proceedings of the 13th World Congress of Structural and Multidisciplinary Optimization (WCSMO13)*, Guo, X., Huang, H. (Eds.), Dalian University of Technology Electronic & Audio-Visual Press, 2019. Available at https://www.issmo.net/wp-content/uploads/WCSMO13-Proceeding.pdf

Select WCSMO-13 papers were also collected for a Special Issue appearing in *Structural and Multidisciplinary Optimization* (Springer Verlag) titled "Selected papers from 13th World Congress on Structural and Multidisciplinary Optimization" and is to be published in 2020.

WCSMO-14: ISSMO issued a call for proposals to host WCSMO-14 in 2021. The proposal to host WCSMO-14 in Boulder CO, USA, June 13-18, 2021, with Conference Chairman Prof. Kurt Maute, was selected.
https://www.wcsmo14.org

3. Young Researcher ISSMO/ Springer Prize

The ISSMO-Springer Prize 2017 was awarded to the following:
Mathilde Boissier (Ecole Polytechnique, France) "Laser path optimization for Additive Manufacturing", with Gregoire Allaire and Christopher Tournier as co-authors;

Weiming Wang (Delft University of Technology, the Netherlands) "Space-Time Topology Optimization for Additive Manufacturing: Concurrent Optimization of

Structural Layout and Fabrication Sequences", with Dirk Munro, Charlie Wang, Fred van Keulen and Jun Wu as co-authors.

The award ceremony will be held at the WCSMO-14 in Boulder CO, USA, 2021.

4. ISSMO endorsed the following international scientific meetings during 2019:

- Optimization Driven Architectural Design (OPTARCH2019), Amman, Jordan, 5-7 November, 2019.
- AIAA/ISSMO MAO 2019 – The 20th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Atlanta, GA, USA, 25-29 June, 2019.
- DAC/IDETC 2017 – The 45th Design Automation Conference of the International Design Engineering Technical Conference, Anaheim CA, USA, 18-21 August, 2019.

5. To date, ISSMO has endorsed the following international scientific meetings to be held in 2020:

- ACSMO 2020 – Asian Congress of Structural and Multidisciplinary Optimization, Seoul, Korea, 24-28 May, 2020. http://acsmo2020.org
- AIAA/ISSMO MAO 2020 - AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, San Francisco CA, USA 16-19 June, 2020.
- DAC/IDETC 2020 – International Design Engineering Technical Conferences and Computers and Information in engineering Confeence, St. Louis MO, 16-19 August 2020. https://event.asme.org/IDETC-CIE
- 25th ICTAM Symposium, Milan Italy, 23-28 August, 2020. https://www.ictam2020.org
- 14th WCCM and ECCOMAS Congress, Paris, France, 19-24 July 2020, https://www.wccm-eccomas2020.org/frontal/

Please consult the website www.issmo.net for more information about ISSMO.

Report composed by H. Alicia Kim and Wei Chen

LACCOTAM (Latin American & Caribbean Congress of Theoretical and Applied Mechanics)

There were no meetings or events of LACCOTAM in 2019.

WCB (World Council of Biomechanics)
https://wc-biomechanics.org

The objective of the World Council of Biomechanics is to provide permanence and stability for the periodic meetings of the World Congress of Biomechanics every 4 years, and to communicate information about the World Congress and any associated satellite meetings, as well as about the scientific priorities in Biomechanics, to as many people interested in the subject as possible. The next World Congress of Biomechanics is planned to be held in Taipei in 2022. The World Council of Biomechanics has the responsibility for selection of future meeting sites. The World Council also sponsors specialty meetings especially in countries in which biomechanics is an evolving discipline.

Activities of the Council in 2019 include:

1. Planning for Ninth World Congress of Biomechanics
July 2022 | Taipei

The Council negotiated and signed an MOU with the organizers of World Congress of Biomechanics in 2022.

The Council has held teleconferences with the organizers of World Congress of Biomechanics in 2022, reviewed documentation, and made suggestions to the organizers regarding various aspects of the conference.

The Council Chair, Professor Peter Hunter, inspected the venues during a visit to Taipei in November 2019.

2. Other Activities

The Council endorsed the 2020 Summer Biomechanics, Bioengineering, and Biotransport Conference (the conference is proceeding as a virtual conference due to COVID-19).

The Council developed guidelines for bids for future World Congresses of Biomechanics, and provided these to parties who have expressed interest in hosting the 2026 and 2030 congresses.

The Council discussed plans to intiate an international biomechanics researcher mentoring scheme.

For more details see https://www.wc-biomechanics.org

Report composed by Lynne Bilston

Reports on ISC and its Scientific Committees

ISC (International Science Council)
https://council.science/

As you may recall, the International Social Science Council (ISSC) and the International Council for Science (ICSU) formally merged following a meeting of and vote by the founding General Assembly (GA) in Paris on July 4, 2018, to which I participated as IUTAM president (see my previous report on this GA meeting). The resulting entity, International Science Council (ISC), is an (and the only) international, non-governmental, organization where scientists from both the natural and social sciences work together and engage in important scientific issues. It is also the largest global science organization of this type, with 40 international scientific unions (including IUTAM) and associations, and over 140 national and regional scientific organizations that include national academies and research councils of the various countries around the world.

ISC defines its vision around the theme of *"Science as a global public good"* and centers its efforts around i) science-for-policy to support scientific research and scholarship around the world, and ensure that scientific findings and data are taken into account in the development of policies, ii) policy-for-science to make sure policies further enable science and empower scientists, iii) scientific freedom and responsibility of scientists.

In 2019, ISC developed an Action Plan through the year 2021 to execute its vision of *Science as a global public good*. Four areas of the Action Plan have been identified: sustainable development, the digital revolution, science in policy and public discourse, and the evolution of science and scientific systems. More details in these four focus areas can be found by clicking the links below.

- The 2030 Agenda for Sustainable Development
- The Digital Revolution
- Science in Policy and Public Discourse
- The Evolution of Science and Science Systems

The aim of the Action Plan is to help catalyze action by inspiring ISC members to take part in the projects. Beginning in July of 2019, ISC focused on the first area: The 2030 Agenda for Sustainable Development. Two projects are currently in progress.

Project 1. International science for global sustainability: addressing complexity, supporting policy coherence. This project aims to rally and coordinate efforts of the

global scientific community on the United Nations' 17 Sustainable Development Goals (SDGs) with the goal to influence policy processes related to the 2030 agenda. ISC convened a global forum of science funders who met for the first time in July 2019 and agreed upon a decade of global sustainability funding action. Plans are in the works to continue hosting such a forum of science funders in the future as well as holding a global sustainability science leadership meeting.

Project 2. SDG interactions as a national policy driver. This project aims to expand on Project 1 and identify areas of greatest potential impact and prioritize efforts and analyze interactions across the 17 SDGs at the global, regional, national and local levels to inform collaboration and policy. ISC plans to develop an online tool for mapping and visualizing interactions across the 17 SDGs, and identifying associated priorities for action that can be used in different geographical or sectoral contexts. Workshops and materials are also proposed to aid in developing SDG interactions and science policy at the local level.

Respectfully submitted by Nadine Aubry, President of IUTAM

CODATA (Committee on Data)
http://www.codata.org/

2019 was a very rich year concerning the progression of DATA in engineering sciences and technology in general, and in theoretical and applied mechanics in particular.

The number of sessions on data-driven modelling in the different large events in the domain of mechanics and computational mechanics is increasing impressively, and conquering new disciplines other than the data-driven modelling of material constitutive equations, as for example digital twins. The hybrid paradigm also irrupted in many domains, where more than presenting models and data as concurrent approaches, they are the more and more presented as complementary, with data enhancing model's accuracy, and with models enabling data becoming smarter.

In 2019 and the beginning of 2020, different exchanges between CODATA (S. Hodson) and F. Chinesta (IUTAM representative in the data committee) existed, and many opportunities identified, because of the necessity in science and technology, without excluding industry, to better capitalize, assimilate, use and protect their valuable and sometimes precious data.

Different initiatives were initiated, while inviting CODATA, to participate:

- Conferences, in particular the IUTAM conference in data-driven mechanics, France, 2021.
- Industrial discussion group, under the auspices of the French AFM (French Association of Mechanics), on the use of data in industry, with technology leaders such as SAFRAN, EDF and AIRBUS, with two active workshops in 2019 and beginning of 2020.
- Engineering discussion groups, again under the auspices of the French AFM to check the penetration and prospective around data in the different mechanical disciplines: solid, fluids, processes, biomechanics, thermal, tribology, etc. with a plenary meeting end of 2019.
- The first meeting grouping all scientific groups (dealing with mathematics, mechanics and other areas and involving French academies, CNRS, INRIA, and other institutions) & CODATA initially scheduled May 11st in Paris, was postponed to September (if COVID slows down). This event should be starting point of a larger international initiative for end 2020.

Report composed by Francisco Chinesta

COSPAR (Committee on Space Research)
https://cosparhq.cnes.fr/

The Committee on Space Research (COSPAR) was established by the International Council for Science (ICSU) in 1958. The Purpose of COSPAR is "to promote at an international level scientific research in space, with emphasis on the exchange of results, information, and opinions, and to provide a forum, open to all scientists, for the discussion of problems that may affect scientific space research. The objectives of COSPAR are to be achieved through the organization of scientific assemblies, publications, or any other means." The 4th COSPAR symposium was held in Herzlyia, Israel, during 4-8 November 2019. The topic of the symposium was "Small satellites for sustainable Science and Development." The symposium brought together scientists and engineers from around the world, focusing on myriad applications of Cubesats on topics ranging from space science to earth observation to sustainability. The 43rd Scientific Assembly is scheduled to take place in Sydney, Australia, 28 January - 4 February 2021 to connect space research for global impact. Beginning in the fall of 2018, COSPAR undertook a thorough examination of how best to accomplish its mission on behalf of its constituents and stakeholders. The Strategic Action Plan for 2019-2023, which resulted from this examination, directs a series of actions by the leaders and volunteers of COSPAR that will, in fact, and perception establish COSPAR's unique importance for each of its constituents and stakeholders. The plan, which is available at

https://cosparhq.cnes.fr/assets/uploads/2020/01/COSPAR-Flyer2019_Constituents-Stakeholders-Final.pdf , contains specific actions for each constituent and stakeholder, all of which comply with the principles of COSPAR.

Report composed by Guruswami Ravichandran

SCOR (Scientific Committee on Oceanic Research)
https://scor-int.org/

Report will be provided when an IUTAM representative has been appointed.

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. XIII 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 ou messagerie électronique 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 ou par des moyens électroniques sur proposition formulée par le Bureau (cf. Art. XII 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.

**) *Article V adopté par l'Assemblée Générale de l'Union, le 24 juillet 2018 à Boston, États-Unis*

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. XII);
c) des membres cooptés par l'Assemblée Générale de l'Union;
d) le Secrétaire du Comité de Congrès (cf. art. XIII c);
e) les présidents des «Symposia Panels» Fluides et Solides nommés par le Bureau.

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. XI);
ii) les présidents des «Working Parties»;
iii) des représentants des « organisations associées adhérentes » (cf. art. IX)
iv) des représentants des pays candidats à l'adhésion;
v) 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 19 août 2014 à Lyngby, Danemark*

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 Adélaide, 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 Adélaide, 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 XII) 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. Les candidats aux sept postes doivent avoir été membres de l'Assemblée Générale à un moment de la période précédant de six 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 1er 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 19 août 2014 à Lyngby, Danemark*

XIII******* L'Assemblée Générale désigne un Comité permanent des Congrès (dorénavant noté CC) chargé d'organiser à intervalles réguliers les Congrès Internationaux de Mécanique Théorique et Appliquée (ICTAM).

a) Le Président de l'Union préside aussi le CC.

b) Le CC nomme un Secrétaire parmi ses membres, sous entendu que cette personne soit d'accord pour être nommée. A partir de la recommandation du CC, l'Assemblée Générale élit le Secrétaire pour un mandat de quatre ans, renouvelable une fois. Il est souhaitable que le Secrétaire ait été membre du CC pour au moins quatre ans avant d'être nommé.

c) Les Membres du CC sont élus par l'Assemblée Générale; ce sont des scientifiques actifs en mécanique théorique ou appliquée, n'appartenant pas nécessairement à l'Assemblée Générale. Avant une Assemblée Générale, le Secrétaire du CC sollicite des nominations des membres du CC, de l'Assemblée Générale, des organisations adhérentes et des organisations affiliées, et des autres sous-comités tels que les « Symposia Panels » et les « Working Parties ». La taille du CC ne doit pas dépasser un tiers de la taille de l'Assemblée Générale. Les mandats des membres du CC sont limités, sauf cas particuliers, à deux mandats successifs.

   Il est souhaitable que la composition du CC soit représentative des différentes branches des sciences mécaniques ainsi que de la diversité de la communauté des sciences mécaniques.

d) Le CC nomme un Comité Exécutif parmi ses membres. Le Président de l'IUTAM et le Secrétaire du CC jouent automatiquement les rôles respectifs de Président et de Secrétaire du comité exécutif. Quatre membres supplémentaires sont nommés. Le President du Congrès International de Mécanique Théorique et Appliquée à venir peut également être nommé au sein du comité exécutif « ex officio ». L'un des prérequis pour être nommé au sein du comité exécutif est d'avoir une solide expérience de grands congrès. A partir des nominations effectuées par le CC, l'Assemblée Générale élit le comité exécutif du CC. Les mandats des membres supplémentaires du comité exécutif CC sont limités à deux mandats successifs.

e) Les règles de fonctionnement du CC sont soumises à l'approbation de l'Assemblée Générale.

*******) *Article XIII adopté par l'Assemblée Générale de l'Union, le 19 août 2014 à Lyngby, Danemark*

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 Adélaide, Australie*

XV Le nombre des 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 Adélaide, 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 à chaque fois que l'Assemblée Générale se réunit. Typiquement, cela veut dire tous les deux ans, à l'occasion de l'Assemblée Générale entre congrès et à l'occasion du Congrès International.

2. Pendant un Congrès International, le CC passe en revue les propositions pour le Congrès International suivant et sélectionne le lieu par un vote des membres du CC présents (les votes par procuration ne sont pas autorisés). Ce processus de sélection se déroule au cours de deux réunions distinctes du CC.

3. Le Comité Exécutif est chargé de prendre au nom du CC 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 Secrétaire doit rester en contact avec tous les membres du CC et les solliciter lorsqu'il y a des questions importantes à traiter.

4. L'organisation effective d'un Congrès est confiée à un Président et à un Secrétaire-Général du Congrès, identifiés par l'organisation qui invite. Le Président et le Secrétaire-Général du Congrès sont responsables de tous les aspects du succès du Congrès, et en particulier de la publication des Comptes rendus du Congrès. Le Président et le Secrétaire-Général du Congrès maintiendront un dialogue constant avec le Comité Exécutif, feront un rapport annuel au Comité Exécutif et un rapport au CC à chaque réunion du CC, depuis le moment où le lieu a été choisi jusqu'à ce que le Congrès ait eu lieu.

5. Le Président et le Secrétaire-Général du Congrès devront obtenir l'approbation du CC (normalement par l'intermédiaire du Comité Exécutif) pour toutes les questions relevant de la politique générale du CC, en particulier pour celles qui concernent:
   - 5.1. le but du Congrès;
   - 5.2. la sélection des communications pour le Congrès;
   - 5.3. le choix des conférences générales pour le Congrès;
   - 5.4. la désignation des présidents de sessions du Congrès;
   - 5.5. les principes généraux régissant les arrangements financiers du Congrès.

6. Les organisateurs percevront, de tous les membres du congrès, une contribution afin de couvrir les dépenses administratives du CC. Ces contributions seront reversées à

l'IUTAM immédiatement après le congrès. Le montant de ces contributions restera du même ordre de grandeur de congrès à congrès.

*) *Procédure adoptée par l'Assemblée Générale de l'Union, le 19 Août 2014 à Lyngby, Danemark*

Règles 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 doit 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*

Règles 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 or notification via

electronic mail 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 or by electronic means upon proposals made by the Bureau (Article XII); 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.

**) *Article V adopted by the General Assembly on July 24, 2018, in Boston, USA*

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;
d) the Secretary of the Congress Committee (Article XIII c);
e) the Chairs of the Fluids and Solids Symposia panels appointed by the Bureau.

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) chairmen of the Working Parties;
iii) representatives of adhering associated organisations (Article IX);
iv) representatives of countries applying for membership;
v) representatives of committees and groups of scientists, if so decided by the General Assembly.

***) *Article VI adopted by the General Assembly on August 19, 2014, in Lyngby (Denmark)*

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. The candidates for all seven positions must have been full, voting members of the General Assembly at some time within the six 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 are 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 XII adopted by the General Assembly on August 19, 2014, in Lyngby (Denmark)*

XIII.******* The General Assembly establishes a standing Congress Committee (henceforth abbreviated CC) 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 chair of the CC.

b) The CC shall nominate a Secretary from its membership subject to that person's willingness to be nominated. Based on the CC nomination, the General Assembly elects the Secretary of the CC for a four-year term with the possibility of renewal for a second term. It is desirable that the Secretary should have been a member of the CC for at least four years prior to nomination.

c) Members of the CC are elected by the General Assembly as individuals active in theoretical and applied mechanics and need not be members of the General Assembly. Prior to a General Assembly, the Secretary of the CC shall invite nominations from members of the CC, the General Assembly, Adhering and Affiliated Organizations, and any appropriate subcommittees, such as the Symposia Panels and Working Parties. The size of the CC shall not exceed one-third the size of the General Assembly. Terms of service as a member of the CC shall generally be limited to two, successive four-year terms.
It is desired that the composition of the CC be representative of the various mechanics disciplines, and of the diversity of the mechanics community.

d) The CC shall nominate an Executive Committee from its membership. The President of IUTAM and the Secretary of the CC automatically serve as Chair and Secretary of the Executive Committee, respectively. Four additional members shall be nominated. The President of the upcoming International Congress may also be appointed to the Executive Committee ex officio. Experience with large congresses is a desirable quality of nominees for the Executive Committee. Based on the CC nominations, the General Assembly elects the Executive Committee of the CC. Terms of service of the additional members on the Executive Committee of the CC are generally limited to two four-year terms.

e) The rules of procedure of the CC shall be approved by the General Assembly.

*******) *Article XIII adopted by the General Assembly on August 19, 2014, in Lyngby (Denmark)*

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 XVII adopted by the General Assembly on August 28, 1994, in Amsterdam, Netherlands*

Rules of procedure for the Congress Committee (CC) of IUTAM*

1. The CC shall hold meetings whenever the General Assembly meets. Typically, this is every two years, during the General Assembly meeting between congresses and during the International Congress.

2. During an International Congress, the CC shall review proposals for the next International Congress and select the location by a vote of the CC members present

(i.e., proxy votes are not permitted). This selection process will typically be accomplished over two separate meetings of the CC.

3. The Executive Committee handles matters arising on behalf of the CC during the period between General Assemblies. At each General Assembly the Secretary of the CC reports on all such matters and their disposition since the last General Assembly. The Secretary should stay in close contact with the full membership of the CC and solicit input on substantive issues.

4. The actual organization of a Congress is delegated to a President and Secretary-General of the Congress, identified by the host. The President and the Secretary-General of the Congress are responsible to IUTAM for all aspects of the successful conduct of the Congress, including the publication of its Proceedings. The President and the Secretary-General of the Congress shall maintain an ongoing dialog with the Executive Committee, and shall make an annual report on progress to the Executive Committee, and a report to the full committee at every meeting of the CC, from the time the congress location is selected until the congress has been held.

5. The President and the Secretary-General of the Congress shall obtain the approval of the CC (often through the Executive Committee) with regard to all matters affecting the general policy of the CC, and in particular with regard to:
   - 5.1. the scope of the Congress;
   - 5.2. the screening of papers for the Congress;
   - 5.3. the selection of general lectures for the Congress;
   - 5.4. the appointment of chairs of sessions of the Congress;
   - 5.5. the broad principles regarding financial arrangements for the Congress.

6. Following the congress, the host will pay a fee to IUTAM equivalent to a percentage of the registration fee paid by all attendees. The Executive Committee will ascertain that the level of the fee is consistent from congress to congress.

*) *Procedure adopted by the General Assembly on August 19, 2014, in Lyngby, Denmark*

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 (GA) provided for in Article VI(c) of the Statutes.

2. Proposals, by members of the GA with voting rights, for Members-at-Large must be received by the Bureau at least three months before the meeting of the GA 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 GA such proposals as it deems will have at least a reasonable support by the GA, provided however that the total number of Members-at-Large is not to exceed approximately one eighth (1/8) of the total GA membership with voting rights. Such proposals will be circulated to all members of the GA 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 GA before its second session.

5. The GA will vote on those candidates mentioned in the proposals of §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. Since 2013, all these Annual Reports are available as pdf files on the IUTAM website.

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 IUTAM Newsletters are available from the IUTAM website.

c) Proceedings of IUTAM Symposia
Since 2018, the recommended form of publication of proceedings of IUTAM Symposia is the IUTAM Bookseries by Springer. The website of the series is
https://www.springer.com/series/7695

From 2011 to 2017, the official publisher for proceedings of IUTAM Symposia was Elsevier, under the Procedia IUTAM series. Procedia IUTAM is open access. All proceedings are freely available on the website of Procedia IUTAM
http://www.journals.elsevier.com/procedia-iutam

d) Proceedings of the International Congresses on Theoretical and Applied Mechanics (ICTAM)
Until 2008, they were only available by direct ordering from the publisher.

The Proceedings of ICTAM 2012 have been published under the Procedia IUTAM series. The link is www.sciencedirect.com/science/journal/22109838/10.

The Proceedings of ICTAM 2016 have been published under the Procedia IUTAM series. The link is www.sciencedirect.com/science/journal/22109838/20. All two-page abstracts of papers presented at ICTAM 2016 have been published by IUTAM and are available at www.iutam.org/publications/ictam-proceedings/ictam_2016.

e) Publications on the history of IUTAM
See page 148

Proceedings of IUTAM Symposia

The Proceedings of IUTAM Symposia published since 2010 are listed below.
A complete listing of all published Proceedings can be found at the IUTAM website https://www.iutam.org.

2010

10-1 *IUTAM Symposium on Computational Aero-Acoustics for Aircraft Noise Prediction* (Southampton, UK, March 29 – 31, 2010).
The Proceedings of the Symposium edited by Astley, Jeremy and Gabard, Gwenael have been published by Elsevier, 2011, as the first issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 1

10-2 *IUTAM Symposium on Nonlinear Stochastic Dynamics and Control* (Hangzhou, China, May 10-14, 2010).
The Proceedings of the Symposium edited by Zhu, W.Q., Lin, Y.K. and Cai, G. Q. have been published by Springer, 2011. ISBN 978-94-007-0731-3

10-3 *IUTAM Symposium on Dynamics Modeling and Interaction Control in Virtual and Real Environments* (Budapest, Hungary, June 7-11, 2010).
The Proceedings of the Symposium edited by Stépán, Gábor, Kovács, László L. and Tóth, András have been published by Springer, 2010.
ISBN 978-94-007-1642-1

10-4 *IUTAM Symposium on Bluff Body Wakes and Vortex-Induced Vibrations* (Capri, Italy, June 22-25, 2010).
The Proceedings of the Symposium edited by Leweke, Thomas and Williamson, Charles, have been published by Elsevier, as a special issue of the Journal of Fluids and Structures, Volume 27, Issues 5-6, Pages 637-884, July-August 2011.

10-5 *IUTAM Symposium on Nonlinear Dynamics for Advanced Technologies and Engineering Design (NDATED)* (Aberdeen, UK, July 27-30, 2010).
The Proceedings of the Symposium edited by Marian Wiercigroch and Giuseppe Rega have been published by Springer, 2013. ISBN 978-94-007-5742-4

10-6 *IUTAM Symposium on Surface Effects in the Mechanics of Nanomaterials and Heterostructures* (Beijing, China, August 8-12, 2010).
The Proceedings of the Symposium edited by Cocks, Alan and Wang, Jianxiang, have been published by Springer, 2012. ISBN 978-94-007-4910-8

10-7 *IUTAM Symposium on Human Movement Analysis and Simulation* (Leuven, Belgium, September 13-15, 2010).

The Proceedings of the Symposium edited by Jonkers, Ilse and Vander Sloten, Jos, have been published online, 2010, www.mech.kuleuven.be/iutam2010/IUTAM_proceedings/index.html. ISBN 978-94-6018-247-1

2011

11-1 *IUTAM Symposium on Mechanics of Liquid and Solid Foams* (Austin, USA, May 8-13, 2011).
The Proceedings of the Symposium edited by Kyriakides, Stelios and Kraynik, Andrew, have been published by Elsevier, as a special issue of the International Journal of Solids and Structures, 2012, and of the Journal of Rheology, Volume 56, Issue 3, Pages i-665, May 2012.

11-2 *IUTAM Symposium on Linking Scales in Computations: From Microstructure to Macro-scale Properties* (Pensacola, USA, May 17-19, 2011).
The Proceedings of the Symposium edited by Cazacu, Oana, have been published by Elsevier, 2012, as the third issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 3

11-3 *IUTAM Symposium on Human Body Dynamics* (Waterloo, Canada, June 5-8, 2011).
The Proceedings of the Symposium edited by McPhee, John and Kovecses, Jozsef, have been published by Elsevier, 2011, as the second issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 2

11-4 *IUTAM Symposium on Full-field Measurements and Identification in Solid Mechanics* (Cachan, France, July 4-8, 2011).
The Proceedings of the Symposium edited by Hild, F. and Espinosa, H.D., have been published by Elsevier, 2011, as the fourth issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 4

11-5 *IUTAM Symposium on Impact Biomechanics in Sport* (Dublin, Ireland, July 7-9, 2011).
The Proceedings of the Symposium edited by Michael Gilchrist and Manuel Forero Rueda have been published as a special issue of the Proceedings of the Institution of Mechanical Engineers, Part P: Journal of Sports Engineering and Technology, Volume 226, No 3-4, 2012.

11-6 *IUTAM Symposium on Computer Models in Biomechanics* (Stanford University, USA, August 29 – September 02, 2011)
The Proceedings of the Symposium edited by Holzapfel, Gerhard A. and Kuhl, Ellen have been published by Springer, 2013. ISBN 978-94-007-5464-5

11-7 *IUTAM Symposium on 50 Years of Chaos: Applied and Theoretical* (Kyoto, Japan, November 28 – December 2, 2011).
The Proceedings of the Symposium edited by Hikihara, Takashi have been published by Elsevier, 2012, as the fifth issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 5

11-8 *IUTAM Symposium on Bluff Body Flows*
(Kanpur, India, December 12-16, 2011).
The Proceedings of the Symposium edited by Mittal, Sanjay and Biswas, Gautam have been published as a special issue of the Journal of Fluids and Structures, Volume 41, Pages 1-186, August 2013.

2012

12-1 *IUTAM Symposium on Mobile Particulate Systems: Kinematics, Rheology and Complex Phenomena* (Bangalore, India, January 23-27, 2012).
The Proceedings of the Symposium edited by P.R. Nott, R.H. Davis, M. Reeks, D. Saintillan and S. Sundaresan have been published as a special issue of Physics of Fluids, Volume 25, Issue 7, July 2013.

12-2 *IUTAM Symposium on Advanced Materials Modelling for Structures*
(Paris, France, April 23-27, 2012).
The Proceedings of the Symposium edited by Altenbach, Holm and Kruch, Serge have been published by Springer, 2013. ISBN 978-3-642-35167-9

12-3 *IUTAM Symposium on From Mechanical to Biological Systems: an Integrated Approach* (Izhsvesk, Russia, June 5-10, 2012).
The Proceedings of the Symposium edited by V.V. Kozlov and A.V. Borisov have been published as a special issue of Regular and Chaotic Dynamics, Volume 18, No. 1-2, 2013.

12-4 *IUTAM Symposium on Waves in Fluids: Effects of Nonlinearity, Rotation, Stratification and Dissipation* (Moscow, Russia, June 18-22, 2012).
The Proceedings of the Symposium edited by Y. Chashechkin and D. Dritschel have been published by Elsevier, 2013, as the eighth issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 8

12-5 *IUTAM Symposium on Multiscale Problems in Stochastic Mechanics*
(Karlsruhe, Germany, June 25-28, 2012).
The Proceedings of the Symposium edited by C. Proppe and J.-M. Bourinet have been published by Elsevier, 2013, as the sixth issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 6

12-6 *IUTAM Symposium on Fracture Phenomena in Nature and Technology*
(Brescia, Italy, July 1-5, 2012).

The Proceedings of the Symposium edited by D. Bigoni, A. Carini, M. Gei and A. Salvadori have been published as a Special Issue of the International Journal of Fracture, Volume 184, Issues 1-2, November 2013, and by Springer, 2014. ISBN 978-3-319-04396-8

12-7 *IUTAM Symposium on Understanding Common Aspects of Extreme Events in Fluids* (Dublin, Ireland, July 2-6, 2012).
The Proceedings of the Symposium edited by M. Bustamante, A.C. Newell, R.M. Kerr and M. Tsubota have been published by Elsevier, 2013, as the ninth issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 9

12-8 *IUTAM Symposium on Topological Fluid Dynamics: Theory and Applications* (Cambridge, UK, July 23-27, 2012).
The Proceedings of the Symposium edited by H.K. Moffatt, K. Bajer and Y. Kimura have been published by Elsevier, 2013, as the seventh issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 7

12-10 *IUTAM Symposium on Particle Methods in Fluid Mechanics* (Lyngby, Denmark, October 15-17, 2012).
The Proceedings of the Symposium edited by J.H. Walther have been published by Elsevier, 2016, in the IUTAM e-Procedia series.
Procedia IUTAM Volume 18

2013

13-1 *IUTAM Symposium on Vortex Dynamics: Formation, Structure and Function* (Fukuoka, Japan, March 10-14, 2013).
The Proceedings of the Symposium edited by Y. Fukumoto have been published as a special issue of Fluid Dynamics Research, Volume 46, No. 3, 2014.

13-2 *IUTAM Symposium on Nonlinear Interfacial Wave Phenomena from the micro- to the macro-scale* (Limassol, Cyprus, April 14-18, 2013).
The Proceedings of the Symposium edited by Papageorgiou D.T., Smyrlis, Y.S., Vanden-Broeck J.-M. and Christodoulides, P. have been published by Elsevier, 2014, as the eleventh issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 11

13-3 *IUTAM Symposium on Recent Development of Experimental Techniques under Impact Loading* (Xi'an, China, May 6-10, 2013).
The Proceedings of the Symposium edited by Yulong Li and Han Zhao have been published as a special issue of the International Journal of Impact Engineering, Volume 79, 2015.

13-4 *IUTAM Symposium on Materials and Interfaces under High Strain Rate and Large Deformation* (Metz, France, June 17-21, 2013).
The Proceedings of the Symposium edited by S. Mercier, J.F. Molinari and D. Rittel have been published as a special issue of Mechanics of Materials, Volume 80, Part B, pp 163-374, 2015.

13-5 *IUTAM Symposium on Multiscale Modeling and Uncertainty Quantification of Materials and Structures* (Santorini Island, Greece, September 9-11, 2013).
The Proceedings of the Symposium edited by M. Papadrakakis and G. Stefanou have been published by Springer, 2014. ISBN 978-3-319-06330-0

13-6 *IUTAM Symposium on the Dynamics of Extreme Events Influenced by Climate Change* (Lanzhou, China, September 23-25, 2013).
The Proceedings of the Symposium edited by N. Huang have been published by Elsevier, 2016, as the seventeenth issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 17

2014

14-1 *IUTAM Symposium on Transition and Turbulence in the Flow through Deformable Tubes and Channels* (Bangalore, India, January 20-24, 2014).
The Proceedings of the Symposium edited by Shankar, V. and Kumaran, V. have been published as a special issue of Sadhana, Volume 40, Issue 3, May 2015.

14-2 *IUTAM Symposium on Mechanics of Soft Active Materials*
(Haifa, Israel, May 12-15, 2014).
The Proceedings of the Symposium edited by Volokh, K. and Jabareen, M. have been published by Elsevier, 2015, as the 12th issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 12

14-3 *IUTAM Symposium on Connecting Multiscale Mechanics to Complex Material Design* (Evanston, USA, May 13-16, 2014).
The Proceedings of the Symposium edited by Liu, W.K., Fish, J., Chen, J.S. and Camanho, P.P. have been published as a special issue of Computational Mechanics, Volume 57, Issue 3, March 2016.

14-4 *IUTAM Symposium on Micromechanics of Defects in Solids*
(Seville, Spain, June 9-13, 2014).
The Proceedings of the Symposium edited by Ariza, P., Ortiz, M. and Tvergaard, V. have been published as a special issue of Mechanics of Materials, Volume 90, Pages 1-268, November 2015.

14-5 *IUTAM Symposium on Dynamical Analysis of Multibody Systems with Design Uncertainties* (Stuttgart, Germany, June 9-13, 2014).

The Proceedings of the Symposium edited by Hanss, M. have been published by Elsevier, 2015, as the 13th issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 13

14-7 *IUTAM Symposium on Dynamics of Capsules, Vesicles and Cells in Flow* (Compiegne, France, July 15-18, 2014).
The Proceedings of the Symposium edited by Barthès-Biesel, D., Blyth, M.G. and Salsac, A.-V. have been published by Elsevier, 2015, as the 16th issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 16

14-8 *IUTAM Symposium on Innovative Numerical Approaches for Multi-Field and Multi-Scale Problems* (Burg Schnellenberg, Germany, September 1-4, 2014).
The Proceedings of the Symposium edited by Weinberg, K. and Pandolfi, A. have been published in the Lecture Notes in Applied and Computational Mechanics series by Springer, 2016. ISBN 978-3-319-39021-5

14-9 *IUTAM Symposium on Complexity of Nonlinear Waves*
(Tallinn, Estonia, September 8-12, 2014).
The Proceedings of the Symposium edited by Salupere, A. and Maugin, G.A. have been published as a special issue of the Proceedings of the Estonian Academy of Sciences, Volume 64, Issue 3S, 2015.

14-10 *IUTAM Symposium on Multiphase Flows with Phase Change: Challenges and Opportunities* (Hyderabad, India, December 8-11, 2014).
The Proceedings of the Symposium edited by Sahu, K.C. have been published by Elsevier, 2015, as the 15th issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 15

14-11 *IUTAM Symposium on Advances in Computation, Modeling and Control of Transitional and Turbulent Flows* (Goa, India, December 15-18, 2014).
The Proceedings of the Symposium edited by Sengupta, T.K, Lele, S.K., Sreenivasan, K.R. and Davidson, P.A. have been published by World Scientific, 2016. ISBN 978-981-4635-15-8

IUTAM-ABCM Symposium on Laminar Turbulent Transition
(Rio de Janeiro, Brazil, September 8-12, 2014).
The Proceedings of the Symposium edited by Medeiros, M.A.F. and Meneghini, J.R. have been published by Elsevier, 2015, as the 14th issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 14

2015

15-2 *IUTAM Symposium on Ductile Failure and Localization*
(Paris, France, March 17-20, 2015).

The Proceedings of the Symposium edited by Mohr, D. and Ravi-Chandar, K. have been published as a special issue of the International Journal of Fracture, Volume 200, Issue 1-2, 2016.

15-3 *IUTAM Symposium on Growing Solids*
(Moscow, Russia, June 23-27, 2015).
The Proceedings of the Symposium edited by Manzhirov, A.V., Altenbach, H., and Gupta, N. have been published by Elsevier, 2017, as the 23rd issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 23

15-4 *IUTAM Symposium on Analytical Methods in Nonlinear Dynamics*
(Frankfurt, Germany, June 6-9, 2015).
The Proceedings of the Symposium edited by Hagedorn, P. and Clerkin, E. have been published by Elsevier, 2016, as the 19th issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 19

2016

16-1 *IUTAM Symposium on Filling Gaps in Material Property Space*
(Cambridge, UK, March 14-16, 2016).
The Proceedings of the Symposium edited by Deshpande, V.S. and Fleck, N.A. have been published as a special issue of Extreme Mechanics Letters, Volume 10, Pages 1-78, 2017.

16-2 *IUTAM Symposium on Mechanics of Stretchable Electronics*
(Hangzhou, China, March 17-18, 2016).
A report on the Symposium by Song, J. has been published in Journal of Applied Mechanics, Volume 83, 128001, 2016.

16-3 *IUTAM Symposium on Helicity, Structures and Singularity in Fluid and Plasma Dynamics* (Venice, Italy, April 11-15, 2016).
The Proceedings of the Symposium edited by Fukumoto, Y., Ricca, R.L., Boyland, P., and Eggers, J. have been published as a special issue of Fluid Dynamics Research, Volume 50, Issue 1, 2018.

16-4 *IUTAM Symposium on Advances in Biomechanics of Hearing*
(Stuttgart, Germany, May 17-20, 2016).
The Proceedings of the Symposium edited by Ziegler, P. have been published by Elsevier, 2017, as the 24th issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 24

16-5 *IUTAM Symposium on Dynamic Instabilities in Solids*
(Madrid, Spain, May 17-20, 2016).

The Proceedings of the Symposium edited by Rittel, D. and Rodriguez-Martinez, J.A. have been published as a special issue of Mechanics of Materials, Volume 116, 2018.

16-6 *IUTAM Symposium on Nanoscale Physical Mechanics*
(Nanjing, China, May 23-27, 2016).
The Proceedings of the Symposium edited by Guo, W. have been published by Elsevier, 2017, as the 21st issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 21

16-7 *IUTAM Symposium on Integrated Computational Structure-Material Modeling of Deformation and Failure under Extreme Conditions*
(Baltimore, USA, June 20-22, 2016).
The Proceedings of the Symposium edited by Ghosh, S. and Bronkhorst, C.A. have been published as a special issue of Computational Mechanics, Volume 61, Issue 1-2, 2018, and as a special issue of the International Journal of Fracture, Volume 208, Issue 1-2, 2017.

16-8 *IUTAM Symposium on Jet Noise Modelling and Control*
(Palaiseau, France, September 28-30, 2016).
The Proceedings of the Symposium edited by Lesshafft, L., Jordan, P. and Agarwal, A. have been published as a special issue of Comptes Rendus Mécanique, Volume 346, Issue 10, 2018.

16-9 *IUTAM Symposium on Storm Surge Modelling and Forecasting*
(Shanghai, China, October 17-20, 2016).
The Proceedings of the Symposium edited by Liu, H. and Dias, F. have been published by Elsevier, 2017, as the 25th issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 25

16-10 *IUTAM Symposium on Nonlinear and Delayed Dynamics of Mechatronic Systems* (Nanjing, China, October 17-21, 2016).
The Proceedings of the Symposium edited by Wang, Z., Insperger, T., and Zhang, L. have been published by Elsevier, 2017, as the 22nd issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 22

2017

17-3 *IUTAM Symposium on Multi-Scale Fatigue, Fracture and Damage of Materials in Harsh Environments*
(Galway, Ireland, August 28 – September 1, 2017).
The Proceedings of the Symposium edited by Leen, S., O'Donoghue, P. and Barrett, R. have been published as a special issue of the International Journal of Fatigue, October 2018.

17-4 *IUTAM Symposium on Wind Waves*
(London, UK, September 4-8, 2017).
The Proceedings of the Symposium edited by Grimshaw, R., Hunt, J., and Johnson, E. have been published by Elsevier, 2018, as the 26th issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 26

17-5 *IUTAM Symposium on Intelligent Multibody Systems – Dynamics, Control, Simulation* (Sozopol, Bulgaria, September 11-15, 2017).
The Proceedings of the Symposium edited by Zahariev, E.V. and Cuadrado, J. have been published by Springer, 2019, as Volume 33 of the IUTAM Bookseries. ISBN 978-3-030-00527-6

17-6 *IUTAM Symposium on Co-Simulation and Solver Coupling – Recent Developments in Theory and Application*
(Darmstadt, Germany, September 18-20, 2017).
The Proceedings of the Symposium edited by Schweizer, B. have been published by Springer, 2019, as Volume 35 of the IUTAM Bookseries. ISBN 978-3-030-14883-6

2018

18-1 *IUTAM Symposium on Recent Advances in Moving Boundary Problems in Mechanics* (Christchurch, New Zealand, February 12-15, 2018).
The Proceedings of the Symposium edited by Gutschmidt, S., Hewett, J.N. and Sellier, M. have been published by Springer, 2019, as Volume 34 of the IUTAM Bookseries. ISBN 978-3-030-13720-5

18-4 *IUTAM Symposium on Model Order Reduction of Coupled Systems (MORCOS 2018)* (Stuttgart, Germany, May 22-25, 2018).
The Proceedings of the Symposium edited by Fehr, J. and Haasdonk, B. have been published by Springer, 2020, as Volume 36 of the IUTAM Bookseries. ISBN 978-3-030-21012-0

18-8 *IUTAM Symposium on Mechanical Environments of Living Cells*
(Xi'an, China, June 28-30, 2018).
The Proceedings of the Symposium edited by Xu, F., Lu, T.J., Genin, G.M. and Huang, G. have been published as a special issue of Acta Mechanica Sinica, Volume 35, Issue 2, 2019.

18-9 *IUTAM Symposium on Exploiting Nonlinear Dynamics for Engineering Systems (ENOLIDES 2018)* (Novi Sad, Serbia, July 15-19, 2018).
The Proceedings of the Symposium edited by Kovacic, I. and Lenci, S. have been published by Springer, 2020, as Volume 37 of the IUTAM Bookseries. ISBN 978-3-030-23691-5

18-11 *IUTAM Symposium on Mechanics of Electro/Magneto-Active Materials and Structures* (Beijing, China, August 26-30, 2018).
The Proceedings of the Symposium edited by Li, F. and Hong, W. have been published as a focus collection in Smart Materials and Structures, Volume 28, Issues 2-5, 2019.

18-13 *IUTAM Symposium on Architectured Material Mechanics*
(Chicago, USA, September 17-19, 2018).
The Proceedings of the Symposium edited by Siegmund, T. and Barthelat, F. have been published as a special issue of the Journal of Applied Mechanics, Volume 86, Issue 11, 2019.

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 - Compte 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 (were 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, Piazelle delle Science 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

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Warsaw (Poland), 15-21 August 2004.
The Proceedings, entitled "Mechanics of the 21st Century" and edited by W. Gutkowski and T.A. Kowalewski, have been published by Springer, Dordrecht, The Netherlands, 2005. ISBN 1-4020-3456-3

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Adelaide (Australia), 24-29 August 2008.
The Proceedings, entitled "Mechanics Down Under" and edited by J. Denier and M. Finn, have been published by Springer, Dordrecht, The Netherlands, 2013, both as an eBook (ISBN 978-94-007-5968-8) and as a Hardcover (ISBN 978-94-007-5967-1).

23rd International Congress on Theoretical and Applied Mechanics (ICTAM),
Beijing (China), 19-24 August 2012.
The Proceedings, entitled "Mechanics for the World" and edited by Y. Bai, J. Wang and D. Fang, have been published by Elsevier, 2014, as the tenth issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 10

24th International Congress on Theoretical and Applied Mechanics (ICTAM),
Montreal (Canada), 22-26 August 2016.
The Proceedings, entitled "Mechanics – Foundation of Multidisciplinary Research" and edited by J. M. Floryan, have been published by Elsevier, 2017, as the twentieth issue of the IUTAM e-Procedia series. Procedia IUTAM Volume 20

All 2-page papers presented during ICTAM 2016 are collected in the e-book entitled "Contributions to the Foundations of Multidisciplinary Research in Mechanics", edited by J.M. Floryan and published by IUTAM, 2017. The book is available on the IUTAM website. ISBN 978-0-660-05459-9

Publications on the history of IUTAM

IUTAM - A Short History,
edited by S. Juhasz, has been published by Springer- Verlag, Berlin, Germany, 1988. ISBN 978-3-540-50043-8 (Print), 978-3-642-45649-7 (Online).

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.

The second, updated and revised, edition of the book:
IUTAM - A Short History, Second Edition,
edited by P. Eberhard and S. Juhasz, has been published by Springer International Publishing, 2016. ISBN 978-3-319-31061-9 (Print), 978-3-319-31063-3 (Online); DOI: 10.1007/978-3-319-31063-3.

The book is available free of charge at www.springer.com/de/book/9783319310619.

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 and search for Schiehlen as the author. Moreover, this booklet is available upon request at the IUTAM Secretariat.

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