

# INTERNATIONAL UNION OF THEORETICAL AND APPLIED MECHANICS

(IUTAM)

## ANNUAL REPORT 2023

Edited by  
Robert M. McMeeking  
Secretary-General

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## **1. Board of Directors**

*The Board of Directors of IUTAM during 2023*

Officers

Norman A. Fleck (UK)	President
Nadine Aubry (USA)	Vice-President
Pilar Ariza (Spain)	Treasurer
Robert M. McMeeking (USA)	Secretary-General

Directors

Atila P.S. Freire (Brazil)  
Irina G. Goryacheva (Russia)  
Kikuo Kishimoto (Japan)  
Detlef Lohse (Netherlands)

## **2. Registered Office of the Incorporated IUTAM and Registration Information**

The registered office of IUTAM

International Union of Theoretical and Applied Mechanics  
Stardock Keizersgracht B.V.  
Keizersgracht 482  
Amsterdam, 1017EG  
Netherlands

Registration number with the Dutch Trade Register: 864498925

## **3. Secretariat**

Robert M. McMeeking  
Department of Mechanical Engineering  
University of California  
Santa Barbara CA 93106  
USA  
[rmcm@ucsb.edu](mailto:rmcm@ucsb.edu)

Internet: <https://www.iutam.org>

#### 4. IUTAM Congress Committee

##### *Executive Committee of the Congress Committee during 2023*

Norman A. Fleck (UK)	President
Sanjay Mittal (India)	Secretary
Leslie Banks-Sills (Israel)	
Shiyi Chen (China)	
Alberto Corigliano (Italy)	
Heuy Dong Kim (Republic of Korea)	
Paul Linden (UK)	

<i>Congress Committee during 2023</i>	<i>Year in which term ends (October 31<sup>st</sup>)</i>	
Pilar Ariza	Spain	2024
Ellen Arruda	USA	2024
Leslie Banks-Sills	Israel	2024
L. Catherine Brinson	USA	2024
Shiyi Chen	China	2024
Alan C.F. Cocks	UK	2026
Alberto Corigliano	Italy	2024
Raj Das	Australia	2026
Anne De Wit	Belgium	2026
Norman A. Fleck	UK	2024
J. Maciej Floryan	Canada	2024
Samuel Forest	France	2024
Peter Frick	Russia	2024
Elisabeth Guazzelli	France	2024
Stefan Hartmann	Germany	2024
Peter Hunter	New Zealand	2024
Anne Juel	UK	2026
Huey Dong Kim	Rep. of Korea	2024
Yoon Young Kim	Rep. of Korea	2026
Stefano Lenci	Italy	2026
Paul F. Linden	UK	2024
Detlef Lohse	Netherlands	2022
Gareth McKinley	USA	2024
Sanjay Mittal	India	2024
Henryk Petryk	Poland	2024
Stéphane Popinet	France	2024
Gherhardt Ribatski	Brazil	2024
Maria Vittoria Salvetti	Italy	2024
Alfredo Soldati	Austria	2024
Kathleen Stebe	USA	2024
Shu Takagi	Japan	2026
Wei-Chung Wang	China-Taipei	2026
Hiroshi Yabuno	Japan	2024
Xiaojing Zheng	China	2024

## 5. Symposia Panels

### *Fluids Symposia Panel during 2023*

Detlef Lohse (Chair)	Netherlands	2024
Meheboob Alam	India	2026
Elisabeth Guazzelli	France	2024
Hua Liu	China	2024
Ellen Longmire	USA	2026

### *Solids Symposia Panel during 2023*

Huajian Gao (Chair)	Singapore	2024
Leslie Banks-Sills	Israel	2026
Alexander Belyaev	Russia	2024
Davide Bigoni	Italy	2024
Huiling Duan	China	2026

## 6. General Meeting Voting Members

An IUTAM General Meeting of Members (GMM) was held in hybrid form in June 2023. The individuals who were authorized to vote at that GMM are as follows. Note that the attendance at that GMM is provided below in the minutes of the meeting. The appearance of a name on the list of authorized voting members does not mean that the authorized voting member attended the 2023 GMM.

### *Authorized Voting Members in June 2023*

I. David Abrahams	UK	
Marco Amabili	Canada	
Jorge Ambrósio	Portugal	
Pilar Ariza	Spain	Treasurer
Nadine Aubry	USA	Vice-President
Marc Avila	Germany	
Yilong Bai	China	Member-at-Large
Kamran Behdinan	Canada	
Davide Bigoni	Italy	
Tore Børvik	Norway	
Alessandro Bottaro	Italy	
Mark Bradford	Australia	
Felix Chernousko	Russia	
Richard J. Clarke	New Zealand	
Alan C.F. Cocks	UK	
Enrico De Bernardis	Italy	
Wim Desmet	Belgium	
Jürg Dual	Switzerland	
Peter Eberhard	Germany	Member-at-Large
Horacio Espinosa	USA	

Daining Fang	China	
Nenad Filipovic	Serbia	
Norman A. Fleck	UK	President
J. Maciej Floryan	Canada	
Atila P.S. Freire	Brazil	Director
François Gallaire	Switzerland	
Huajian Gao	Singapore	Chair of Solids Symposia Panel
Irina Goryacheva	Russia	Director
Elisabeth Guazzelli	France	
Peter Gudmundson	Sweden	
Patrick Guillaume	Belgium	
Alexandr Guz	Ukraine	
Michael Hanss	Germany	
Stefan Hartmann	Germany	
Guowei He	China	
Christian Hellmich	Austria	
Dan Henningson	Sweden	
Francois Hild	France	
Koichi Hishida	Japan	
Muneo Hori	Japan	
K. Jimmy Hsia	Singapore	
Shu-San Hsiau	China-Taipei	
Melany Hunt	USA	
George Jaiani	Georgia	
Masuhara Kameda	Japan	
Tomasz Kapitaniak	Poland	
Santosh Kapuria	India	
Kikuo Kishimoto	Japan	Director
Reijo Kouhia	Finland	
V. Kumaran	India	
Vladimir Levin	Russia	
Detlef Lohse	Netherlands	Director, Chair, Fluids Symposia Panel
Juliana B.R. Loureiro	Brazil	
Tianjian Lu	China	
Fernando Lund	Chile	
Staffan Lundström	Sweden	
Beverley J. McKeon	USA	
Robert M. McMeeking	USA	Secretary-General
Marcello A.F. de Medeiros	Brazil	
Sanjay Mittal	India	Secretary of the Congress Committee
Nicolas Moës	France	
Nikita Morozov	Russia	
Hung Nguyen-Xuan	Vietnam	
Jarkko Niiranen	Finland	
Christian Niordson	Denmark	
Miloslav Okrouhlik	Czech Republic	

Patrick Onck	Netherlands	
Vikram Pakrashi	Ireland	
Timothy J. Pedley	UK	Member-at-Large
Thomas Pence	USA	
Stéphane Popinet	France	
Stefan Radev	Bulgaria	
G.P. Rajasekhar	India	
Giuseppe Rega	Italy	
Miles B. Rubin	Israel	
John Sader	Australia	
Takashi Sakajo	Japan	
Jean Salençon	France	Member-at-Large
Andrus Salupere	Estonia	
Werner Schiehlen	Germany	Member-at-Large after 5 <sup>th</sup> June, 2023
Bernhard Schrefler	Italy	Member-at-Large after 5 <sup>th</sup> June, 2023
Jörg Schumacher	Germany	
Reuven Segev	Israel	
Janko Slavic	Slovenia	
Sonya Smith	USA	
Jens Nørkær Sørensen	Denmark	
Georgios E. Stavroulakis	Greece	
Gábor Stépán	Hungary	
Stanislaw Stupkiewicz	Poland	
Qing-Ping Sun	China-Hong Kong	
Hyung Jin Sung	Republic of Korea	
Peichun Amy Tsai	Canada	
Goran Turkalj	Croatia	
Viggo Tvergaard	Denmark	Member-at-Large after 5 <sup>th</sup> June, 2023
Dirk Vandepitte	Belgium	
Wei-Chung Wang	China-Taipei	
Sarah Waters	UK	
Daniel N. Wilke	South Africa	
Helen Wilson	UK	
Wei Yang	China	
Gil Ho Yoon	Republic of Korea	
Xiaoqing Zheng	China	

## **7. Adhering Organisations during 2023**

### **Armenia (2016) (*Associate Organization*)**

Armenian National Committee on Theoretical and Applied Mechanics

24B Marshall Baghramyan Ave., 0019 Yerevan

President/Chair: Ara Avetisyan, Representative in IUTAM: Avetik V. Sahakyan

### **Australia (1964)**

The Australian National Committee for Mechanical and Engineering Sciences of the Australian Academy of Science, GPO Box 783, ACT 2601, Canberra City

President/Chair: Mark Bradford, Representatives in IUTAM: Mark Bradford, John E. 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: Manfred Kaltenbacher, Contact: Franz Rammerstorfer

Representative in IUTAM: Christian Hellmich

### **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: Patrick Guillaume

Representatives in IUTAM: Wim Desmet, Patrick Guillaume, Dirk V.H. Vandepitte

### **Brazil (1982)**

Associação Brasileira de Engenharia e Ciências Mecânicas – ABCM, Avenida Rio Branco

124/18º andar, 20040-001 Rio de Janeiro

President/Chair: Gherhardt Ribatski, Contact: Atila P.S. Freire

Representatives in IUTAM: Juliana B.R. Loureiro, Marcello A.F. 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: Stefan Radev, Representative in IUTAM: Stefan Radev

### **Canada (1963)**

The National Research Council of Canada, Canadian National Committee for IUTAM

1200 Montreal Road, Building M-50, Ontario K1A 0R6, Ottawa

President/Chair: Marco Amabili, Secretary: Peidong Wu

Representatives in IUTAM: Marco Amabili, Kamran Behdinan, J. Maciej Floryan, Amy Tsai

### **Chile (1996)**

The Chile National Committee on Theoretical and Applied Mechanics

Academia Chilena de Ciencias, Almirante Montt 454, Santiago

President/Chair: Juan Asenjo, Secretary: Francisco Hervé

Representative in IUTAM: Fernando Lund

**China (1980)**

Chinese Society of Theoretical & Applied Mechanics, 15 Beisihuanxi Road, 100190 Beijing  
President/Chair: Daining Fang, Secretary: Yazheng Yang, Contact: Jie Chen  
Representatives in IUTAM: Daining Fang, Guowei He, TJ Lu, Wei Yang, Xiaojing Zheng

**China-Hong Kong (1996)**

The Hong Kong Society of Theoretical and Applied Mechanics (HKSTAM), Department of Mech. Engin., City University of Hong Kong, 83 Tat Chee Ave., Kowloon Tong, Hong Kong  
President/Chair: Li Cheng, Secretary: Zhong-Qing Su  
Representative in IUTAM: Qing-Ping Sun

**China-Taipei (1980)**

The Society of Theoretical and Applied Mechanics, Department of Civil Engineering, National Taiwan University, No. 1, Sec. 4, Roosevelt Rd., 10617 Taipei  
President/Chair: Chuin-Shu-San Hsiau, Secretary: Yu-Ren Wu  
Representatives in IUTAM: Shu-San Hsiau, Wei-Chung Wang

**Croatia (1994)**

Croatian Society of Mechanics, Ivana Lučića 5, HR-10000 Zagreb  
President/Chair: Marko Canadija, Representative in IUTAM: Goran Turkalj

**Czech Republic (2018/1949)**

Czech Society for Mechanics, Dolejškova 5, CZ-18200 Prague 8  
President/Chair: Jindrich Petruska, Secretary: Jiri Naprstek  
Representative in IUTAM: 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: Tom Fenchel  
Representatives in IUTAM: Christian Niordson, Jens Nørkær Sørensen

**Estonia (1992)**

Estonian Committee for Mechanics, Akadeemia tee 21, EE-12618 Tallinn  
President/Chair: Andrus Salupere, Representative in IUTAM: Andrus Salupere

**Finland (1952)**

The Finnish National Committee on Mechanics  
Tampere University, Atent. Reijo Kouhia, PO Box 600, FI-33014 Tampere  
President/Chair: Reijo Kouhia, Secretary: Jarkko Niiranen  
Representatives in IUTAM: Reijo Kouhia, Jarkko Niiranen

**France (1949)**

Comité National Français de Mécanique, Académie des Sciences, 23 quai Conti, F-75006 Paris  
President/Chair: Nicolas Moës, Secretary: Jacques Magnaudet  
Representatives in IUTAM: Elisabeth Guazzelli, Francois Hild, Nicolas Moës, Stéphane Popinet

**Georgia (2000)**

Georgian National Committee of Theoretical & Applied Mechanics, I. Vekua Institute of Applied Mathematics of Iv. Javakhishvili Tbilisi State University, 2 University Str., 0186 Tbilisi  
President/Chair: George Jaiani, Representative in IUTAM: George Jaiani

**Germany (1950)**

Gesellschaft für angewandte Mathematik und Mechanik/Deutsches Komitee für Mechanik, TUHH, Institute of Mechanics and Ocean Engineering, Eissendorfer Str. 42, D-21073, Hamburg  
President/Chair: Prof. Seifried  
Representatives in IUTAM: Marc Avila, Michael Hanss, Stefan Hartmann, Jörg Schumacher

**Greece (1979)**

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

**Hungary (1948)**

Hungarian National Committee for IUTAM, Department of Applied Mechanics, Budapest University of Technology and Economics, Műegyetem rkp. 3, H-1521 Budapest  
President/Chair: Gábor Stépán, Secretary: Peter Varkonyi  
Representative in IUTAM: 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: Santosh Kapuria; Contact S. Gopalakrishnan  
Representatives in IUTAM: Santosh Kapuria, V. Kumaran, G.P. Rajasekhar

**Ireland (1984)**

Irish Nat. Comm. for Mathematical Sciences, Royal Irish Academy, 19 Dawson Street, Dublin 2  
Representative in IUTAM: Vikram Pakrashi

**Israel (1950)**

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

**Italy (1949)**

Associazione Italiana di Meccanica Teorica ed Applicata, Piazza L. da Vinci 32, I-20133 Milano  
President/Chair: Walter d'Ambrogio, Secretary: Sandra Carillo  
Representatives in IUTAM: Davide Bigoni, Alessandro Bottaro, Dr. Enrico De Bernardis, 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: Yasuyuki Takata, Secretary: Shu Takagi

Representatives in IUTAM: Koichi Hishida, Muneo Hori, Masuhara Kameda, Takashi Sakajo

**Korea, Republic of (2012/1989)**

Korean Committee for Theoretical & 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: Heuy Dong Kim, Contact: Simon Song

Representative in IUTAM: Hyung Jin Sung, Gil Ho Yoon

**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: GertJan J.F. van Heijst, Secretary: Dick H. van Campen

Representatives in IUTAM: Detlef Lohse, Patrick Onck

**New Zealand (1979)**

Royal Society Te Apārangi, P.O. Box 598, 6140 Wellington

Representative in IUTAM: Richard J. Clarke

**Norway (2023/1949)**

NTVA Norwegian Academy of Technological Sciences, c/o NTNU Faculty of Engineering, Geologibyget, 7491 Trondheim, Norway

President/Chair: Tor Inge Waag, Secretary: Sveinung Løset

Representative in IUTAM: Tore Børvik

**Poland (1952)**

Committee for Mechanics of the Polish Academy of Sciences, Pawinskiego 5B, 02-106 Warsaw

President/Chair: Stanisław Stupkiewicz

Representatives in IUTAM: Tomasz Kapitaniak, Stanisław Stupkiewicz

**Portugal (1968)**

Portuguese Society of Theoretical, Applied and Computational Mechanics Laboratório Nacional de Engenharia Civil, Avenida do Brasil 101, 1700-066 Lisboa

President/Chair: Jose Cesar de Sa, Contact: Carlos A.B. Pina

Representative in IUTAM: Jorge A.C. Ambrósio

**Russia (1992/1956)**

Russian National Committee of Theoretical and Applied Mechanics of the Russian Academy of Sciences, Prospekt Vernadskogo 101: 1, 119526 Moscow

President/Chair: Irina G. Goryacheva, Secretary: Vladimir Karev

Representatives in IUTAM: Felix L. Chernousko, Irina G. Goryacheva, Vladimir A. Levin, Nikita F. Morozov

**Serbia (2006/1952)**

Serbian Society of Mechanics, Kneza Milosa 9/1, 11000 Belgrade  
President/Chair: Nenad Filipovic, Secretary: Dalibor Nikolic  
Representative in IUTAM: Nenad Filipovic

**Singapore (2021)**

Council on Theoretical and Applied Mechanics of the Materials Research Society of Singapore,  
Nanyang Technological University, 60 Nanyang Drive, 637551, Singapore  
President/Chair: Huajian Gao; Representative in IUTAM: Huajian Gao, K. Jimmy Hsia

**Slovenia (1994)**

Slovene Mechanics Society, Jamova 2, 1000 Ljubljana  
President/Chair: Janko Slavič, Secretary: Martin Česnik  
Representative in IUTAM: 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: Daniel N. Wilke, Representative in IUTAM: Daniel N. Wilke

**Spain (2018/1950)**

SEMTA, ETSI, Camino de los descubrimientos s/n, 41092, Sevilla  
President/Chair: Pilar Ariza, Representative in IUTAM: Pilar Ariza

**Sweden (1950)**

Swedish National Committee for Mechanics, Lund University, Avdelning för Hållfasthetslära,  
Box 118, SE-22100 Lund  
President/Chair: Matti Ristinmaa, Secretary: Hakan Hallberg  
Representatives in IUTAM: Peter Gudmundson, Dan Henningson, Staffan Lundström

**Switzerland (1950)**

Rat der Eidgenössischen Technischen Hochschulen, ETH-Zentrum, CH-8092 Zürich  
President/Chair: Michael Hengartner  
Representatives in IUTAM: Jürg Dual, François Gallaire

**UK (1948)**

The Royal Society, UK Panel for IUTAM, 6 Carlton House Terrace, SW1Y 5AG London  
President/Chair: Prof. Anne Juel, Secretary: Prof. Alan C.F. Cocks  
Representatives in IUTAM: I. David Abrahams, Alan C.F. Cocks, Sarah Waters,  
Helen Wilson

**Ukraine (1995)**

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

**USA (1949)**

The U.S. National Committee for Theoretical and Applied Mechanics of the National Academies,  
500 Fifth Street NW, Washington DC 20001.

President/Chair: Horacio Espinosa, Secretary: Thomas Pence

Representatives in IUTAM: Horacio Espinosa, Melany Hunt, Beverley J. McKeon,  
Thomas Pence, Sonya Smith

**Viet Nam (1990)**

Vietnamese Association of Mechanics (VAM), Hoi Co Hoc Vietnam, 264 Doi Can, Hanoi

President/Chair: Nguyen Tien Khiem, Secretary: Tran Van Lien

Representative in IUTAM: Hung Nguyen-Xuan

## **8. Affiliated Organisations (with year of affiliation)**

### **Asian Fluid Mechanics Committee (AFMC, 1982)**

Center for Atmospheric and Oceanic Sciences, Indian Institute of Science, 560012 Bangalore  
President/Chair: Prof. Song Fu, Representative in IUTAM: Prof. Ganapati S. Bhat,  
Representative of IUTAM in AFMC: Prof. Frédéric Dias

### **Beijing International Center for Theoretical and Applied Mechanics (BICTAM, 2010)**

Institute of Mechanics, Chinese Academy of Sciences, 15 Beisihuanxi Road, 100190 Beijing,  
President/Chair: Prof. Daining Fang, Representative in IUTAM: Prof. Daining Fang,  
Representative of IUTAM in BICTAM: Prof. Narinder Gupta

### **European Mechanics Society (EUROMECH, 1978)**

IMFT, Allée Camille Soula, 31400, Toulouse, France; President/Chair: Prof. Marc G.D. Geers,  
Secretary: Prof. Jacques Magnaudet, Representative in IUTAM: Prof. Anne Juel, Representative  
of IUTAM in EUROMECH: Prof. Norman A. Fleck

### **International Association for Boundary Element Methods (IABEM, 1994)**

President/Chair: Prof. Naoshi Nishimura, Representative in IUTAM: Prof. Naoshi Nishimura,  
Representative of IUTAM in IABEM: Prof. Naoshi Nishimura

### **International Association for Computational Mechanics (IACM, 1984)**

International Center for Numerical Methods in Engineering, Edificio C-1, Gran Capitán s/n, E-08034 Barcelona, Spain, President/Chair: Prof. Antonio Huerta, Secretary: Prof. John Dolbow,  
Representative in IUTAM: Prof. Pierre Ladevèze, Representative of IUTAM in IACM: Prof. R. Eduardo de Arantes e Oliveira

### **International Assoc for Hydromagnetic Phenomena and Applications (HYDROMAG, 1996)**

Applied Mathematics Research Centre, Coventry University, Priory Street, Coventry, CV1 5FB, UK, President/Chair: Prof. Alban Pothérat, Representative in IUTAM: Prof. Alban Pothérat,  
Representative of IUTAM in HYDROMAG: Prof. H. Keith Moffatt

### **International Association for Multibody System Dynamics (IMSD, 2014)**

President/Chair: Prof. Jorge Ambrosio, Secretary: Prof. Javier Cuadrado, Representative in IUTAM: Prof. Peter Eberhard, Representative of IUTAM in IMSD: Prof. Werner Schiehlen

### **International Association for Structural Control and Monitoring (IASCM, 2014)**

President/Chair: Prof. Hui Li, Secretary: Prof. Sami Masri, Representative in IUTAM: Prof. Sami Masri, Representative of IUTAM in IASCM: Prof. Robert Seifried

### **International Association for Vehicle System Dynamics (IAVSD, 1977)**

Institute of Mechanics and Mechatronics, TU Wien, Getreidemarkt 9, 1060, Vienna, Austria  
President/Chair: Prof. Tim Gordon, Secretary: Prof. Manfred Plöchl, Representative in IUTAM: Prof. Mats Berg, Representative of IUTAM in IAVSD: Prof. Robert Seifried

**International Centre for Heat and Mass Transfer (ICHMT, 1972)**

Mechanical Engineering Department E-104, Middle East Technical University, Dumlupınar Bulvarı No:1, 06800 Çankaya Ankara, Turkey, President/Chair: Prof. Terrence W. Simon, Secretary: Prof. Ilker Tari, Representative in IUTAM: Prof. Faruk Arinc, Representative of IUTAM in ICHMT: Dr. Rudolf Dvorák

**International Centre for Mechanical Sciences (CISM, 1970)**

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. Antonio De Simone, Representative in IUTAM: Prof. Antonio De Simone, Representative of IUTAM in CISM: Prof. Frédéric Dias

**International Commission for Acoustics (ICA, 1998)**

President/Chair: Prof. Mark Hamilton, Secretary: Prof. Antonino Di Bella, Representative in IUTAM: Prof. Andrew Norris, Representative of IUTAM in ICA: Prof. Andrew Norris

**International Committee on Rheology (ICR, 1974)**

President/Chair: Prof. Paulo R. de Souza Mendes, Secretary: Prof. Gerald Fuller, Representative in IUTAM: Prof. L.Gary Leal, Representative of IUTAM in ICR: Prof. Gareth H. McKinley

**International Conference on the Mechanical Behaviour of Materials (ICM, 1982)**

President/Chair: Dr. Raj Das, Secretary: Prof. Yoshihiko Uematsu, Representative in IUTAM: Prof. Soo Woo Nam, Representative of IUTAM in ICM: Prof. Christian Niordson

**International Congress on Fracture (ICF, 1978)**

Research Institute for Strength and Fracture of Materials, Tohoku University, Sendai, Japan, President: Prof. Robert M. McMeeking, Secretary: Prof. A. Toshimitsu Yokobori, Jr., Representative in IUTAM: Prof. Leslie Banks-Sills, Representative of IUTAM in ICF: Prof. Jean-Baptiste Leblond

**International Congresses on Thermal Stresses (ICTS, 2002)**

Department of Mechanical Science & Engineering, University of Illinois Urbana-Champaign, USA, President/Chair: Prof. Martin Ostoj-Starzewski, Secretary: Prof. Kumar K. Tamma, Representative in IUTAM: Prof. Martin Ostoj-Starzewski, Representative of IUTAM in ICTS: Prof. Masato Abe

**International Institute of Acoustics and Vibration (IIAV, 1997)**

Dept. of Mechanical Engineering, Auburn University, 201 Ross Hall, Auburn, AL 36849 USA, President/Chair: Prof. Marek Pawelczyk, Secretary: Mr. Rupert M. Thornely-Taylor, Contact: Prof. Malcolm J. Crocker, Representative in IUTAM: Prof. Malcolm J. Crocker, Representative of IUTAM in IIAV: Prof. Peter Eberhard

**International Society for the Interaction of Mechanics and Mathematics (ISIMM, 1978)**

President/Chair: Prof. Anja Schlömerkemper, Secretary: Dr. Paolo Piovano, Representative in IUTAM: Prof. Alain Goriely, Representative of IUTAM in ISIMM: Prof. Felix L. Chernousko

**International Society for Structural and Multidisciplinary Optimization (ISSMO, 1996)**

Structural Engineering Department, University of California, San Diego, 9500 Gilman Drive, Mail Code 0085, CA 92093, San Diego, USA, President/Chair: Prof. Wei Chen, Secretary: Prof. H. Alicia Kim, Representative in IUTAM: Prof. James K. Guest, Representative of IUTAM in ISSMO: Prof. Niels Olhoff

**Latin American & Caribbean Conf. on Theor. & Appl. Mechanics (LACCOTAM, 2010)**

Department of Math and Computer Science, University of the West Indies, St. Augustine, Trinidad, West Indies, President/Chair: Prof. Harold Ramkissoon, Secretary: Dr. Donna Comissiong, Representative in IUTAM: Dr. Sreedhara Rao Gunakala, Representative of IUTAM in LACCOTAM: Prof. Atila P.S. Freire

**World Council of Biomechanics (WCB, 2016)**

President/Chair: Prof. Peter Hunter, Secretary: Prof. Lynne Bilston, Representative in IUTAM: Prof. Peter Hunter, Representative of IUTAM in WCB: Prof. Timothy J. Pedley

## 9. Articles of Incorporation and Internal Regulations

On 4<sup>th</sup> November, 2022, IUTAM was incorporated as a Vereniging (an Association) in the Netherlands. The official Articles of Incorporation of the IUTAM Association, known colloquially as IUTAM Inc., that were used for setting up the Vereniging are in Dutch and can be found in the IUTAM Annual Report for 2022, available on the IUTAM website.

An unofficial English translation of the Articles of Incorporation is provided in Section 11.1.

At the 1<sup>st</sup> General Meeting of Members of IUTAM Inc., held in Amsterdam on 12<sup>th</sup> December, 2022, the membership, which consisted at that time of the incorporators, Norman A. Fleck (President), Pilar Ariza (Treasurer) and Robert M. McMeeking (Secretary-General), adopted Internal Regulations to govern the regular activities of IUTAM Inc. The Internal Regulations are given below in Section 11.2.

### 9.1 Unofficial English Translation of the Articles of Incorporation

#### **International Union of Theoretical and Applied Mechanics (IUTAM)**

An Association Incorporated in the Netherlands  
(Seat: Amsterdam)

#### **Articles of Association**

##### **Preamble**

A deed of incorporation was executed on November 4<sup>th</sup> 2022 in order to register IUTAM as an incorporated Association with full legal capacity (in Dutch, *vereniging mit volledige rechtsbevoegdheid*), seated in Amsterdam, the Netherlands with the address Keizersgracht 482, 1017EG Amsterdam. The Incorporators were (1) Norman Andrew Fleck and (2) Robert Maxwell McMeeking. A civil-law notary (in Dutch: *toegevoegd notaris*), Nick Maarten van Dijk, appeared before the relevant authority in Amsterdam to incorporate and register IUTAM. Proof of registration at the Dutch Business Register (Handelsregister) is IUTAM's KVK number: 88085457. This KVK number also proves that IUTAM officially has a business. The official Articles of Association of IUTAM are in Dutch.

#### **Unofficial Translation of the ARTICLES OF ASSOCIATION of the INTERNATIONAL UNION OF THEORETICAL AND APPLIED MECHANICS (IUTAM)**

##### **Introduction**

The International Union of Theoretical and Applied Mechanics (the '**Union**') was founded in nineteen hundred and forty-six as an international non-governmental non-profit scientific organization and emerged from the international congresses of mechanics initiated in Delft, the Netherlands, in nineteen hundred and twenty-four. The Incorporators have indicated that it is their intention that the association to be incorporated by means of this deed will constitute a continuation

of the Union and that all activities of the association shall be guided by the tradition of the Union. In all its decisions the general meeting of members shall be guided by the tradition of free international scientific cooperation, developed at the international congresses of the Union. 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, sex, disability or age. Taking into account the foregoing, the articles of association will read as follows:

## **ARTICLES OF ASSOCIATION**

### ***Name and seat***

#### **Article 1**

1.1 The association bears the name: International Union of Theoretical and Applied Mechanics. The association can also be referred to under its abbreviated name: IUTAM.

1.2 The seat of the association is in the municipality of Amsterdam, the Netherlands.

1.3 The association will be governed by these articles of association. The general meeting of members may adopt and amend rules and regulations of the association.

### ***Objects***

#### **Article 2**

The objects of the association 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 supervise international congresses of theoretical and applied mechanics through a standing congress committee, and to supervise other international meetings on subjects falling within the field of theoretical and applied mechanics;
- (c) to engage in other activities meant to promote the development of mechanics, both theoretical and applied, as a branch of science, all in the broadest sense of the words.

### ***Members. Obligations of the members. Observers***

#### **Article 3**

3.1 Only legal subjects (in Dutch: *rechtssubject*), not necessarily being a legal person (in Dutch: *rechtspersoon*) or a natural person may become a member of the association. The general meeting of members decides on admittance of members. Upon admittance each member will be categorized in a category ranging from I up to and including V. The general meeting of members may choose to admit directors of the association, secretaries of a committee of the association, chairs of a panel of the association and members-at-large as members. Members-at-large are natural persons admitted as such by the general meeting of members.

3.2 The members are obliged to pay an annual subscription to the association. Directors of the association, secretaries of a committee of the association, chairs of a panel of the association and members-at-large are not required to pay an annual subscription to the association. The general meeting of members determines the units of annual subscription per category of members.

3.3 The board of directors may admit observers, not being members, to the general meeting of members. Observers do not have any voting rights in the general meeting of members. Observers do have speaking rights in the general meeting of members.

### ***General meeting of members***

#### **Article 4**

4.1 At least once a year a general meeting of members shall take place. The board of directors of the association may convene a general meeting of members. At least ten (10) members of the association may request the board of directors of the association to convene a general meeting of members.

4.2 A meeting of the general meeting of members may be convened by sending convening notices to the members taking into account a convening period of at least thirty (30) days (not including the day of sending out the convening notice and the day of the general meeting of members). Provided that members have provided an e-mail address for this purpose, a convening notice may also be sent to the e-mail address provided by a member.

4.3 The general meeting of members shall be chaired by the director who is the president. If the president is not able to chair the general meeting of members he or she shall designate one of the other directors as his or her substitute. If the president has failed to do so, the general meeting of members may designate one of the members as chair of the general meeting of members. Each member of category I shall have one (1) vote. Each member of category II shall have two (2) votes. Each member of category III shall have three (3) votes. Each member of category IV shall have four (4) votes. Each member of category V shall have five (5) votes. Except for the resolutions of articles 5.4 (dismissal of a director) and 5.5 (suspending a director), article 7 (amendment articles of association) and article 8 (liquidation) all resolutions shall be adopted by simple majority (more than half) of the votes validly cast, blank and abstaining votes excluded. A member may cast his vote(s) by making use of electronic means of communication.

4.4 A member not able to attend a general meeting of members may provide a proxy to another member attending the general meeting of members to vote on its behalf. Voting by proxy is not allowed if a general meeting of members will be solely held by electronic means provided this is allowed by law at the time of the general meeting of members.

4.5 Decisions of the general meeting of members can also be taken in writing instead of in a general meeting of members, provided that all members unanimously vote. Such decisions can only be validly taken with prior notification to the board of directors. The board of directors keeps a record of the decisions taken by the general meeting of members.

### ***Board of directors. Representation. Appointment, dismissal and suspension of directors. Absence or inability to act of directors. Conflict of interest.***

#### **Article 5**

5.1 The board of directors of the association consists of at least three (3) directors and shall in any event consist of a president (in Dutch: *voorzitter*), a secretary-general (in Dutch: *secretaris-generaal*) and a treasurer (in Dutch: *penningmeester*).

5.2 In fulfilling their duties the directors will be guided by the interests of the association and the associated organization.

5.3 The board of directors acting jointly can represent the association towards third parties. In addition, the president, secretary-general and treasurer acting alone may also represent the association towards third parties.

5.4 The general meeting of members can appoint a director. The general meeting of members can dismiss a director. A resolution to dismiss a director can only be adopted by a simple majority (more than half) of the votes validly cast, blank and abstaining votes excluded, in a meeting in which at least half of the members are present or represented. If this majority is met but the quorum is not met, a second meeting may be convened by taking into account a period of at least thirty (30) days, not taking into account the day of sending out the convening notice and the day of the general meeting of members, in which the resolution to dismiss a director may be adopted with simple majority (more than half) of the votes cast, regardless of the number of members being present or represented.

5.5 The general meeting of members can suspend a director for a maximum term of three (3) months. This period can be extended once for a maximum term of three (3) months. A resolution to suspend a director or to extend the period of suspension of a director can only be adopted by a simple majority (more than half) of the votes validly cast, blank and abstaining votes excluded, in a meeting in which at least half of the members are present or represented. If this majority is met but the quorum is not met, a second meeting may be convened by taking into account a period of at least thirty (30) days, not taking into account the day of sending out the convening notice and the day of the general meeting of members, in which the resolution to suspend a director or to extend the period of suspension of a director may be adopted with simple majority (more than half) of the votes cast, regardless of the number of members being present or represented.

5.6 If a director is absent (in Dutch: *ontstentenis*) or unable to act (in Dutch: *belet*), the other directors will be charged with the management of the association. If all directors are absent or unable to act, the person or persons designated for such purpose by the board of directors, or if the board of directors has failed to do so, the general meeting of members, will be temporarily charged with the management of the association.

5.7 If a director has an interest which is in conflict with the interests of the association, this director will not take part in the deliberations and decision-making. If all directors have an interest which is in conflict with the interests of the association, the general meeting of members will be able to adopt the resolution instead of the board of directors.

### ***Financial year. Adoption of annual accounts.***

#### **Article 6**

6.1 The financial year of the association runs from the first day of January until the thirty-first day of December.

6.2 The board of directors is obliged to keep books and records of the assets and liabilities of the association in accordance with the requirements by law, and it must store the books and records in such a way that at all times the rights and obligations of the association can be known. .

6.3 The board of directors shall, within six (6) months after the end of the financial year, prepare the balance sheet and the profit and loss account of the association in accordance with the law.

6.4 The general meeting of members shall adopt the annual accounts within seven (7) months after the end of the financial year.

### ***Amendment of the articles of association***

#### **Article 7**

The general meeting of members can resolve to amend the articles of association. The articles of association can be amended only by a resolution of the general meeting of members, convened by a notice sent in accordance with article 4.2, in which notice it is mentioned that an amendment of the articles of incorporation will be proposed at this meeting. A resolution to amend the articles of association can only be adopted by a majority of two-thirds (2/3) of the votes validly cast, blank and abstaining votes excluded, in a meeting in which at least two-thirds (2/3) of the members are present or represented. If this majority is met but the quorum is not met, a second meeting may be convened by taking into account another period of at least thirty (30) days, not taking into account the day of sending out the convening notice and the day of the general meeting of members, in which the resolution to amend the articles of association may be adopted with two-thirds of the votes cast, regardless of the number of members being present or represented.

### ***Liquidation and distribution of liquidation proceeds***

#### **Article 8**

8.1 The general meeting of members can resolve to liquidate the association. A resolution to liquidate the association can only be adopted by a majority of two-thirds (2/3) of the votes validly cast, blank and abstaining votes excluded, in a meeting in which at least two-thirds (2/3) of the members are present or represented. If this majority is met but the quorum is not met, a second meeting may be convened by taking into account another period of at least thirty (30) days, not taking into account the day of sending out the convening notice and the day of the general meeting of members, in which the resolution to liquidate the association may be adopted with two-thirds of the votes cast, regardless of the number of members being present or represented.

8.2 If the association will be liquidated, the directors will be the liquidators of the assets and liabilities of the association, unless the general meeting of members resolves differently.

8.3 The liquidators will distribute the assets and liabilities that remain after liquidation to a non-profit organization which has objects that resemble the objects of the association as much as possible.

### ***Transitional provision***

The first financial year of the association will end on the last day of December two thousand twenty-three.

Finally, the person appearing declared that the Incorporators appoint the following first directors:

1. the Incorporator 1 as president;
2. the Incorporator 2 as secretary-general; and
3. Maria del Pilar Ariza Moreno, born in San Fernando, Spain on the eleventh day of June of nineteen hundred and seventy, as treasurer.

Finally, the person appearing acting in said capacities, stated that in accordance with article 3 the first directors of the association are the first members of the association. Acting as such, after execution of this deed they will admit all organizations which have adhered as adhering organizations to the Union as members of the association.

## *9.2 Internal Regulations of IUTAM Inc.*

### **IUTAM's Internal Regulations**

**Adopted by the IUTAM General Meeting of Members on 12 December 2022**

#### **Part I – General**

I. "The International Union of Theoretical and Applied Mechanics", hereinafter called "the Association" or "IUTAM", is an international non-governmental scientific organization incorporated in the Netherlands as an Association ('*vereniging*').

II. The objectives of the Association are defined in Article 2 of the Articles of Association.

III. The members of IUTAM are:

- . . . a) adhering organizations (Article VIII of these Internal Regulations);
- b) members-at-large (Part II of these Internal Regulations);
- c) directors (Article XII);
- d) the Secretary of the Congress Committee (Article XIII);
- e) the Chairs of the Fluids and Solids Symposia Panels.

The members of the Association are also the members of the General Meeting of Members.

An adhering organization can become a member of IUTAM with its written consent as a legal subject upon admittance by the General Meeting of Members.

The term of membership of a member-at-large shall be determined by the General Meeting of Members at the time of the election. The members referred to in points c), d), e) are elected by the General Meeting of Members for a specified term, namely a maximum of four years, starting on November 1, following the General Meeting of Members at which they were elected. Reelections are possible.

Matters related to ending of membership, removal of a member and termination of membership are regulated by Dutch law.

The convening notice for a General Meeting of Members shall be given by means of an electronically transmitted message. Each member is obliged to give their consent for that and provide the address disclosed for this purpose.

IV. The highest authority of IUTAM is the General Meeting of Members.

The General Meeting of Members decides on admittance of members as regulated by Article 3 of the Articles of Association.

The General Meeting of Members is regulated by Article 4 of the Articles of Association.

Each adhering organization being a member shall determine who may represent such member in the General Meeting of Members and as a result may vote on behalf of such member. Persons who may represent such member are henceforth called ‘representatives’ of such member. The number of persons who may represent a member is equal to the number of votes specified by Article 4.3 of Articles of Association and dependent on the membership category regulated by Article XV of these Internal Regulations.

V. The Board of Directors (Article XII of these Internal Regulations) may admit the following categories of observers in general meetings of members:

- i) observers appointed by adhering organizations (Article VIII of these Internal Regulations);
- ii) representatives of associate organizations (Article IX);
- iii) representatives of affiliated organizations (Article XI);
- iv) representatives of countries applying for membership;
- v) representatives of committees and groups of scientists.

VI. In all its decisions the General Meeting of Members shall be guided by the tradition of free international scientific cooperation, developed at the International Congresses for Theoretical and Applied Mechanics and IUTAM Symposia. In pursuing its objectives the Association 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, sex, disability or age.

VII. The General Meeting of Members shall provide for an adequate representation of any group of scientists carrying out research in theoretical or applied mechanics and not a member of IUTAM.

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, which are called adhering organizations, can be admitted by the General Meeting of Members as members of the Association provided they can be listed under a name that will avoid any misunderstanding about the country or territory represented.

In general, only one adhering organization from each country or territory will be admitted.

IX. Organizations 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 a member of IUTAM may, with the written support of one member, be admitted as an associate organization of IUTAM. The name of the proposed associate organization must be unambiguous and politically neutral in order to avoid misunderstanding about the country or territory being represented.

X. Each adhering organization being a member pays an annual subscription to the Association in accordance with Article XV of these Internal Regulations.

Each associate organization shall have one representative as a non-voting observer in the General Meeting of Members, and shall pay a single subscription once for each four-year period.

XI. International organizations mainly occupied in fields closely related to that of IUTAM can be admitted by the General Meeting of Members as affiliated organizations of IUTAM.

Each affiliated organization has the right to appoint an observer, who is invited to take part in the General Meeting of Members without voting rights. The Board of Directors of IUTAM has the reciprocal right to appoint a non-voting observer to the corresponding council or other executive body of the affiliated organization.

The affiliated organization and IUTAM are mutually obliged to keep each other informed about all important activities and organizational measures taken.

In organizing international scientific events each of the affiliated organizations is obliged to consider carefully the timing of the major events in order to coordinate such activities with IUTAM.

IUTAM will not be held liable for any deficit incurred by events that it endorses. Affiliated members pay no annual dues to the Association.

XII. To execute the decisions of the General Meeting of Members and to perform the administration and management tasks, the General Meeting of Members elects the Board of Directors.

Matters related to Board of Directors including representation, appointment, dismissal and suspension of directors, absence or inability to act of directors and conflict of interest are regulated by Article 5 of the Articles of Association.

The Board of Directors consists of the President, the retiring president who serves as Vice-President, the Secretary-General, the Treasurer and four other persons. These four named directors shall operate as President, Vice-President, Secretary-General and Treasurer of IUTAM, respectively.

The maximum continuous period of service as a director other than the President (P), Vice-President (VP), Secretary-General (SG) and Treasurer (T), is limited to eight years. Newly elected

directors enter into office on the date of November 1, following the General Meeting of Members at which they are elected.

The Board of Directors will meet at least once every year.

The Secretary-General will act as a permanent center for all matters affecting IUTAM, including relations with its members and other organizations.

The Board of Directors is authorized to appoint one or more Assistant-Treasurers who will not be directors.

The Board of Directors shall draft a budget for each coming year, and shall administer the finances. The Treasurer prepares an annual financial report, and the accounts are audited. Then, the Board of Directors signs and submits the audited annual financial report to the General Meeting of Members for adoption.

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

XIII. The General Meeting of Members establishes a standing Congress Committee (henceforth abbreviated CC) which supervises the organization of International Congresses of Theoretical and Applied Mechanics (ICTAM) at regular intervals.

a) The President shall also serve as Chair of the CC.

b) The CC shall nominate a Secretary from its membership or past membership subject to that person's willingness to be nominated. Based on the CC nomination, the General Meeting of Members elects the Secretary of the CC for a four-year term of service 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 Meeting of Members as individuals active in theoretical and applied mechanics and need not be members of the Association. Prior to a General Meeting of Members, the Secretary of the CC shall invite nominations from members of the CC, members of IUTAM and affiliated organizations, and any appropriate subcommittees, such as the Symposia Panels. The size of the CC shall not exceed one-third of the size of the General Meeting of Members. 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 of Theoretical and Applied Mechanics 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 Meeting of Members 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 terms of the Chair, Secretary and members of the CC and Executive Committee of the CC begin on November 1 following the General Meeting of Members at which they are elected, and end on October 31 of the fourth succeeding year.

f) The rules of procedure of the CC shall be adopted by the General Meeting of Members.

XIV. The financial means of the Association are formed by:

- a) the annual subscriptions of the adhering organizations that are members;
- b) the subscriptions of the associate organizations;
- c) the levy from the organizers of International Congresses of Theoretical and Applied Mechanics;
- d) gifts and grants.

The Association 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 Association.

XV. The number of representatives of an adhering organization that is a member of the Association 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 Meeting of Members:

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 Meeting of Members not less than one year in advance.

XVI. The subscription of an associate organization 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 member. Admission as an associate organization shall be conditional on receipt of this subscription by the Treasurer. The status of each associate organization shall be reviewed after the initial four years and again after an additional period of four years. Associate organization status shall normally be limited to a maximum of eight years. The option to apply for Category I-II membership shall be open to an associate organization at any time.

XVII. Any proposal for alteration of the Internal Regulations either prepared by the Board of Directors or supported by statements to the Secretary-General signed by at least ten members of the General Meeting of Members with voting rights, will then be considered by the Board of Directors in consultation with lawyers if necessary. Then the proposal shall be sent to the members of the association with the Agenda for a meeting of the General Meeting of Members. Such proposals shall normally be discussed during the first session of that meeting and voted upon during the second session.

## **Part II**

### **Rules of procedure**

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

1. The CC shall hold meetings at least once every two years at a time when the General Meeting of Members occurs. Typically, this is during an International Congress of Theoretical and Applied Mechanics (ICTAM) and two years after a Congress. Such a meeting shall follow the format (in-person, hybrid or virtual if provided by law) of the accompanying General Meeting of Members.
2. During a Congress, the CC shall review proposals for the next 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 of the CC handles matters arising during the period between meetings of the CC on behalf of the CC. At each General Meeting of Members accompanying a CC meeting, the Secretary of the CC reports on all such matters and their disposition since the last CC meeting. 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 the Association 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, shall present 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 the Association 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. The Association will not be held liable for any deficit incurred by the running of any ICTAM event.

### **Procedure for election of the Board of Directors**

1. The General Meeting of Members convened in accordance with article 4.2 of the Articles of Association at which the new Board of Directors is to be elected shall be held during two consecutive days, and a meeting session shall be held each day. At the General Meeting of Members preceding the one at which the new Board of Directors is to be elected, an Electoral Committee (EC) shall be elected, consisting of the President of IUTAM (who shall act as Chair of the EC) and two to four members of the General Meeting of Members who are not members of the current Board of Directors.
2. Following its election, the EC shall invite from members and their representatives, as well as observers of the General Meeting of Members indicated in Article VI under i) and ii) of these Internal Regulations, within a specified time limit, suggestions for candidates for the Board of Directors, viz. for the President (P), the Secretary-General (S) and the Treasurer (T), and for the four complementary 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 Board of Directors: one name for each of the positions (P, S, T) and one or more names for each of the other 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 General Meeting of Members in advance of the first session of the General Meeting of Members at which the new Board of Directors is to be elected in accordance with Article 4.2 of the Articles of Association.
4. At this first session, additional candidates may be proposed by members of the General Meeting of Members 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. In the second session of the General Meeting of Members convened in accordance with article 4.2 of the Articles of Association at which the new Board of Directors is to be elected, the proposals under clause 4 above shall be accepted if approved by the General Meeting of Members; otherwise they shall be considered withdrawn.
6. The General Meeting of Members 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 for electing Members-at-Large**

1. This procedure shall apply for the election and re-election of the Members-at-Large of the Association provided for in Article III(b) of these Internal Regulations.
2. Proposals, by members of the Association, for Members-at-Large must be received by the Board of Directors at least three months before the General Meeting of Members 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 Board of Directors.
3. Taking into account all material received, the Board of Directors will present to the General Meeting of Members such proposals as it deems will have at least a reasonable support by the General Meeting of Members, provided however that the total number of Members-at-Large is not to exceed approximately one eighth ( $1/8$ ) of the total number of votes that can be cast at the General Meeting of Members. Such proposals will be circulated during the first session of the General Meeting of Members at which the proposals are to be voted on.
4. Proposals not identical with those presented by the Board of Directors are considered to be withdrawn, unless they are sustained and supported by at least ten members of the General Meeting of Members before its second session.
5. The General Meeting of Members will vote on those candidates mentioned in the proposals of §3 and §4.

## **Rules of procedure for Associate Organizations**

1. Eligibility: the prime criteria for the eligibility of any country X shall be
  - a) that X be in the developing world (as commonly understood) and not already a member of the Association;
  - b) that X can demonstrate an independent scientific activity in theoretical and applied mechanics (TAM), and a desire to extend this activity through association with IUTAM;
  - c) that an existing member country of the Association has research and/or teaching contacts in X through members of its community, and is prepared to support the application and act in an advisory capacity for X; and
  - d) that there exists in X a nationally recognized organization with approved Statutes (or equivalent), which represents all interested parties within the TAM community in X, and which can act as the Associate Organization for the purpose of official communication with, and representation in, IUTAM.
2. Rights and privileges: the rights and privileges of Associate Organizations include
  - a) the right to have a representative attend the General Meeting of Members of IUTAM as an observer without voting rights;
  - b) the right to have a representative attend an ICTAM, or any IUTAM Symposium, the registration

fee being waived;

c) the right to propose the holding of an IUTAM Summer School in the country of the Associate Organization; in the event that such a proposal is successful, IUTAM could undertake to provide an increased grant (say 50 % more than the current standard allocation).

### **Part III**

In case of a conflict between the text of the Articles of Association of IUTAM and the text of these Internal Regulations, the text of the Articles of Association will prevail. The General Meeting of Members may then decide to amend the Articles of Association and/or Internal Regulations. In matters not covered by the Articles of Association or Internal Regulations, the provisions of Dutch Civil Code shall apply.

## **10. Minutes of the General Meeting of Members, Sevilla and Online, 5<sup>th</sup> June, 2023**

International Union of Theoretical and Applied Mechanics (IUTAM)  
An Association (Vereniging) Registered in the Netherlands  
Registration Number with the Dutch Trade Register: 864498925  
Registered Office: Stardock Keizersgracht B.V., Keizersgracht 482, 1017EG Amsterdam  
Netherlands

IUTAM General Meeting of Members (GMM)  
Escuela Técnica Superior de Ingeniería, Sevilla and online.

### **Minutes**

Voting Members Present (in person): Norman Fleck (President), Pilar Ariza (Treasurer), Robert McMeeking (Secretary-General), Sanjay Mittal (Secretary of the Congress Committee), Atila Freire, Kikuo Kishimoto (Directors). Voting Members Present (online): Nadine Aubry (Vice-President), Irina Goryacheva (Director).

Voting members registered to attend online and presumed present: Marc Avila, Yilong Bai, Davide Bigoni, Tore Børvik, Felix Chernousko, Richard Clarke, Alan Cocks, Enrico De Bernardis, Peter Eberhard, Daining Fang, Nenad Filipovic, Maciej Floryan, Francois Gallaire, Huajian Gao, Elisabeth Guazzelli, Peter Gudmundson, Michael Hanss, Stefan Hartmann, Francois Hild, Koichi Hishida, Muneo Hori, Shu-San Hsiau, Melany Hunt, Masaharu Kameda, Tomasz Kapitaniak, Santosh Kapuria, Reijo Kouhia, Juliana Loureiro, Tianjian Lu, Fernando Lund, Staffan Lundström, Beverley McKeon, Marcello Medeiros, Nikita Morozov, Jarkko Niiranen, Christian Niordson, Patrick Onck, Vikram Pakrashi, Timothy Pedley, Thomas Pence, G.P. Rajasekhar, Giuseppe Rega, Takashi Sakajo, Reuven Segev, Sonya Smith, Gábor Stépán, Stanislaw Stupkiewicz, Dirk Vandepitte, Wei-Chung Wang, Helen Wilson, Wei Yang.

Proxy votes: Avila (from Schumacher), Segev (from Rubin)

Registered observers: Leslie Banks-Sills (ICF), Khalil Elkhodary (Egyptian CTAM), Ana Ferreras (USNCTAM), Hilde Hambro (Organiser), Anne Juel (Euromech), Avetik Sahakyan (Armenia), Werner Schiehlen (Member-at-Large of the predecessor unincorporated IUTAM), Bernhard Schrefler (Member-at-Large of the predecessor unincorporated IUTAM).

Absent: David Abrahams, Marco Amabili, Jorge Ambrósio, Kamran Behdinan, Alessandro Bottaro, Mark Bradford, Wim Desmet, Jörg Dual, Horacio Espinosa, Patrick Guillaume, Alexandr Guz, Guowei He, Christian Hellmich, Dan Henningson, Jimmy Hsia, George Jaiani, V. Kumaran, Vladimir Levin, Detlef Lohse, Nicolas Moës, Hung Nguyen-Xuan, Miloslav Okrouhlík, Stéphane Popinet, Stefan Radev, Miles Rubin, John Sader, Jean Salençon, Andrus Salupere, Jörg Schumacher, Janko Slavic, Jens Nørkær Sørensen, Georgios Stavroulakis, Qing-Ping Sun, Hyung Jin Sung, Peichun Amy Tsai, Goran Turkalj, Sarah Waters, Daniel Wilke, Gil Ho Yoon, Xiaojing Zheng.

1. The President started the meeting at 14.30. The agenda was adopted.

2.1 The minutes of the IUTAM General Meeting of Members held in Amsterdam on December 12, 2022 were approved.

2.2 The President noted that he has compiled a document containing a summary of resolutions passed by the General Assembly of IUTAM over the years. This document will be uploaded to the IUTAM website.

2.3 The Secretary-General noted that the IUTAM website now has a ‘New Horizons’ page, *i.e.*, examples of developments in Theoretical and Applied Mechanics that point to the future. He encouraged submissions for contributions to the New Horizons segment.

2.4 The Secretary-General summarized the current Status of IUTAM Members-at-Large, *i.e.*, those elected in 2020. It is as follows, with the statement “Agreed to resign” indicating that the individual has agreed to resign as a member of the incorporated IUTAM at the end of the current period for which the individual was elected unless given a continuing membership role in the incorporated IUTAM at the subsequent election; *i.e.*, the individual agreed to resign effective October 31, 2024 unless elected at ICTAM2024 to an IUTAM position that gives the individual membership in the incorporated IUTAM for the period November 1, 2024 to October 31, 2028.

Henceforth, the unincorporated IUTAM is referred to as the IUTAM Union and the incorporated IUTAM is referred to as IUTAM Inc.

Status of IUTAM Members-at-Large (MaL), *i.e.*, those elected in 2020.

Yilong Bai – Agreed to resign – appointed MaL in IUTAM Inc. at GMM on 12-12-2022.

Peter Eberhard – Agreed to resign – appointed MaL in IUTAM Inc. at GMM on 12-12-2022.

Giulio Maier - Declined appointment as MaL in IUTAM Inc.

Robert McMeeking – Became a member of IUTAM Inc. on 4-11-2022 as its Secretary-General.

Keith Moffatt - Resigned as MaL in 2021.

Niels Olhoff - Did not respond to e-mails. MaL of IUTAM Union but not of IUTAM Inc.

Timothy Pedley – Agreed to resign – appointed MaL of IUTAM Inc. at GMM on 12-12-2022.

Jean Salencon – Agreed to resign – appointed MaL of IUTAM Inc. at GMM on 12-12-2022.

Werner Schiehlen - IUTAM had out-of-date e-mail address – has now agreed to resign, is eligible for MaL appointment in IUTAM Inc..

Bernhard Schrefler – IUTAM had out-of-date e-mail address – has now agreed to resign, is eligible for MaL appointment in IUTAM Inc.

Viggo Tvergaard - Was not responding to e-mails, was recently informed verbally - has now agreed to resign, is eligible for MaL appointment in IUTAM Inc.

The Secretary-General commented that other members of IUTAM Inc. are Adhering Organisations plus Norman Fleck (President), Nadine Aubry (Vice President), Pilar Ariza (Treasurer), Atila Freire, Irina Goryacheva, Kikuo Kishimoto, Detlef Lohse (Directors), Sanjay Mittal (Secretary of the Congress Committee), Huajian Gao (Chair of a Symposia Panel).

### 3. Report by the Treasurer

3.1 The Treasurer reported income (in black) and expenditure (in red) for the net cash flow as shown for 2022 and for 2023 to date.

	2022	2023
Interest	<b>\$2,754.38</b>	<b>\$0.00</b>
Fees	<b>\$834.99</b>	<b>\$517.50</b>
Dues	<b>\$113,012.74</b>	<b>\$67,542.70</b>
Symp	<b>\$39,786.58</b>	<b>\$30,043.00</b>
TravBu	<b>\$6,555.89</b>	<b>\$0.00</b>
TravCC	<b>\$3,233.74</b>	<b>\$0.00</b>
Trav - others	<b>\$1,702.88</b>	<b>\$2,373.31</b>
Secretary Gen.	<b>\$12,977.08</b>	<b>\$2,000.00</b>
insurance	<b>\$0.00</b>	<b>\$0.00</b>
ISC	<b>\$4,658.54</b>	<b>\$4,515.28</b>
ICTAM levy/seed	<b>\$27,676.36</b>	<b>\$3,347.00</b>
Auditor	<b>\$2,703.98</b>	<b>\$2,912.82</b>
Transfer	<b>\$90.13</b>	<b>\$0.00</b>
Web	<b>\$2,752.78</b>	<b>\$30,782.07</b>
Invoices	<b>\$0.00</b>	<b>\$886.18</b>
van Dijk - lawyers	<b>\$20,608.53</b>	<b>\$0.00</b>
virtual office	<b>\$1,433.18</b>	<b>\$0.00</b>
Net	<b>\$46,105.18</b>	<b>\$9,834.46</b>

3.2 The Treasurer's financial report for 2022 of the IUTAM Union is attached to these minutes.

3.3 The Treasurer reported that the first 3 directors of IUTAM Inc (President Fleck, Treasurer Ariza, Secretary-General McMeeking) are already registered in the Netherlands and have IUTAM Inc. Ultimate Beneficial Owner (UBO) status: The process of registering the remaining 5 members of the Board of Directors (BoD) is currently underway. When that is completed, they will acquire UBO status.

4. Helen Wilson, Chair of the IUTAM Diversity Advocacy Group (DAG), reported verbally on the recent DAG activity, including the creation of a modified application form for Symposia and Summer Schools. The minutes of the DAG meeting that was held on April 20, 2023 are attached to these minutes.

5. The President reported that the *Egyptian Committee for Theoretical and Applied Mechanics* wishes to apply to become a Category I adhering organisation of IUTAM Inc., according to Article XV of the IUTAM Internal Regulations, with one representative on the IUTAM General Meeting of Members (GMM).

This application was discussed and approved by a vote. The *Egyptian Committee for Theoretical and Applied Mechanics* is admitted as an adhering organisation, effective immediately.

6. After due discussion, Treasurer Ariza proposed and Director Freire seconded a motion to admit IUTAM Union Members-at-Large, who have responded to and accepted IUTAM's invitation, to become Members-at-Large of the IUTAM Association. The motion was carried by a substantial majority. These individuals, therefore, become Members-at-Large of IUTAM Inc. effective immediately. These individuals are Professors Werner Schiehlen, Bernhard Schrefler and Viggo Tvergaard.

After due discussion, Treasurer Ariza proposed and Director Freire seconded a motion to admit Members-at-Large of the IUTAM Association as Members of the IUTAM Association in category I. The motion was carried by a substantial majority.

The outcome of this procedure was that Professors Werner Schiehlen, Bernhard Schrefler and Viggo Tvergaard become Members-at-Large and Category I Members of IUTAM Inc, effective immediately. They join those who are already Members-at-Large and Category I Members of IUTAM Inc., namely Professors Yilong Bai, Peter Eberhard, Timothy Pedley and Jean Salençon.

7. The President reported that the Batchelor and Hill prize committees have met for ICTAM2024. He reported also that Cambridge University Press and Assessment wishes to renew its contract with IUTAM for the Batchelor Prize for 2028 and 2032, and that Elsevier wishes to renew its contract with IUTAM for the Hill Prize for 2028 and probably for 2032.

8. After due discussion, Treasurer Ariza proposed and Secretary-General McMeeking seconded a motion to postpone the next GMM to coincide with ICTAM 2024. The motion was carried without dissent.

9. Any Other Business:

Secretary Mittal of the IUTAM Congress Committee gave an update on ICTAM 2024, with the following outline.

There will be an Opening Lecture, a Closing Lecture, 16 Sectional Lectures and 8 Mini-Symposia. There will be 18 Thematic Sessions in Solids, 18 in Fluids and 9 in Solids-Fluids.

Details of the Congress can be found at: <http://ictam.cjint.kr/index.php>

There will be a 2-Page abstract submission process Sept 1, 2023 to Jan 15, 2024.

The International Papers Committee will evaluate all submissions.

Notification of Acceptance: April 12, 2024

Early-Bird Registration Deadline: May 3, 2024

Final Registration Deadline: June 30, 2024

Selected papers to be published in Special Issues of Journals.

The Local Organising Committee is working on Hotels, Shuttle Buses, Tours, Social and Partner Program, Support Grants, etc.

10. The meeting adjourned at 15.46.

*Documents attached to the Minutes*

**10(a)** Treasurer's report for the IUTAM Union for 2022.

See the next 4 pages.

## Treasurer's Report 2022

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	U.S. Dollars
<b>Statement of Change in Fund Balance</b>	
<b>Balance, 31 December 2021</b>	<b>809.178,29</b>
Net revenues minus expenses for 2022	63.337,27
<b>Balance, 31 December 2022</b>	<b>872.515,56</b>
 <b>Statement of Cash Revenues Collected over Expenses Paid</b>	
<b>Revenues collected during 2022:</b>	
Subscription dues	113.012,74
Interest income	2.754,38
ICTAM levy/seed	27.676,36
<b>Total</b>	<b>143.443,48</b>
 <b>Expenses paid during 2022:</b>	
IUTAM Symposia	39.786,58
Travel, Bureau	6.560,36
Travel, Executive Committee of Congress Committee	3.238,41
Travel, others	1.704,94
Contribution to ISC	4.658,54
Auditor's fee	2.703,98
Administration Website	2.752,78
Transfer	90,13
Bank fees	834,99
Insurance	0,00
Office costs Secretary General	12.977,08
Bureau prize	0,00
IUTAM registration	20.644,16
Virtual office - Amsterdam	1.433,18
<b>Total</b>	<b>97.385,13</b>
 <b>Revenues minus expenses for 2022</b>	
	<b>46.058,35</b>
Gain from exchange of currency	18.752,76
<b>Net revenues minus expenses for 2022</b>	<b>64.811,11</b>

## IUTAM Bank Accounts 2022

### Running Accounts

Bank	Balance 31 Dec. 2021	Withdrawals 2022	Deposits 2022	Balance 31 Dec. 2022	Currency
Spar Nord Bank Aalborg 9236 457 73 07097*	678.933,94	-397.832,42	152.976,03	434.077,55	USD
Spar Nord Bank Aalborg 9236 457 73 07089	3.203,53	-8.295,37	308.143,06	303.051,22	EUR
Spar Nord Bank Aalborg 9236 457 22 92520	4.630,52	-17.389,06	821.152,75	808.394,21	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	824.905,83	-824.905,83	0,00	0,00	DKK

### Savings Account

Bank	Balance 31 Dec. 2021	Withdrawal s 2022	Deposits 2022	Balance 31 Dec. 2022	Currency
Nordea Bank Horsholm	0,00	0,00	0,00	0,00	DKK

## Summary of Subscriptions Received

Adhering Organization	2017	2018	2019	2020	2021	2022
Armenia	1	1	1	1	1	1
Australia	3	3	3	3	3	3
Austria	1	1	1	1	1	1
Belgium	5	5	5	5	5	-
Brazil	3	3	3	3	3	3
Bulgaria	1	1	1	1	1	-
Canada	8	8	8	8	8	8
Chile	1	1	1	1	1	1
China/Beijing	12	12	12	12	12	12
China/Hong Kong	1	1	1	1	1	1
China/Taipei	3	3	3	3	3	3
Croatia	1	1	1	1	1	1
Czech Republic	1	1	1	1	1	1
Denmark	3	3	3	3	3	3
Egypt	-	-	-	-	-	-
Estonia	1	1	1	1	1	1
Finland	3	3	3	3	3	3
France	8	8	8	8	8	8
Georgia	1	1	1	1	-	-
Germany	8	8	8	8	8	8
Greece	1	1	1	1	1	1
Hungary	1	1	1	1	1	1
India	5	5	5	5	5	5
Ireland	1	1	1	1	1	1
Israel	3	3	3	3	3	3
Italy	8	8	8	8	8	8
Japan	8	8	8	8	8	8
Korea	1	1	1	1	1	1
Mexico	1	1	-	-	-	-
Netherlands	3	3	3	3	3	3
New Zealand	1	1	1	1	1	1
Norway	1	1	1	1	1	-
Poland	3	3	3	3	3	3

Portugal	1	1	1	1	1	-
Romania	1	1	1	-	-	-
Russia	8	8	8	8	8	-
Saudi Arabia	-	-	-	-	-	-
Serbia	1	1	1	1	1	1
Singapore**					3	3
Slovenia	1	1	1	1	1	1
South Africa	1	1	1	1	1	1
Spain	1	1	1	1	1	1
Sweden	5	5	5	5	5	5
Switzerland	3	3	3	3	3	3
Turkey	-	-	-	-	-	-
Ukraine	1	1	1	1	1	1
United Kingdom	8	8	8	8	8	8
United States	12	12	12	12	12	12
Vietnam	1	1	1	1	1	-

Note: For any particular year, a dash (–) indicates that dues had not been paid as of December 31, 2022. Dues are expressed in membership units of 1, 3, 5, 8 or 12, corresponding to category of membership from I through V, respectively.

\*\*Singapore paid the dues for 2021-2024 in 2020 (3 units each year).

Saudi Arabia and Egypt memberships were suspended in GA 2021.

Mexico, Turkey and Romania memberships were suspended in GA 2022.

Pilar Ariza, Treasurer of IUTAM

**10(b) Minutes of the meeting of the Diversity Advocacy Group**

This document is provided as Section 12.

## **11. Treasurer's Report for 2023 for the incorporated IUTAM**

See the next 5 pages

## Treasurer's Report 2023

### Balance sheet as at 31 December 2023

	31-12-2023			31-12-2022
	\$	\$	\$	\$
<b>ASSETS</b>				
Cooperative titles		222		-
Investment in time deposits		99.700		-
Investment trust		223.555		-
Cash in running accounts		592.143		872.515
			915.620	872.515
Total assets			915.620	872.515

	31-12-2023			31-12-2022
	\$	\$	\$	\$
<b>FUND BALANCES</b>				
			-	-
Accumulated excess of cash revenues collected over expenses paid			915.620	872.515
Total equity and liabilities			915.620	872.515

## Statement of Change in Fund Balance

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	U.S. Dollars
<b>Balance, 31 December 2022</b>	<b>872.515,56</b>
Net revenues minus expenses for 2023	43.104,01
<b>Balance, 31 December 2023</b>	<b>915.619,57</b>

## Statement of Cash Revenues Collected over Expenses Paid

### Revenues collected during 2023:

Subscription dues	100.689,70
Interest income	23.321,19
<b>Total</b>	<b>124.010,89</b>

### Expenses paid during 2023:

ICTAM levy/seed	6.317,38
IUTAM Symposia	39.222,69
Travel, Bureau	2.364,29
Travel, Executive Committee of Congress Committee	3.207,47
Travel, others	2.359,06
Contribution to ISC	4.515,28
Auditor's fee	2.912,82
Administration and Design new Website	36.984,48
Transfer	267,96
Bank fees	1.296,31
Office costs Secretary General	2.000,00
Invoices	886,18
KvK	67,66
Virtual office - Amsterdam	1.516,33
<b>Total</b>	<b>103.917,91</b>

<b>Revenues minus expenses for 2023</b>	<b>20.092,98</b>
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Gain from exchange of currency	15.936,70
Gain from investment trust account (CI CIMS 2027 2E, FI)	7.074,33

<b>Net revenues minus expenses for 2023</b>	<b>43.104,01</b>
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## IUTAM Bank Accounts 2023

### Running Accounts

Bank	Balance 31 Dec. 2022	Withdrawals 2023	Deposits 2023	Balance 31 Dec. 2023	Currency
Spar Nord Bank Aalborg 9236 457 73 07097	434.077,55	-157.704,42	207.513,18	483.886,31	USD
Spar Nord Bank Aalborg 9236 457 73 07089	303.051,22	-216.239,42	4.513,42	91.325,22	EUR
Spar Nord Bank Aalborg 9236 457 22 92520	808.394,21	-797.238,12	283,25	11.439,34	DKK
Caja de Ingenieros Barcelona 3025 0007 7814 3331 6701 (opened 21 Jul. 2023)	200.000,00	-195350,97	200.000,00	4.649,03	EUR
Caja de Ingenieros Barcelona 3025 0007 7858 1422 0027 (opened 21 Jul. 2023)	99.732,04	-99.700,00	99.732,04	32,04	USD

### Savings Account

Bank	Balance 31 Dec. 2022	Withdrawals 2023	Deposits 2023	Balance 31 Dec. 2023	Currency
Caja de Ingenieros Barcelona 7.887150665.5	0,00	0,00	201.423,49	201.423,49	EUR
Caja de Ingenieros Barcelona	0,00	0,00	99.700,00	99.700,00	USD
Caja de Ingenieros Barcelona	0,00	0,00	200,00	200,00	EUR

### Summary of Subscriptions Received

Adhering Organization	2018	2019	2020	2021	2022	2023
Armenia	1	1	1	1	-	-
Australia	3	3	3	3	3	3
Austria	1	1	1	1	1	1
Belgium	5	5	5	5	5	-
Brazil	3	3	3	3	3	3
Bulgaria	1	1	1	1	-	-
Canada	8	8	8	8	8	8
Chile	1	1	1	1	1	1
China/Beijing	12	12	12	12	12	12
China/Hong Kong	1	1	1	1	1	-
China/Taipei	3	3	3	3	3	3
Croatia	1	1	1	1	1	1
Czech Republic	1	1	1	1	1	1
Denmark	3	3	3	3	3	3
Egypt	-	-	-	-	-	-
Estonia	1	1	1	1	1	1
Finland	3	3	3	3	3	3
France	8	8	8	8	8	8
Georgia	1	1	1	1	1	-
Germany	8	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	1
Israel	3	3	3	3	3	-
Italy	8	8	8	8	8	8
Japan	8	8	8	8	8	8
Korea	1	1	1	1	1	3

Netherlands	3	3	3	3	3	3
New Zealand	1	1	1	1	1	1
Norway	1	1	1	1	-	1
Poland	3	3	3	3	3	3
Portugal	1	1	1	1	1	-
Russia	8	8	8	8	-	-
Serbia	1	1	1	1	1	1
Singapore**				3	3	3
Slovenia	1	1	1	1	1	1
South Africa	1	1	1	1	1	1
Spain	1	1	1	1	1	1
Sweden	5	5	5	5	5	5
Switzerland	3	3	3	3	3	3
Ukraine	1	1	1	1	1	1
United Kingdom	8	8	8	8	8	8
United States	12	12	12	12	12	12
Vietnam	1	1	1	1	-	-

Note: For any particular year, a dash (–) indicates that dues had not been paid as of December 31, 2023. Dues are expressed in membership units of 1, 3, 5, 8 or 12, corresponding to category of membership from I through V, respectively.

\*\*Singapore paid the dues for 2021-2024 in 2020 (3 units each year).

Pilar Ariza, Treasurer of IUTAM

## **12. Minutes of the Diversity Advocacy Group Meeting, 20<sup>th</sup> April, 2023.**

See next 5 pages.

## Minutes of IUTAM DAG (Diversity Advocacy Group) meeting

1pm-2pm, UTC/GMT time, on 20<sup>th</sup> April 2023 by a ZOOM call (virtual meeting)

### The members present

- (i) Chair: A Member of the General Meeting of Members (GMM)  
Helen Wilson (UK, Fluid)
- (ii) Secretary: A member of the Board of Directors  
Kikuo Kishimoto (Japan, Solid)
- (iii) A Member of the GMM  
Horacio Espinosa (USA, Solid)
- (iv) A Member of the XCCC  
Leslie Banks-Sills (Israel, Solid)
- (v) A Member of the Nominations Committee of the CC  
Maria Vittoria Salvetti (Italy, Fluid)
- (vi) A Member of the Symposium panels  
Ellen Longmire (USA, Fluid)

### Agenda

#### 1. Opening of the meeting by the Chair

The chair welcomed the member and opened the meeting. All members introduced themselves.

#### 2. Current status of IUTAM and next General Meeting of Members

Letter from the president and secretary-General on 6 March 2023 were introduced. IUTAM became a fully incorporated Association on 4 November 2022, registered in Amsterdam, Netherlands. The Association now has a Board of Directors (BoD) that replaces the Bureau, and a General Meeting of Members (GMM) that replaces the General Assembly (GA). The GMM will have its main annual meeting in hybrid mode by ZOOM on 5 June at 14.30 to 16.00 (Central European Time, CET). DAG planned to make a report to this meeting and propose some ideas to encourage diversity within IUTAM. In order to appear on the agenda, this proposal needs to be submitted to the President by the first of May.

#### 3. Background to the formation of DAG

The information taken from the Summary Record of the General Assembly held in August, 2022 was reviewed. Following the discussion at the GA meeting in August 2020, Bureau appointed the Diversity Working Group (DWG). DWG focused on four points of the diversity topic, namely geography, gender, age and mechanics disciplines, and proposed several recommendations in 2022. To continue working on diversity in IUTAM, the Diversity Advocacy Group (DAG) has been established. DAG comprises individuals within existing committees who will pay particular attention to Diversity. DAG members meet as a group to

co-ordinate their activities, such as sharing best practice, and will report their findings to the Bureau on an annual basis.

#### 4. Discussions of future activities of DAG

Chair reported the one action already taken in supporting the website refurbishment. A DAG representative had pointed out the need to pay attention to accessibility for people with visual disabilities.

A previous report from DWG, which contained a lot of data, was discussed and it was decided that gathering more data would not be a good use of the DAG effort, and instead to focus on reflecting on the data and identifying areas for improvement.

A call for proposals for symposia was discussed to be issued, in order to better encourage diversity in all aspects. A request for plans for diversity was proposed to be added to the instructions for symposia applications.

The running of a survey to gather ideas for emerging topics in mechanics, and the use of the results to encourage proposals in those areas, were also discussed.

Several actions were decided to be taken, including looking at the instructions for symposia proposal, updating Table 5 of the previous report (Appendix 1), and taking proposals to change the IUTAM conference proposal form (Appendix 2) to the GMM.

#### 5. Any other business

Next meeting will be held after GMM to deal with any decisions made on the proposals etc.

### Appendix 1: Revisions and update of Table 5 in Report – IUTAM Diversity Working Group

#### Geographical diversity in the IUTAM symposia locations since 1986

Year	Number of Symposium	Asia	Europe	North America	Rest of the World
2022*	11	27.3%	54.5%	18.2%	0.0%
2021	4	25.0%	50.0%	25.0%	0.0%
2020	0	0.0%	0.0%	0.0%	0.0%
2019	7	0.0%	57.1%	42.9%	0.0%
2018	15	33.3%	40.0%	20.0%	6.7%
2017	6	0.0%	83.3%	16.7%	0.0%
2016	9	40.0%	50.0%	10.0%	0.0%
1986-2015	239	19.2%	60.3%	15.9%	4.6%

(Source: IUTAM annual reports & IUTAM – A Short History, Second Edition)

\* Source: Newsletter 2022-1

## Appendix 2: Suggested modification of IUTAM conference proposal (red characters)

### IUTAM CONFERENCE PROPOSAL

<b>General Information</b>	
Proposal Type IUTAM Symposium / Summer School	<input type="checkbox"/> Summer School <input type="checkbox"/> Symposium
Title Provide a short and meaningful title	
Proposed year 2024 or 2025 or 2024/25	
Proposal area Select appropriate area for this proposal. You may select multiple areas.	<input type="checkbox"/> Fluids <input type="checkbox"/> Solids
Hosting Institution Full Institution name	
Prepared to accept responsibility for the local organization Please confirm	
Co-sponsored by Co-sponsoring institution ("--" if none)	
<b>Proposer details</b>	
Proposer's full name	
Institution	
Address 1 First part of the Institution address	
Address 2 Second part of the Institution address (if needed)	
Postal Code	
City	
Country	
Email	
<b>Co-organiser's details (if relevant)</b>	

Co-Organizer's full name (If relevant)	
Institution	
City	
Country	
Co-Organizer's Email	
<p>Detailed description of the subject</p> <p>Proposers are strongly encouraged to organize symposia in emergent areas of high societal impact, which have not been traditionally covered by IUTAM symposia.</p> <p>Max 400 words</p>	
<p>Scientific Committee</p> <p>IUTAM encourages you to consider aspects of diversity when selecting members of the scientific committee. This includes aspects such as gender and race, but also career stage and country of current institution.</p> <p>Members (7) of Scientific Committee</p>	<p>Committee Member</p> <p>Full name</p> <p>Name and Surname <input type="text"/></p> <p>Affiliation <input type="text"/></p> <p>City <input type="text"/></p> <p>Country <input type="text"/></p> <p>Email <input type="text"/></p>
Prospective Chair(s)	
Project discussed with National Organization	<input type="radio"/> Yes <input type="radio"/> No
Do you request a grant from IUTAM?	<input type="radio"/> Yes <input type="radio"/> No
<p>Comment on how your symposium engages speakers and participants from a diverse range of relevant scientists</p> <p>Max 200 words</p>	

Additional comments	
Max 200 words	
EU regulations on personal data protection	<input type="checkbox"/> I accept the <a href="#">Confidentiality policy of IUTAM</a> on behalf of everyone whose personal data appear in the proposal

### 13. IUTAM Publications in 2023

No publications associated with IUTAM Symposia appeared in 2023. Recent volumes published in association with IUTAM Symposia can be found at [www.springer.com/series/7695](http://www.springer.com/series/7695)

### 14. IUTAM Summer Schools Held in 2023.

There were no IUTAM Summer Schools in 2023.

### 15. IUTAM Symposia Held in 2023

Symposia are listed by number as designated at the General Assembly that gave its approval; *i.e.*, those listed as 20-XX were approved at the General Assembly in 2020. Those numbered 18-XX were postponed from 2020 or 2021 due to the Covid pandemic.

18-03 *IUTAM Symposium on Dynamics and Interface Phenomena of Bubbles and Droplets at Multiple Scales*

Chairperson: Shu Takagi      Location: Tokyo, Japan      3-5 December, 2023

To be inserted.

18-07 *IUTAM Symposium on UltraLarge-Scale Topology Optimization*

Chairperson: Ole Sigmund      Location: Kongens Lyngby, Denmark      23-26 April, 2023  
Proceedings were not published.

#### Session 1: Ultra High Resolutions

Moderator: Grégoire Allaire, École Polytechnique

Speakers:

1. H. Alicia Kim, University of California San Diego. *Large Scale Level Set Topology Optimization via Sparse Hierarchical Data Structures.*
2. Michael Y. Wang, Monash University. *Cellular Level Set Models for Ultralarge-Scale Topology Optimization.*
3. Niels Aage, Technical University of Denmark. *On the Success of Ultra-large Scale Structural Optimization.*

#### Session 2: Buckling and Eigenvalue Problems

Moderator: Mathias Wallin, Lund University

Speakers:

1. Graeme Kennedy, Georgia Institute of Technology. *Algorithms for Large-Scale Topology Optimization with Eigenvalue Problems.*
2. Fengwen Wang, Technical University of Denmark. *Architected Materials with Programmable Strength and Stiffness Response.*

3. Federico Ferrari, Technical University of Denmark. *Large-Scale Buckling Topology Optimization: State of the Art and Challenges*.

### **Session 3: Fluids and Multiphysics**

Moderator: Casper Andreasen, Technical University of Denmark

Speakers:

1. Eddie Wadbro, Umeå University. *Towards Ultralarge-Scale Topology Optimization for Fluids and Electromagnetics*.
2. Ryohei Katsumata, Nagoya University. *Topology Optimization of Large-Scale Transient Flow Using Building-Cube Method*.
3. Jihong Zhu, Northwestern Polytechnical University. *Topology Optimization for Morphing Structures Driven by Smart Materials*.
4. Mingdong Zhou, Shanghai Jiao Tong University. *Topology Optimization of Channel-Cooling Structures for Thermomechanical Behaviors*.

### **Session 4: Industrial**

Moderator: Ole Sigmund, Technical University of Denmark

Speakers:

1. Christian Thomsen & Bradley Rothenberg, nTopology Inc. *Field Optimization – A Modular Design Tool for Advanced Manufacturing*.
2. Claus B. W. Pedersen, Dassault Systemes Deutschland GmbH. *Transient Structural Non-Linear Optimization*.

### **Session 5: De-homogenization**

Moderator: Ole Sigmund, Technical University of Denmark

Speakers:

1. Dennis Kochmann, ETH Zürich. *Homogenization-Based Topology Optimization of Spatially Variant Structural Networks*.
2. Florian Feppon, KU Leuven. *Challenges in Dehomogenization of Fluid Microchannels*.
3. Jonàs Martinéz, Inria. *Procedural Single-Scale Structures for Scalable Dehomogenization*.

### **Session 6: Efficient Optimizers**

Moderator: Martin Berggren, Umeå University

Speakers:

1. Bich Ngoc Vu, FAU Erlangen-Nürnberg. *Sequential Global Programming for Structural Optimization*.
2. Oded Amir, Technion – Israel Institute of Technology. *Topology Optimization with Inexact Design Sensitivities*.
3. Yuan Liang, Dalian University of Technology. *High-Precise Multi-Resolution Discrete Variable Topology Optimization*

### **Session 7: Reduced Order Methods**

Moderator: Niels Aage, Technical University of Denmark

Speakers:

1. Piotr Breitkopf, Alliance Sorbonne Universités. *Multi-Fidelity Reduced Order Modeling for Ultralarge-Scale Topology Optimization*.
2. Quhao Li, Shandong University. *Reduced-Order Methods for Large-Scale Dynamic Problems in Topology Optimization*.
3. Xiaoping Qian, University of Wisconsin-Madison. *On-The-Fly Dual Reduction for Transient Fluid Topology Optimization*.

### **Session 8: Non-linear Problems**

Moderator: Martin Berggren, Umeå University

Speakers:

1. Mathias Wallin, Lund University. *Design of Dissipative Materials Using Topology Optimization*.
2. Shelly Zhang, University of Illinois at Urbana-Champaign. *Multiphysics Topology Optimization for Highly Deformable Materials*.
3. Jonathan Russ, Princeton University. *Topology Optimization Methods for Increasing Resistance to Failure*.

### **Session 9: Future Methods**

Moderator: Michael Y. Wang, Monash University

Speakers:

1. Yichao Zhu, Dalian University of Technology. *Combinative Use of Asymptotic Analysis and Machine Learning for Multiscale Modelling and Optimization*.
2. Weisheng Zhang, Dalian University of Technology. *Machine-Learning Assisted Topology Optimization with Structural Gene Inheritance*.
3. Erik Träff, Technical University of Denmark. *Large-Scale Topology Optimisation. A Mixed Bag of Strategies*.

### **Poster Presentations**

Moderator: Niels Aage, Technical University of Denmark

Presenters:

1. Andreas Bærentzen, Technical University of Denmark. *Conversion of 3D Truss Structures to Quad-Meshes*.
2. Anna Dalklint, Lund University. *Tunable Phononic Bandgap Materials Designed via Topology Optimization*.
3. Arnoud Delissen, Delft University of Technology. *Multi-GPU Accelerated Topology Optimization for a Blended-Wing-Body Aircraft*.
4. Casper S. Andreasen, Technical University of Denmark. *Large-Scale Optimization of Forced Convection Heat Sinks*.
5. Christoffer F. Christensen, Technical University of Denmark. *Topology Optimization of Multiscale Structures Considering Yield and Buckling Limits*.
6. Douglas De Aquino Castro, University of California San Diego. *Large-Scale Level Set for Topology Optimization for Laminar Flow Designs*.
7. Konstantinos Poullos, Technical University of Denmark. *Second Order Structural Topology Optimization in Weak Form*.

8. Lukas Høghøj, Technical University of Denmark. *Large-Scale Robust Topology Optimization of Forced Convection Heat Sinks.*
9. Peter D. L. Jensen, Technical University of Denmark. *Efficient Ultralarge-Scale Topology Optimization for Complex Geometries Using De-Homogenization.*
10. Rebekka Woldseth, Technical University of Denmark. *Review of the Use of Neural Networks in Topology Optimization.*
11. Rebekka Woldseth, Technical University of Denmark. *De-Homogenization Using Phasor Noise.*
12. Tim Felle Olsen, Technical University of Denmark. *Stream Surface Based De-Homogenization.*
13. Tom de Weer, Siemens and KU Leuven. *Multiscale Topology Optimization with Pareto-Optimal Lattice Structures.*
14. Vilmer Dahlberg, Lund University. *Efficient Buckling Constrained Topology Optimization Using Reduced Order Modeling.*

### 18-11 IUTAM Symposium on Turbulent Structure and Particles-Turbulence Interaction

Chairpersons: Xiaojing Zheng, S. Balachandar

Location: Lanzhou, China

7-10 July, 2023

Proceedings of the IUTAM Symposium, on Turbulent Structure and Particles-Turbulence Interaction.

Edited by: Xiaojing Zheng and S. Balachandar

IUTAM Bookseries (IUTAMBOOK, Volume 41), Springer Cham 2024.

### Summary

Day 1 – July 8, 2023

08:30-08:50 Opening Ceremony

08:50-09:20 Group photo & Coffee break

#### Session 1

09:20-10:00 **S. Balachandar**, Department of Mechanical and Aerospace Engineering, University of Florida: Turbulent structure of super, sub, and trans-critical turbidity currents and turbulent-sediment interaction at the bed  
 10:00-10:40 **Zhaosheng Yu**, Department of Mechanics at Zhejiang University. : Turbulence modulation by heavy finite-size particles in vertical channel flows and development of two-fluid models from interface-resolved simulations.

10:40-11:20 **Lianping Wang**, Southern University of Science and Technology: Simulation and analysis of turbulent flows laden with spherical and non-spherical particles.

#### Session 2

13:30-14:10 **Francesco Picano**, Department of industrial engineering & CISAS “Bepi Colombo”, University of Padova: Modeling and simulation of droplet evaporation in turbulent sprays with application to respiratory disease transmission.

14:10-14:50 **Xiaojing Zheng**, Center for particle-laden turbulence, Lanzhou University: Two phase structures in high-Reynolds-number sand-laden wall-bounded turbulence.

14:50-15:30 **Eckart Meiburg**, Center for Interdisciplinary Research in Fluids, UCSB: Cohesive particles in turbulence.

#### Session 3

15:40-16:20 **Detlef Lohse** (online), the Physics of Fluids group at the University of Twente in the Netherlands: Dispersed multiphase Taylor-Couette turbulence: From bubbly drag reduction to catastrophic phase inversion.

16:20-17:00 **Devaraj van der Meer** (online), the Physics of Fluids group at the University of Twente in the Netherlands: A synthetic, scaling-law approach to liquid impact.

17:00-17:40 **David Richter** (online), Department of Aerospace and Mechanical Engineering, University of Notre Dame: Particle-turbulence interactions in high-Re flows: Can small particles influence large-scale motions?

17:40-18:20 **Cristian Marchioli** (online), University of Udine: From DNS to LES of turbulent dispersed flows: Modelling subgrid effects on particle dispersion.

18:20-19:00 **Gaetano Sardina** (online), Department of Mechanics at Chalmers University of Technology: Particle-turbulence interactions in atmospheric warm clouds.

Day 2 – July 9, 2023

#### **Session 4**

08:30-09:10 **Lian Shen**, University of Minnesota: Direct numerical simulation and analysis of bubbly flow in breaking waves.

09:10-09:50 **Jesse Capecelatro** (online), Departments of Mechanical Engineering and Aerospace Engineering at the University of Michigan: Towards robust turbulence models for strongly-coupled gas-particle flows.

09:50-10:30 **Jiarong Hong**, Departments of Mechanical Engineering, Electrical and Computer Engineering, Biomedical Engineering, and the Saint Anthony Falls Laboratory at the University of Minnesota: Unveiling the Dynamics of Snow Settling in Atmospheric Turbulence: A Review of Nearly a Decade of Field Research at EOLOS

#### **Session 5**

10:40-11:20 **Keqing Xia**, Center for Complex Flows and Soft Matter Research, Department of Mechanics and Aerospace Engineering, Southern University of Science and Technology: Vortices as particles in rapidly rotating turbulent flows.

11:20-12:00 **René van Hout**, Mechanical Engineering, Technion – Israel Institute of Technology: Particle-turbulence interactions: from spheres to fibers.

12:00-12:40 **Chunxiao Xu**: Hierarchical structures and particle transport in wall turbulence

#### **Session 6**

13:30-14:10 **Alfredo Soldati**, the Technische Universitaet Wien (Austria): Dynamics of anisotropic particles in turbulence.

14:10-14:50 **Chao Sun**, Center for Combustion Energy, and the Department of Energy and Power Engineering, and the Department of Engineering Mechanics, Tsinghua University: Global and local statistics in turbulent emulsions.

14:50-15:30 **Rui Ni**, Mechanical Engineering at Johns Hopkins University: The deposition and clustering dynamics of charged inertial particles in turbulent channel flows.

#### **Session 7**

15:40-16:20 **Yali Tang**, the Power and Flow group in the Department of Mechanical Engineering, Eindhoven University of Technology: Coarse-grained Euler-Lagrange simulations of polydisperse reactive particulate flows.

16:20-17:00 **Susumu Goto**, Osaka University, Japan: The condition and rate of attenuation of turbulent kinetic energy due to solid spherical particles.

17:00-17:40 **Wei Ge**, Chemical Engineering, Institute of Process Engineering, Chinese Academy of Sciences: Multi-scale discrete simulation of particle-fluid Interactions.

17:40-18:20 **Kun Luo**, College of Energy Engineering, Zhejiang University: An improved direct-forcing immersed boundary method for modeling flow dynamics and heat transfer in gas-solid dense flow.

Day 3 – July 10, 2023

#### **Young scholar and PhD student Forum**

To give young scholars an opportunity to present their research progress in this field, an ‘Early-career forum’ with oral presentations by 24 young scholars and PhDs was organized on the last day.

18-13 *IUTAM Symposium on Optimal Guidance and Control for Autonomous Systems*

Chairperson: Dilmurat Azimov

Location: Honolulu, HI, USA

15-17 March, 2023

Proceedings of the IUTAM Symposium on Optimal Guidance and Control for Autonomous Systems, Edited by Dilmurat Azimov

IUTAM Bookseries, (IUTAMBOOK Volume 40), Springer Cham, 2024.



## APPENDIX

**IUTAM Symposium on Optimal Guidance and Control for Autonomous Systems**  
**University of Hawai'i at Manoa**  
**East West Center**  
**March 15 – 17, 2023**

**Day 1: Wednesday, March 15, 2023**  
**Location: Pacific Room, East West Center**

8:30 AM	<b>Registration &amp; Sign In</b>
<b>MORNING SESSION 1: Welcome! [9:00 – 10:05 AM]</b>	
9:00 – 9:10 AM	<b>Welcome and Introduction</b> Dr. Dilmurat Azimov, <i>Associate Professor, University of Hawai'i at Manoa</i> <i>Department of Mechanical Engineering, IUTAM Symposium Chair. USA.</i>
9:10 – 9:30 AM	<b>Opening Remarks</b> Dr. Vassilis Syrmos, <i>Professor, the Vice President for Research and</i> <i>Innovation of the University of Hawai'i System. USA</i>
9:30 – 10:05 AM	<b>Featured Lecture: Nā Mea 'Ike 'Ia Cultural Presentation</b> Kumu Brad Lum. <i>USA.</i>
10:10 – 10:25 AM	<b>Coffee Break</b>
<b>MORNING SESSION 2: Guidance, Navigation and Control (GNC) [10:30 AM – 12:15 PM]</b>	
10:30 – 11:05 AM	<b>Mathematical Modeling for Precision Navigation by Tracking Ground Targets</b> Robert H. Bishop. <i>University of South Florida. USA.</i>
11:05 – 11:40 AM	<b>Force Estimation and Control Enhanced by a Force-Derivative Sensor</b> Yu-Sheng Lu, Liang-Hao Chen. <i>National Taiwan Normal University. Taiwan.</i>
11:40 AM – 12:15 PM	<b>Iterative Control Framework with Application to Space Docking</b> Xun Liu, Hashem Ashrafiuon, Sergey G. Nersesov. <i>Villanova University. USA.</i>
12:15 – 1:15 PM	<b>Lunch</b> <i>Location: Makana Room, East West Center</i>
<b>AFTERNOON SESSION 1: GNC &amp; Sensor Technologies [1:15 – 2:25 PM]</b>	
1:15 – 1:50 PM	<b>Detection, Classification and Tracking Challenges in Acoustics</b> John S. Allen III. <i>University of Hawai'i at Manoa. USA.</i>
1:50 – 2:25 PM	<b>ESA Technology Developments in Vision-based Navigation</b> Olivier Dubois-Matra, Massimo Casasco, Manuel Sanchez Gestido, Irene



	Huertas. <i>European Space Agency. The Netherlands.</i>
2:30 – 2:45 PM	<b>Coffee Break</b>
<b>AFTERNOON SESSION 2: GNC &amp; Robotic Technologies [2:50 – 4:15 PM]</b>	
2:50 – 3:15 PM	<b>Performance Evaluation of Real World Clicker Fine-tuning Operation Method Based on Manipulability of a Robot Arm</b> Shin-ichiro Sakamoto, Keigo Noguchi, Satoshi Iwaki. <i>Hiroshima City University. Japan.</i>
3:15 – 3:40 PM	<b>Mobile Robot Guidance Method Using Laser Spots Irradiated on the Floor from Real World Clicker and its Application for Object Grasping System</b> Keigo Noguchi, Shin-ichiro Sakamoto, Satoshi Iwaki. <i>Hiroshima City University. Japan.</i>
3:40 – 4:15 PM	<b>Extending Explicit Guidance Methods to Higher Dimensions, Additional Conditions, and Higher Order Integration</b> Evan Kawamura, Dilmurat Azimov. <i>NASA Ames Research Center. University of Hawai'i at Manoa. USA.</i>
5:00 – 6:30 PM	<b>Tea Gathering - Informal Social Networking Event</b> <i>Location: Makana Room, East-West Center</i>

**Day 2: Thursday, March 16, 2023**

**Location: Pacific Room, East West Center**

8:30 AM	<b>Registration &amp; Sign In</b>
<b>MORNING SESSION 1: Robotic Technologies [9:00 – 10:45 AM]</b>	
9:00 – 9:35 AM	<b>Development of a Simulator for Operator Proficiency Training for Seafloor Exploration by Remotely Operated Vehicle</b> Ryusei Kamewari, Yusuke Fujishima, Kuniaki Kawabata, Kenta Suzuki, Norimitsu Sakagami, Fumiaki Takemura, Satoru Takahashi. <i>Kagawa University. Tokai University. Sector of Fukushima Research and Development, Japan Atomic Energy Agency. Japan.</i>
9:35 – 10:10 AM	<b>Identifying Consumer Drones Via Encrypted Traffic</b> David Liang, Yingfei Dong. <i>University of Hawai'i at Manoa. USA.</i>
10:10 – 10:45 AM	<b>Optimization of the Four Coil Configuration for Single Magnet Levitation from Below</b> Peter Berkelman, Steven Kang. <i>University of Hawai'i at Manoa. USA.</i>
10:50 – 11:05 AM	<b>Coffee Break</b>
<b>MORNING SESSION 2: Stochastic Systems &amp; Game Theory [11:10 AM – 12:20 PM]</b>	
11:10 – 11:45 AM	<b>Assigning Probability Distributions to the State of Stochastic Systems</b> Ali Pakniyat. <i>University of Alabama. USA.</i>
11:45 AM – 12:20 PM	<b>Applications of the II-Strategy when Players Move with Acceleration</b> Bahrom T. Samatov, Ulmasjon B. Soyibboev. <i>Institute of Mathematics of the Academy. Namangan State University of Sciences of Uzbekistan.</i>



	<i>Namangan State University. Uzbekistan.</i>
12:20 – 1:20 PM	<b>Lunch</b> <i>Location: Makana Room, East West Center</i>
<b>AFTERNOON SESSION 1: Game Theory &amp; Mission Operations [1:20 – 2:30 PM]</b>	
1:20 – 1:55 PM	<b>Initial Development of Cooperative Control and Localization of Multiple Spacecraft using a Multi-Agent Mission Operations System</b> Trevor Sorensen, Eric Pilger, Miguel Nunes, James Lewis, Scott Ginoza, Zhuoyuan Song, Chris Battista, Lillian Shibata. <i>University of Hawai'i at Manoa. USA.</i>
1:55 – 2:30 PM	<b>Optimal Number of Pursuers in the Game on the 1-Skeleton of 4D Cube</b> Gafurjan Ibragimov, Zahriddin Muminov. <i>Tashkent State University of Economics. Uzbekistan.</i>
2:35 – 2:50 PM	<b>Coffee Break</b>
<b>AFTERNOON SESSION 2: Optimal Control &amp; Underwater Vehicles [2:55 – 4:30 PM]</b>	
2:55 – 3:30 PM	<b>Development of An Operation Support Device for Portable Underwater Vehicles</b> Yu Kimura, Norimitsu Sakagami, Takahiro Wada, Koichi Koganezawa. <i>Tokai University. Nara Institute of Science and Technology. Japan.</i>
3:30 – 4:05 PM	<b>Hamiltonian Distributed Optimal Control of Coupled Finite and Infinite-Dimensional Lagrangian Systems</b> Nhan Nguyen. <i>NASA Ames Research Center. USA.</i>
4:05-4:40 PM	<b>Optimal control of thermal processes in a nonlinear inverse problem with redefinition function at the end-point of the interval</b> Tursun K. Yuldashev. <i>Tashkent State University of Economics. Uzbekistan.</i>
5:00 – 7:30 PM	<b>Reception: Banquet Dinner</b> <b>Nā Mea 'Ike 'Ia Cultural Performance with Kumu Brad Lum</b> <i>Location: East-West Center, Makana Room</i>

**Day 3: Friday, March 17, 2023**

**Location: Pacific Room, East West Center**

8:30 AM	<b>Registration &amp; Sign In</b>
<b>MORNING SESSION 1: Modeling &amp; Data Analytics [9:00 – 10:25 AM]</b>	
9:00 – 9:30 AM	<b>Koopman Operator Based Modeling and Control of Quadrotor</b> Simone Martini, Kimon P. Valavanis, Alessandro Rizzo. <i>University of Denver. USA. Politecnico di Torino. Torino, Italy.</i>
9:30 – 9:55 AM	<b>On the Vertical and Horizontal Integration of Robotics within Engineering and Computing Education</b> Colleen Berg, Missy Cummings, Robert Handler, Monson Hayes, Nathan Kathir, Leigh McCue, Cameron Nowzari, David Rosenblum, Quentin



	Sanders, Daigo Shishika, John Shortle. <i>George Mason University. USA.</i>
9:55 – 10:20 AM	<b>Vector Thrust Control of an Upper-Stage Rocket with Partially Filled Fuel Tanks via Takagi-Sugeno Fuzzy Model</b> Aaron Inks, Chokri Sendi. <i>University of Alaska-Anchorage. USA.</i>
10.20 -10.45 AM	<b>Microwave thermal rocket engine-based orbital launch system implementation.</b> Abdulazal Toshkhujaev, Akhror Agzamov, Makhsud Yusupov. <i>Spaceborne Corporation. Uzbekistan.</i>
10:45 – 11:00 AM	<b>Coffee Break</b>
<b>MORNING SESSION 2: Nonlinear Control Systems &amp; Machine Learning [10:50 AM – 12:35 PM]</b>	
11:00 – 11:25 AM	<b>Data-driven Reinforcement Learning for Mission Engineering and Combat Simulation</b> A. Henslee, H. Dozier, I. Shukla, B. Hansen, A. Salhi, T. Arnold, J. Jabour, G. Turner, J. White, I. Dettwiller. <i>US Army Engineering Research and Development Center. Vicksburg, USA.</i>
11:25 – 11:50 AM	<b>Optimal control problems for the first order autonomous systems</b> Mansur P. Eshov, Najmiddin N. Qodirov, Tursun K. Yuldashev. <i>Tashkent State University of Economics. Uzbekistan.</i>
11:50 – 12:15 PM	<b>Application of Cybenko's Theorem and Algebraic Geometry in Solving Modified E-Guidance Equations</b> Matthew Leonard, Dilmurat Azimov. <i>University of Hawai'i at Manoa. USA.</i>
12:15-12.40 pm	<b>A Novel Dynamic &amp; Aerodynamic Intelligent Morphing System (DA-IMS) for the Stability of an Autonomous Utility Truck</b> Parth Y. Patel, Vladimir V. Vantsevich, Roy P. Koomulli. <i>University of Alabama at Birmingham. USA.</i>
12:40 – 1:05 PM	<b>Analysis of a model for improving the efficiency of routing control in data transmission networks based on fuzzy logic.</b> Khojiakbar Urinov. <i>National University of Uzbekistan. Uzbekistan.</i>
1:05 – 1:10 PM	<b>Closing remarks</b> Dr. Dilmurat Azimov, <i>Associate Professor, University of Hawai'i at Manoa Department of Mechanical Engineering, IUTAM Symposium Chair. USA.</i>

1. Basic Information

Chairs: Yong Xu and Jürgen Kurths

Location: Xi'an, Shaanxi, China

Date: June 5-9, 2023

Proceedings: Standalone proceedings were not published.

Special Issues: A selection of papers has been published in a special issue of Nonlinear Dynamics. In addition, to extend the symposium's themes, a special issue was presented in the European Physical Journal Special Topics.

2. IUTAM Symposium

Plenary Lectures:

Speaker	Affiliation	Title
Jürgen Kurths	Humboldt University of Berlin; Potsdam Institute for Climate Impact Research	Stability of power grid concerning tropical cyclones: Increasing resilience by protecting critical lines
Gábor Stépán	Budapest University of Technology and Economics	Controlling unstable states of dynamical systems: Digital effects and chaotic behavior
Guowei He	Chinese Academy of Science	Space-time energy spectra and dynamic coupling in turbulent flows
Dengqing Cao	Harbin Institute of Technology	Data and knowledge driven dynamic modeling for composite structures with uncertain connections and/or supports
Alexander Hramov	Immanuel Kant Baltic Federal University	Explainable machine learning approaches for analysis of fMRI-based brain networks
Luonan Chen	University of Chinese Academy of Sciences	Dynamics-based data science and AI
Grzegorz Litak	Lublin University of Technology	Synchronization effect in a multiple degree of freedom energy harvesting system
Yong Xu	Northwestern Polytechnical University	Data-driven based solution to the FP equation
Bala Balachandran	University of Maryland (Online)	Data-driven aperiodic dynamics
Wei Lin	Fudan University	Predicting and modulating complex dynamics using data-driven and machine learning techniques
Changsong Zhou	Hong Kong Baptist University	Spontaneous brain activity: Cortex-wide complex wave and

		nonlinear interaction with sensory-evoked activity
Fang Han	Donghua University	Gamma oscillation dynamics and information processing mechanism of neuronal networks
Jae-Hyung Jeon	Pohang University of Science and Technology	Transport dynamics in polymer environments: From critical subdiffusion in human chromosomes to active diffusion in polymer networks
Jianbing Chen	Tongji University	Dimension-reduced probability density evolution equations: A physically or physics-informed data-driven approach
Eckehard Schöll	Technical University of Berlin (Online)	Nonequilibrium phase transitions and critical behavior in networks
Qi Liu	Tokyo Institute of Technology	Nonlinear dynamics and vibration suppression of conceptual airfoil models with random loads
Alexey Zaikin	University College London	Merging nonlinear dynamics, graphs and artificial intelligence: Synolitic networks and noise-induced AI
Xiaole Yue	Northwestern Polytechnical University	Data-driven cell mapping method for global analysis of dynamical systems
Yong Wang	Zhejiang University	Data-driven identification of variational equations and intrinsic structures
Syamal K. Dana	Jadavpur University	Amplitude and phase coupling play contrarian roles in synchrony
Jinqiao Duan	Illinois Institute of Technology; Great Bay University	Transition phenomena in non-Gaussian stochastic dynamical systems
Stefano Lenci	Polytechnic University of Marche	Sparse data-driven regression algorithm to identify dynamical systems with impacts
Kazuyuki Aihara	University of Tokyo (Online)	Data-driven analysis on early warning signals in complex systems and its possible applications
Caishan Liu	Peking University	Steering control and stability analysis for an autonomous bicycle
Jinjie Zhu	Nanjing University of Aeronautics and Astronautics	Analysis of stochastic dynamical systems based on large deviation theory and data-driven theory
Rui Huang	Nanjing University of Aeronautics and Astronautics	Nonlinear aeroservoelasticity of flexible aircraft
Marcin Kapitaniak	University of Aberdeen	Nonlinear modelling of a novel floating wind turbine concept

Qian Ding	Tianjin University	Data-driven structural parameter identification and optimization
Naoya Fujiwara	Tohoku University	Intersections of nonlinearity and networks in human mobility data
Jun Jiang	Xi'an Jiaotong University	Enhancing efficiency of state-space discretized methods for data analysis of nonlinear stochastic dynamical systems
Sudeshna Sinha	Indian Institute of Science Education and Research Mohali (Online)	Mastering chaos with physics-aware neural networks
Tomasz Kapitaniak	Lodz University of Technology	Different coherent states for lightly supported coupled pendula
Dongchang Li	University of Waterloo	Quickest change detection in nonlinear hidden Markov models using the generalized CUSUM procedure with particle filters
Xingjian Jing	City University of Hong Kong	Complex nonlinear systems identification: A robust control / learning approach
Andreev Andrei	Immanuel Kant Baltic University	Reservoir computing approach for analysis and prediction of complex network dynamics
Heetae Kim	Korea Institute of Energy Technology	Understanding the stability of complex power grids with network science

*Poster and Fast Talk:*

Authors	Poster Title
Xiaolong Wang; Jing Feng; Yong Xu	Deep learning-based state prediction of the Lorenz system with variable parameters
Hua Li; Yong Xu; Jianwei Shen	Transition path properties for non-Markovian models
Cheng Fang; Yubin Lu; Ting Gao; Jinqiao Duan	Reservoir computing with error correction: Long-term behaviors of stochastic dynamical systems
Hufei Li; Shaojuan Ma	Probability density function evolution for linear system driven by multiplicative fractional noise
Jianbing Chen; Mengze Lyu	Probabilistic response determination and dynamic reliability analysis for high-dimensional nonlinear stochastic systems via physics-informed data-driven DR-PDEE
Huikang Zhang; Xiaole Yue; Yongge Li	Stochastic switching analysis of two-dimensional panel system in subsonic flow
Mengmeng Li; Di Liu; Jing Li	Stochastic analysis of vibro-impact bistable energy harvester system under colored noise
Ming Kong; Bin Pei; Qi Liu; Yongge Li	Response analysis and vibration control of the wing system with external store under narrow band noise excitation
Menglin Hu; Wantao Jia	Solving and discovering of quasi-integrable Hamiltonian system based on deep neural network and stochastic averaging method

Ruifang Wang; Yong Xu; Bin Pei	Stochastic averaging for a completely integrable Hamiltonian system with fractional Brownian motion
Rui Xu; Xiaole Yue; Xuefeng Wang; Ruiyi Gao	Stochastic response of a Stewart platform excited by narrow-band noise
Xinyu Bai; Shaojuan Ma; Juan Ma	Dynamical behavior of infectious disease model with secondary vaccination affected by Lévy noise
Xuemei Liu	Stochastic dynamics of heterogeneous diffusion processes with Poisson noise
Xi Chen; Xiaoling Jin; Zhilong Huang	Data-driven identification for approximate analytical solution of first-passage problem
Xiaokai An; Feng Jiang; Yujia Zhang; Lin Du; Zichen Deng	A few-shot identification method for stochastic dynamical systems based on residual sampling
Yang Li; Jinqiao Duan	A data-driven approach for discovering stochastic dynamical systems with non-Gaussian Lévy noise
Zifei Lin; Jiali Zhao; Yanming Liang; Tomasz Kapitaniak	RC-FODS algorithm for solving numerical solutions of fractional order dynamical system
Le Wei; Lin Du; Aili Fan; Yuchen Miao; Zichen Deng	Distributed finite-time prescribed performance consensus control for mass via event-triggered communication
Wenqing Sun; Jinqian Feng	A kernel-based method for discovering governing equations with jump-diffusion processes
Wanrong Zan	Path integral solutions for n-dimensional stochastic differential equations under $\alpha$ -stable Lévy excitation
Jinzhong Ma	Data-driven early warning of Gaussian-white-noise-induced critical transitions
Zhanqing Wang; Yongge Li; Yong Xu; Tomasz Kapitaniak; Jürgen Kurths	Coherence-resonance chimeras in coupled HR neurons with alpha-stable Lévy noise
Hongxia Zhang	Jumping dynamics of a stochastic vegetation ecosystem with threshold policy control
Lingyu Feng; Ting Gao; Min Dai; Jinqiao Duan	Learning effective dynamics from data-driven stochastic systems
Luxuan Yang; Ting Gao; Yubin Lu; Jinqiao Duan; Tao Liu	Neural network stochastic differential equation models with applications to financial data forecasting
Nannan Zhao; Zhongkui Sun	Amplitude death in multiplex networks with stochastic interactions
Tingting Sun; Mengze Lyu; Jianbing Chen	Property of intrinsic drift coefficients in the physics-informed data-driven DR-PDEE for first-passage reliability problems
Tingting Zhang; Yanfei Jin	Enhanced DC power delivery from a rotational tristable energy harvester driven by colored noise under various constant speeds
Wang Xiao; Kai Liu; John Lowengrub; Shuwang Li; Meng Zhao	Three-dimensional numerical study on wrinkling of vesicles in elongation flow
Wenjie Yang; Qianqian Zheng; Jianwei Shen	Pattern dynamics and bifurcation in delayed SIR network with diffusion network
Yanxia Zhang; Jinqiao Duan; Yanfei Jin; Yang Li	Discovering governing equation from data for multi-stable energy harvester under white noise
Ying Zhang; Yiling Gao; Xi Xia Duan	Stochastic response analysis of bistable energy harvesting system with double un-certain parameters

Yuzhi Chen; Zhonghua Liu; Yutao Xu	Electron resolution enhancement in micro-mechanical phonon-cavity systems utilizing nonlinearity
Yajie Zhai; Yanmei Kang	Novel bearing fault diagnosis algorithms based on stochastic resonance systems
Ziheng Xu	Stochastic resonance based visual perception using spiking neural networks
Yaokun Wang; Kun Zhao; Juan L. G. Guirao; Huatao Chen; Dengqing Cao	Online intelligent maneuvering penetration methods of missile with respect to unknown intercepting strategies based on reinforcement learning
Qianqian Zheng; Jianwei Shen; Yong Xu	Pattern selection from instability modes
Rong Guo; Jinzhong Ma; Junlin Li	Response analysis of a shape memory alloy laminated beam with viscoelastic matrix under random fluctuations
Yan Chen; Kuang Zhou	Community vulnerability analysis based on structural and functional retentivity in the frame of causal intervention
Changting Zhong; Gang Li; Zeng Meng	Beluga whale optimization

### 3. Special Issues

#### (1) *Nonlinear Dynamics*:

URL: <https://link.springer.com/collections/bfjbfbfajb>

The Special Issue of Nonlinear Dynamics titled "Data-driven nonlinear and stochastic dynamics with control" comprises 29 peer-reviewed papers. This issue originated from the IUTAM Symposium held in Xi'an, China (June 5–9, 2023). While primarily including the best papers from the symposium, it was also open to external submissions, selecting the best contributions in this field. Specific topics include neural network approaches for solving Schrödinger and Fokker–Planck equations, basin of attraction analysis, innovative data-driven control strategies, and so on. These papers illustrate how modern machine-learning and data-science tools are reshaping theory and practice in nonlinear and stochastic dynamical systems, building a keystone for the discipline and a reference for further developments.

#### (2) *European Physical Journal Special Topics*:

URL: <https://epjst.epj.org/component/toc/?task=topic&id=2038>

Prompted by the progress showcased at the IUTAM Symposium, the editors initiated a derivative collection in the European Physical Journal Special Topics entitled "Data-based nonlinear and stochastic dynamics." Although these papers were not prepared specifically for the symposium, their scope and orientation extend its central themes. The issue brings together 20 peer-reviewed contributions that collect several research domains: data-based modeling, data-driven algorithms, response predictions, diverse practical applications, and inverse problems. The compiled studies address applications ranging from aeroelastic flutter and biomedical system dynamics to financial market behaviors and epidemiological modelling, thereby illustrating the broad utility of data science and deep learning in nonlinear and stochastic dynamics.

*20-05 IUTAM Symposium on Dynamics of Capsules, Vesicles and Cells in Flows*

Chairperson: Anne-Virginie Salsac Location: Compiegne, France

10-13 July, 2023

To be inserted.

20-08 *IUTAM Symposium on Soft Matter Mechanics*

Chairperson: Yonggang Huang      Location: Ningbo, China

5-8 December, 2023

To be inserted.

20-09 *IUTAM Symposium on Mechanics of Advanced Materials and Structures with Multifield Couplings*

Chairperson: J.N. Reddy      Location: Nanjing, China

20-24 October, 2023

No proceedings were published.

The Symposium attracted nearly 200 representatives from 7 countries including the United States, Canada, Germany, Japan and China to attend the meeting in person. A total of 36 experts delivered invited lectures and over 60 young scholars presented their works via posters.

**October 31, Morning**

09:00-9:35	Materials/Mechanics-GPT and Domain Knowledge-Guided Machine Learning <b>Tong-Yi Zhang</b>	<b>Ji Wang</b>
9:35-10:10	Maxwell's equations for a mechano-driven media system that moves with acceleration <b>Zhong Lin Wang</b>	
10:10-10:45	Hydrovoltaics: multifield coupling at multiphase interfaces <b>Wanlin Guo</b>	
11:00-11:35	Multiscale Dynamics of Cells and Biological Tissues <b>Xi-Qiao Feng</b>	<b>Biao Wang</b>
11:35-12:10	Recent Advances on Extreme Mechanics of Metallic Materials <b>Speaker: Huiling Duan</b>	

**October 31, Afternoon**

14:00-14:35	The Principle of Virtual Energy for Predicting the Failure Strength of Material Structures <b>Speaker: Biao Wang</b>	<b>Andreas Ricoeur</b>
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14:35-15:10	Recent Progress in Damage Inspection Techniques Based on Linear and Nonlinear Lamb Waves <b>Speaker: Ning Hu</b>	
15:10-15:45	Chemo-thermo-mechanically coupled constitutive and failure theory of thermal barrier coatings in extreme environments <b>Speaker: Yichun Zhou</b>	
16:00-16:35	Carbon Fiber-Enhanced Piezoelectric Nanocomposites for Energy Harvesting and Flexible Motion Sensors <b>Fumio Narita, <u>Yaonan Yu</u></b>	<b>Xuejun Zheng</b>
16:35-17:10	Design and properties of mechanical multifunctional materials <b><u>Xin Li</u>, Minghui Lu</b>	
17:10-18:10	<b>Poster Presentations-Group 1</b>	<b>Jinxi Liu</b>

#### November 01, Morning

08:30-09:05	Flow-induced vibrations and their applications in renewable fluid energy harvesting <b><u>Quan Wang</u>, Jinlong Liu</b>	<b>Shengping Shen</b>
09:05-09:40	Effective Elastic Properties of Novel Ultralight Composite Panels with Honeycomb-Corrugation Hybrid Cores <b>Rui Kang, <u>Tian Jian Lu</u></b>	
09:40-10:15	Optical-mechanical-magnetic multi field coupling effects on energy harvesting of micro/nano energy devices <b><u>Xuejun Zheng</u>, Hui Dong</b>	
10:30-11:05	Interfacial Chemomechanics and Self-Healing High-temperature Coating <b>Gaosheng Yan, <u>Shengping Shen</u></b>	<b>Weiqiu Chen</b>

11:05-11:40	Contact vibration analysis of a spherical punch on a piezoelectric half-space <b>LiaoLiang Ke</b>	
11:40-12:15	Phase field modeling of coupling evolution of fracture and dielectric breakdown in ferroelectric materials <b><u>Jie Wang</u>, Yong Zhang, Jiajun Sun</b>	

#### November 01, Afternoon

14:00-14:35	A Generalized Formulation of Nonlinear Effects of Bias Fields on Wave Propagation in Electromagnetic Solids <b><u>Ji Wang</u>, Rongxing Wu</b>	<b>Liaoliang Ke</b>
14:35-15:10	A coupled mechanical-electrochemical phase-field model for kinetics of the formation of void and sponge in silicon electrode of lithium ion batteries <b><u>Junqian Zhang</u>, Yang Xiong, Ying Zhao, Bo Lu</b>	
15:10-15:45	Nonlinear electrical properties in piezoelectric semiconductor structures <b>Luke Zhao, <u>Feng Jin</u></b>	

#### November 02, Morning

08:30-09:05	Nonlinear postbuckling of functionally graded graphene composite laminates with a circular or elliptical delamination <b><u>Zengtao Chen</u>, Hamid Akbarzadeh</b>	<b>Yong Ni</b>
09:05-09:40	Effects of perfect/imperfect interfaces and the constituent properties rotations on the effective properties for micropolar laminated media <b><u>Reinaldo-Rodríguez</u>, Y. Espinosa-Almeyda, H. Camacho-Montes, F. J. Sabina, P. Rodríguez-Bermudez, D. Guinovart-Sanjuan [online]</b>	

09:40-10:15	A generalized active Willis meta-layers for unsymmetric flexural wave control <b>Guoliang Huang [online]</b>	
10:30-11:05	Liquid Crystal Elastomers: Constitutive law, 3D printing and Functionality <b>Yongzhong Huo</b>	<b>Amirtham Rajagopal</b>
11:05-11:40	A thermodynamically-consistent non-isothermal phase-field fracture model coupled with phase transformation <b>Yu Zhen, Kaijin Wu, Yuyang Lu, Mengqi Liu, Linghui He, <u>Yong Ni</u></b>	
11:40-12:15	Some applications of machine learning methods in solid mechanics <b><u>Bao Qin</u>, Zheng Zhong, Tong-Yi Zhang</b>	

#### November 02, Afternoon

14:00-14:35	Smart acoustic/elastic metamaterials based on multi-field coupling <b>Chuan-Zeng Zhang [online]</b>	<b>Chunli Zhang</b>
14:35-15:10	Multi-physical Coupled Model of Surface Acoustic Wave Resonators <b>Tao Han</b>	
15:10-15:45	Energy flow tailoring and vibration suppression of laminated composite structures <b>Jian Yang</b>	
16:00-16:35	Mechanical Manipulation of Schottky Diode via Flexoelectricity <b>Liang Sun, Junjie Wu, <u>Chunli Zhang</u>, Weiqiu Chen</b>	<b>Jian Yang</b>
16:35-17:10	Active Control of Robust Elastic Wave Propagation in Plate-type Acoustic Metamaterials <b><u>Zhenyu Chen</u>, C.W. Lim</b>	

17:10-18:00	<b>Poster Presentations-Group 2</b>	<b>Yan Shi</b>
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### November 03, Morning

08:30-09:05	Maxwell stresses in dielectrics: a 100-years-controversy and how cracks could illuminate the problem <b><u>Andreas Ricoeur</u>, Lennart Behlen</b>	<b>Xiaofan Gou</b>
09:05-09:40	Nonlocal modeling of anisotropic fracture and interfacial damage using phase field-cohesive zone model (PF-CZM) <b>Dhalladhuli Pranavi, <u>Amirtham Rajagopal</u></b>	
09:40-10:15	Visualizing Multi-Physical Spatiotemporal Evolution of Dielectric Breakdown in High Performance Polymeric Capacitors <b>Zhigang Liu, Xuhui Fan, Kaixin Liu, Fengyuan Zhang, Boyuan Huang, Yao Wang, <u>Jiangyu Li</u></b>	
10:30-11:05	Wavelet Methods and Their Applications in Multi-field Coupled Nonlinear Mechanics Problems <b><u>Jizeng Wang</u>, Guiguang Li, Xiaojing Liu, Youhe Zhou</b>	<b>Jiangyu Li</b>
11:05-11:40	Construction and application of elastic anisotropy index and fundamental solution for quasicrystalline materials <b><u>Liangliang Zhang</u>, Jinming Zhang, Yang Gao</b>	
11:40-12:15	The adhesive properties and fracture mechanism of YBCO/CeO <sub>2</sub> interface of Superconductor Coated Conductors <b><u>Xiaofan Gou</u>, Shun Gu</b>	

## \*\*Poster Presentations-Group 1

<b>October 31, 17:10-18:10, 3<sup>rd</sup> Floor, Charles Hall, GMH</b>			
<b>MAMSMC -No.</b>	<b>Titles</b>	<b>Authors</b>	<b>Chair</b>
001	Adhesive contact of a pre-deformed soft electroactive half-space by a rigid sphere	Guozhan Xia, Weiqiu Chen	Jinxi Liu
002	Fatigue life analysis of cylindrical roller bearings with the consideration of thermo-mechanical coupling property	Jinhua Xie, Zhi Qian, Peng Li, Zhenghua Qian	
003	Analytical solution of the electro-magneto-elasto-hydrothermal coupling problem of rotating functionally graded piezoelectric/piezomagnetic hollow spheres under a hydrothermal environment	Xiaoyuan Shan, Jun Xie, Xing Li, Wenshuai Wang, Pengpeng Shi	
004	Interface crack behaviors disturbed by Love waves in a 1D hexagonal quasicrystal coating-substrate structure	Yuanyuan Ma, Yueting Zhou, Juan Yang, Xuefen Zhao, Shenghu Ding	
006	The contact problem between two flat punches in a porous half-space with an elastic coating	Yonglin Yang, Wenshuai Wang, Shenghu Ding, Xing Li	
007	Effect of grain size on the electrocaloric properties of polycrystalline ferroelectrics	Xu Hou	
008	A unified thermodynamic modeling approach for amorphous shape memory polymers	Hao Duan, Huiyu Sun	
014	Analysis of silicon anode microstructural effects on electrochemical-mechanical characteristic of lithium-ion batteries based on heterogeneous model	Yutao Shi	
015	Waisted Post-buckling configuration of mechanical metamaterials cylindrical shell and its applications	Jiabin Sun, C.W. Lim, Zhenhuan Zhou, Xinsheng Xu	
016	Study on Mechanical Behavior and Failure Mechanism of Fibrous Network Composites	Yao Zhang, Guan Yang, Yi Jia, Pengfei Wang, Zhenyu Yang, Zixing Lu	
018	A theoretical modeling of strengthening mechanism in graphene-metal nanolayered composites	Xingwei Chen, Kunkun Fu, Yan Li	
019	The spatial Z-shape design of metamaterials with compression-twist coupling and thermal-twist coupling effects	Xuan Chen, Tengwu He, Miaolin Feng	
021	Shape morphing of magnetic hydrogels and applications	Jingda Tang	
023	Magneto-Solid coupling nonlinear free vibration of functionally gradient cylindrical shell	Qi Zhou, Yuda Hu, Tao Yang	

024	Modeling of the multi-field coupling behaviors in U-10Zr Helical Cruciform Fuel rods under irradiation	Xingdi Chen, Zhexiao Xie, Xiaoxiao Mao, Shurong Ding, Tenglong Cong, Yao Xiao, Hui Guo, Hanyang Gu	Jinxi Liu
025	Analysis of functionally graded beams subjected to thermo-mechanical loading using the dual mesh control domain method	Zeyu Jiao, Guannan Wang, Rongqiao Xu	
026	Constitutive parameter identification of hyperelastic materials under biaxial tensile tests with the virtual fields method	Mingliang Jiang, Zhujiang Wang,	
027	Design method for conformal graded lattice structures with complex boundary constraints	Zhujiang Wang, Bin Zhai, Yangfan Xu	
028	A Two-dimensional DtN-FEM solution for scattering analysis of Lamb guided waves in curved plates	Sikai Fu, Bin Wang, Zhenghua Qian	
029	Orientation-dependent superelasticity and fatigue of CuAlMn shape memory alloy under in situ micromechanical tensile Characterization	Zeyuan Zhu, Xian Chen	
030	Nonlocal numerical analysis of thermoelectric coupling field by using peridynamic differential operator	Hongji Zhu, Qingshan Zhu	
031	A data-driven constitutive model for weak texture magnesium alloy	Tao Hu, Tengwu He, Miaolin Feng	
034	Structure and noise reduction of porous materials in fairing	Chengxin Yu, Tiequan Zhang	
035	Analysis of influence of temperature gradient on sound absorption properties of fiber porous materials	Qingshan Zhu, Hongji Zhu	
036	Gradient structures electrode design by multi-physics simulation amplifies the fast-charging performance of thick electrodes	Xinya Niu, Yuyang Lu, Yong Ni	
038	Analysis of Thermal and Structural Vibrations in a Common Bottom Storage Tank	Tiequan Zhang, Chengxin Yu	
040	Magneto-electro-thermo-elastic coupled simulation of functionally graded smart structures	Shunqi Zhang, Yafei Zhao	
041	An integrated experimental and modeling approach to understand the chemomechanical degradation in high-energy lithium batteries	Rong Xu	
042	Thermal-electric-elastic coupling of thermoelectric generator in the fabrication process	Kun Song	
045	Mechanically Gated Transistor	Boyuan Huang, Jiangyu Li	

## \*\*\*Poster Presentations-Group 2

November 2, 17:10-18:10, 3 <sup>rd</sup> Floor, Charles Hall, GMH			
MAMSMC -No.	Titles	Authors	Chair
043	Flexoelectricity and Piezoelectricity in Graphene Based Moiré Superlattices	Yuhao Li, Hanhao Zhang, Yuanhao Wei, Cunfa Gao, Yan Shi, Zaiyao Fei	Yan Shi
044	A laser-induced graphene-based self-sensing composite structure for MMOD hypervelocity impact detection	Gang Yan, Xinfei Yu, Deng Zhou	
046	Analysis of strain and stress fields in the soft materials containing hard inclusions with different shapes	Yu Sun, Quanguan Yang	
047	Optimization analysis of the vibration excavation components for a garlic combined harvester based on the mechanism of shovel-soil-garlic intercropping	Xiao Yin, Yongjian Wang, Hua Li, Hao Zhou, Yue Wang	
048	Large electrocaloric effects induced by domain transition in ferroelectrics with electrical inclusions	Cheng Huang	
049	Optimized Laurent series for planar elasticity problems	Shuang Wang	
050	Study on the necking of hyperelastic materials	Min Li	
051	Analytic solutions for a circular nanohole with surface effects in thermoelectric material	Jieyan Zhao, Haibing Yang	
052	Influence of fiber hollowness on the effective properties of a periodic thermoelectric composite	Haoxin Liu, Chuanbin Yu	
053	Mechanical properties of multi-scale germanium specimens from space solar cells under electron irradiation	Jian Qiu, Maliya Heini, Jusha Ma, Wenjia Han, Xunchun Wang, Jun Yin, Yan Shi, Bin Qian, Cunfa Gao	
054	Axisymmetric vibration of a soft elastic rod with surface tension induced residual stress	Pengyu Pei	
055	Passively adaptive wind energy harvester featuring a double-airfoil bluff body with adjustable attack angles	Jinlong Liu, Quan Wang	
057	Numerical Investigation on corrosion cracks of three-dimensional pipelines under seismic wave loading	Meng Ren, Yanmei Zhang, Mu Fan	
059	Series solutions for a non-circular nanohole with surface effects under uniform heat flux	Yu Zhang, Haibing Yang	
060	Improving the performance of piezoelectric PN junctions by strain engineering	Wanli Yang	
061	Optimization of nanoporous metallic actuators by combining multiscale calculations and machine learning	Sheng Sun, Menghuan Wang, Ying Zhang, Hang Qiao, Tongyi Zhang	

062	Design of a thermal diode with a high rectification ratio using asymmetric deformation	Yuping Han, Zhan Kang	Yan Shi
063	Large deformation model of anisotropic flexible piezoelectric materials	Shihao Lv, Yan Shi, Bin Qian, Cunfa Gao	
064	Thermal-elastic field around an elliptical nano-inhomogeneity with interface effects under uniform remote heat flux	Qianqian Zhang, Shuang Wang, Cunfa Gao	
065	Lightweight biomimetic metamaterials with high strength and toughness	Lei Cai, Qiang Zhang, Cunfa Gao	
066	Stress analysis in the elastic matrix with an arbitrary shaped rigid inclusion	Kui Miao, Hao Hu, Ming Dai, Bin Qian, Cunfa Gao	
067	Topology optimization design of multi-layer structure of space solar cell array in space service environment	Xiaoyan Qian, Yan Shi, Bin Qian, Cunfa Gao	
068	Optimization analysis of intelligent variant structure based on shape memory alloy	XiaoHan Chen, Bin Qian, Shi Yan	
069	Scattering of sh wave around an elliptic hole and dynamic stress concentration with surface effect	Hao Hu, Kui Miao, Ming Dai, Bin Qian, Cunfa Gao	
071	Study on mechanical properties of brittle solar cells with defects	Ao Huang, Yan Shi, Jian Qiu	
072	Chemo-elastic analysis of a cracked half-plane under transient chemical loading	Keqiang Hu, Shuping Chen, Cunfa Gao, Zengtao Chen, Zheng Zhong	
074	Maxwell stress in fracture mechanics of brittle dielectrics	Lennart Behlen, Daniel Wallenta, Andreas Ricoeur	
075	Energy harvesting: hybrid visco-ferroelectric modeling	Andreas Warkentin, Lennart Behlen, Andreas Ricoeur	
076	Investigation of Thermal Strain in Space Solar Array Substrate by Strain Gauge in Thermal-Vacuum Environment	Wenjia Han, Yi Shen, Jusha Ma, Xunchun Wang, Bin Qian, Yan Shi, Cunfa Gao	
077	Optimization of the Topology of Bonding Adhesive between Solar Cell and Substrate for Space Solar Arrays: Design and Realization	Yi Shen, Jihang Wu, Xiaoyan Qian, Wenjia Han, Jusha Ma, Xunchun Wang, Bin Qian, Yan Shi, Cunfa Gao	

*20-11 IUTAM Symposium on Nonlinear Dynamics for Design of Mechanical Systems across  
Different Length/Time Scales*

Chairperson: Hiroshi Yabuno

Location: Tsukuba, Japan

31 July-4 August, 2023

Proceedings of the IUTAM Symposium on Nonlinear Dynamics for Design of Mechanical  
Systems Length/Time Scales, Edited by Hiroshi Yabuno, Walter Lacarbonara, B. Balachandran,  
Alexander Fidlin, Giuseppe Rega, Masaharu Kuroda, Shinichi Maruyama  
IUTAM Bookseries, (IUTAMBOOK Volume 43), Springer Cham, 2025.

See next 14 pages.

# Preface

This book contains papers presented at International Union of Theoretical and Applied Mechanics (IUTAM) Symposium on Nonlinear dynamics for design of mechanical systems across different length/time scales held in Tsukuba Science City.

This volume of IUTAM bookseries includes many papers of the symposium after undergoing review. The papers are categorized into nine areas: calculus and computation, fluid mechanics and fluid-structure interactions, fundamental mechanics, composite materials and soft matter, nonlinear dynamics and control, nonlinear dynamics in practical systems, sports dynamics and biomechanics, stochastic dynamics, and synchronization. The book editors are as follows: Balakumar Balachandran, Alexander Fidlin, Masaharu Kuroda, Walter Lacarbonara, Shinichi Maruyama, Giuseppe Rega, and Hiroshi Yabuno.

Nonlinear phenomena arise in a variety of mechanical and physical systems. Also, the experimental analyses for nonlinear dynamics, together with theoretical analyses, confirm not only the reliability of the theoretical results but also deliver meaningful hints on realizing high-performance machines, which exhibit features of high-accuracy, high-speed, high-flexibility, high-reliability, and so on. In fact, the positive utilization of resonant vibrations and their nonlinear characteristics can be found in various devices such as auto-parametric vibration absorbers, gyroscopic dampers, ultrasonic vibrational machine tools, atomic force microscopes, ultrasensitive mass sensors, in the fields across diverse length scales, i.e., from macroscopic applications to micro/nanoscale ones. This symposium, while shedding light onto state-of-the-art knowledge and advancements, was eminently expected to pave the way towards future directions and perspectives in the field. Share of the knowledge on theoretical and experimental approaches to nonlinear dynamics by extensive discussions and exchange of ideas in the symposium may help to devise novel comprehensive methods to understand nonlinear phenomena much more deeply and lead to paradigm shifts in mechanical system design towards next-generation design by positive exploitation of nonlinear phenomena.

The keynote lectures of the symposium were on some relevant paradigmatic topics as follows:

- “Constructive Utilization of Nonlinear Dynamics in Micro-scale Systems” by Professor Hanna Cho (Ohio State University).
- “Koopman as a gate to Hill: a quest for a stability criterion” by Professor Dr. ir. habil. Remco Leine (University of Stuttgart) and M.Sc. Fabia Bayer.
- “Forecasting Critical Transitions Using Data-Driven Methods” by Professor Bogdan I. Epureanu (University of Michigan).
- “Melnikov’s methods and nonintegrability of forced nonlinear oscillators” by Professor Kazuyuki Yagasaki (Kyoto University).

As most presentations were related to more than one topic, regular presentations were divided into sessions

- Day one: Duffing oscillator, Nonlinear dynamical systems in practical systems.
- Day two: Stochastic dynamics, Nonlinear fluid mechanics and fluid-solid interactions, Sports dynamics, Synchronization.
- Day three: Large deformation and soft robotics, Analysis and reduction of multi-degree-of-freedom nonlinear systems, Design of resonators and sensors, Multi-stability.
- Day four: Vibration control and energy harvesting, Metamaterials and soft matter.
- Day five: Fractional calculus, Energy transfer, Wave and propagation in practical systems.

The presentations in detail are shown below.

## Symposium Schedule

### Jul. 31st, 2023

12:30 – 13:05 **Registration**

13:05 – 13:15 **Opening address**

13:15 – 13:40 **Tutorial**

**Exploiting global nonlinear dynamics for analysis, control and design of mechanical systems and structures across different length/time scales [online]**

Giuseppe Rega

13:40 – 14:30 **Mon-f1: Duffing (Chair: Alexander Fidlin, Karlsruhe Institute of Technology)**

**Bursting oscillations across different time scales: models and quantification of their responses**

Ivana Kovacic

**An asymptotic solution for near peak behavior of the Duffing equation [online]**

Stefano Lenci

14:30 – 15:20 **Keynote 1: Constructive Utilization of Nonlinear Dynamics in Micro-scale Systems (Chair: Walter Lacarbonara, Sapienza University of Rome)**

Associate Professor Hanna Cho

Micro/Nano Multiphysical Dynamics Laboratory

Department of Mechanical and Aerospace Engineering

College of Engineering

The Ohio State University

<https://mae.osu.edu/mnmdl>

15:20 – 15:40 **Coffee break**

15:40 – 17:45 **Mon-f2: Nonlinear dynamics in practical systems (Chair: Tamás Kalmár-Nagy, Budapest University of Technology and Economics)**  
**Asymptotic Approximation of the Maximal Lyapunov Exponent of Moore-Greitzer PDE model with small Multiplicative Noise close to Stall Bifurcation**

Yiming Meng, N. Sri Namachchivaya, Nicolas Perkowski

**Detect and evaluate undesired nonlinearities in engineering structural dynamics**

Mayuko Nishio, Sifan Wang

**Intermodal Targeted Energy Transfer**

Oleg Gendelman, Majdi Gzal, Alexander Vakakis

**Wave propagation in metamaterial honeycombs with embedded nonlinear membrane resonators**

Yichang Shen, Walter Lacarbonara

**Non-linear characteristics of a two-DOF shaft-system coupled by a universal joint with clearance**

Junaid Ali, Anil K. Bajaj, Gregory Shaver

18:00 – 20:00 **Welcome reception**

## **Aug. 1st, 2023**

8:45 – 9:05 **Registration**

9:05 – 9:55 **Keynote 2: Koopman as a gate to Hill: a quest for a stability criterion (Chair: Bala Balachandran, University of Maryland)**

Prof. Dr. ir. habil. Remco Leine, M.Sc. Fabia Bayer

Institute for Nonlinear Mechanics, University of Stuttgart

[www.inm.uni-stuttgart.de](http://www.inm.uni-stuttgart.de)

9:55 – 10:45 **Tue-f1: Stochastic dynamics (Chair: Oleg V. Gendelman, Technion-Israel Institute of Technology)**

**Stability and bifurcation of a noisy nonlinear auto-parametric vibration absorber**

Peter H. Baxendale, N. Sri Namachchivaya, Momoiyoluwa Oluyemi

**Nonlinear stochastic global dynamics of an imperfect, electrically actuated microbeam through an operator approach**

Kaio C. B. Benedetti, Paulo B. Goncalves, Stefano Lenci, Giuseppe Rega

10:45 – 11:05 **Coffee break**

11:05 – 12:45 **Tue-f2: Nonlinear fluid mechanics and fluid-structure interactions (Chair: Anil Bajaj, Purdue University)**

**A novel pair of non-dimensional measures to predict the order-to-chaos wake transition in the flow-field of a flapping foil**

Dipanjan Majumdar, Chandan Bose, Sunetra Sarkar  
**Coupled Bluff Body Energy Harvesters: Vortex-Influenced Dynamics**

Khawar Zamman Wani, Manoj Pandey, Balakumar Balachandran  
**Dynamical Modeling and Analysis of Fluid-Structure Interaction Phenomena and Bifurcation Occurring in the Inducer of a Turbopump for Rocket Engines**

Tsuyoshi Inoue, Hayate Okawa, Hironori Horiguchi  
**Nonlinear phenomena in perturbed Rayleigh-Benard convection**  
 Hiroaki Yoshimura, Masahito Watanabe

12:45 – 13:40 **Lunch**

13:40 – 14:30 **Tue-f3: Sports dynamics (Chair: Masaharu Kuroda, University of Hyogo)**

**Head speed generating mechanisms during turning phases of athletic hammer throwing**

Sekiya Koike, Tempei Tominaga, Keigo Byun Ohyama, Alexander P. Willmott

**Nonlinear Finite Element Analysis of the Impact Between a Tennis Racket and a Tennis Ball**

Toki Shimada, Yudai Washida, Akihiro Matsuda

14:30 – 15:30 **Shotgun session 1 (Chair: Triet Nguyen-Van, University of Tsukuba)**

**[2-01 Viscoelasticity]**

PS01 **Gripping force of pneumatically actuated flexible arms**

Kazuya Sakai, Tomohiko G. Sano

PS02 **Reaction-diffusion model for the tape-peeling trace by deformed adhesives**

Keisuke Taga, Hiroya Nakao, Yoshihiro Yamazaki

PS04 **Theory and computation of weakly nonlinear ultrasound propagation in a viscoelastic bubbly liquid**

Takeru Hasegawa, Tetsuya Kanagawa

**[2-02 Materials]**

PS05 **Modeling of Porous Hyperelastic Materials Containing Compressible Voids**

Xiao Li, Akihiro Matsuda

PS06 **Shrinkage and shape memory of gelated cellulose nanopaper in the drying process**

Shohei Moriwaki, Itsuo Hanasaki

**[2-03 Soft actuators]**

PS07 **Jumping mechanism of elastic shells on rigid or granular substrates**

Takara Abe, Shuhei Shimizu, Genya Ishigami, Tomohiko G. Sano

PS08 **Experimental analysis on jumping mechanism using snap-through buckling of an elastic strip**

Shuhei Shimizu, Takara Abe, Tomohiko G. Sano, Genya Ishigami

**PS09 Modelling of series inflatable actuators for sequential activation control**

Kiyohiro Araki, Diego Paez-Granados, Modar Hassan, Kenji Suzuki

**[2-04 Biomechanical systems]****PS10 Nonlinear material modeling of human skeletal muscle with muscle contraction**

Tomotaka Hamajima, Akihiro Matsuda

**PS11 An Instrumented Pole for Measuring the Individual Hand Forces in Pole Vaulting**

Rinri Uematsu, Kiyoshi Hirose, Osamu Takeda, Alexander P. Willmott, Sekiya Koike

**PS12 Optimization-based Kinetic Synthesis Method to Produce Nonlinear Response Property of Prosthetic Legs**

Sergio Alberto Galindo Leon, Diego Paez-Granados, Modar Hassan, Kenji Suzuki

**PS13 Mechanical Characterization of Multi-Degree-of-Freedom Elastic Neck Exoskeleton for Persons with Drooped Head Syndrome**

Santiago Price Torrendell, Hideki Kadone, Modar Hassan, Kenji Suzuki

**[2-05 Bubble]****PS14 Weakly nonlinear ultrasound propagation in liquids containing multiple ultrasound contrast agents with shell in buckled or ruptured states**

Quoc Nam Nguyen, Tetsuya Kanagawa

**PS15 Thermal effects on bubble dynamics under long-term ultrasound irradiation in a gel**

Satoshi Kusakabe, Keita Ando

**PS16 Effect of microbubble coated with anisotropic shell on ultrasound propagation in liquid containing multiple microbubbles**

Ryoki Kawahata, Tetsuya Kanagawa

**[2-06 CFRP]****PS17 Inelastic two-scale analysis of dovetail joints of CFRP fan blades for jet engines**

Eiichiro Mori, Masayoshi Akaza, Chiharu Tsujikawa, Tetsuya Matsuda, Naoki Morita, Nobuhiro Yoshikawa

**PS18 Vibration characteristics of curvilinear CFRP prepared by electrodeposition resin molding manufacturing method**

Md Tansirul Islam, Shinya Honda, Kazuaki Katagiri, Katsuhiko Sasaki, Ryo Takeda, Isamu Saiwaki, Yuto Shimizu

**PS19 Experiments on Nonlinear and Chaotic Vibrations of a Bi-stable Unsymmetrically Laminated CFRP Plate**

Kodai Hirano, Shinichi Maruyama, Ken-ichi Nagai, Takao Yamaguchi, Chihiro Kamio

**[2-07 Machine tools]**

**PS20 Monitoring system for Laser Welding and Emitting Energy Distribution Model to Explain Nonlinear Relationship**

Ichiro Ogura

**PS21 Feasibility studies of using vibration sensor to monitor tool wear progress during finishing step of hardened steel machining**

Jonny Herwan, German Herrera-Granados, Ichiro Ogura, Yoshiyuki Furukawa, Takashi Misaka, Hitoshi Komoto

**PS22 Experimental study of the nanoscale cutting using the self-excited microcantilever**

Linjun An, Ichiro Ogura, Kiwamu Ashida, Hiroshi Yabuno

**[2-08 Synchronization]**

**PS23 Phase-Amplitude Reduction of Limit Cycling Networks for Optimal Synchronization**

Petar Mircheski, Hiroya Nakao

**PS24 Design of artificial limit-cycle oscillators with global synchronization properties**

Norihisa Namura, Hiroya Nakao

**PS25 Synchronization in Switching Networks of Nonlinear Systems**

Shuma Kamo, Toshiki Oguchi

**PS26 Rigorous numerics for synchronized solutions of coupled time delay Duffing systems**

Kazuki Takahashi, Akitoshi Takayasu

**[2-09 Data-driven dynamics]**

**PS27 A case study of applying virtual node approach to multiple oscillators for reservoir computing**

Takeshi Shibuya

**PS28 Automatic Generation of Governing Equations for Mechanical Systems with Piecewise-Linear Systems using Sparse Regression**

Ryosuke Kanki, Akira Saito

**PS29 Analysis of nonlinear acoustic waves using physics-informed neural networks**

Kazuya Yokota, Takahiko Kurahashi, Masajiro Abe

**[2-10 Numerical analysis and computation]**

**PS30 A GPU-based multi-sphere DE-FE method and its application in the simulations of tire-terrain interaction**

Xiaobing Guo, Shunhua Chen, Mengyan Zang, Naoto Mitsume

**PS31 Parallel Implementation of a rigorous contour integral based eigensolver and its performance evaluation**

Shota Seto, Akitoshi Takayasu

**PS32 Rigorous numerical computations with the Chebyshev interpolation using the Julia language**

Shinsuke Kondo, Akitoshi Takayasu

15:30 – 16:30 **Poster session 1 with Coffee break**

16:30 – 18:00 **Short oral presentations (Chair: Rajesh Chaunsali, Indian Institute of Science & Tomohiko G. Sano, Keio University)**

**Two-scale analysis of magnetoactive polymers and bifurcation studies on slender ferromagnetic structures**

Vivekanand Dabade, Chinika Dangi, Krishna Chand Avatar

**Two-scale damage propagation analysis of CFRP considering randomness of fiber distribution**

Yukinobu Shimura, Kazuma Akashi, Tetsuya Matsuda

**Rheological measurement of Tetra-PEG deformed by laser-induced microbubble oscillation**

JianYi Zhao, Takuya Katashima, Makoto Asai, Keita Ando

**Nonlinear dynamics of topological Kagome lattice**

K. Prabith, R. Chaunsali

**Crack propagation on bilayer spherical shells**

Naoki Sekiya, Yuri Akiba, Tomohiko G. Sano

**Motion of a variable length elastic system made periodic or quasi-periodic through configurational forces**

Francesco Dal Corso, Panagiotis Koutsogiannakis, Diego Misseroni, Davide Bigoni

18:00 – 18:20 **Coffee break**

18:20 – 19:35 **Tue-f4: Synchronization (Chair: Harry Dankowicz, University of Illinois at Urbana-Champaign)**

**Date-driven reconstruction of asymptotic phase and amplitude functions of stochastic oscillators using extended dynamic mode decomposition**

Shohei Takata, Yuzuru Kato, Hiroya Nakao

**Different coherent states for lightly supported coupled pendula**

Dawid Dudkowski, Patrycja Jaros, Tomasz Kapitaniak

**Exciting of slowly modulated vibrations with unbalances rotor exciters using nonlinear resonance and avoiding self-synchronization**

Alexander Fidlin, Tunc Yüzbaşıoğlu

**Aug. 2nd, 2023**

8:45 – 9:05 **Registration**

9:05 – 9:55 **Keynote 3: Forecasting Critical Transitions Using Data-Driven Methods (Chair: George Haller, ETH Zürich)**

Arthur F. Thurnau Professor Bogdan I. Epureanu

Professor of Mechanical Engineering, and Professor of Electrical Engineering and Computer Science

Director, Automotive Research Center

University of Michigan, Ann Arbor

9:55 – 10:45 **Wed-f1: Large deformation and soft robotics (Chair: JC Ji, University of Technology Sydney)**

**Geometrically nonlinear deformation of hyperbolic shells: Experimental and numerical studies**

Kosei Kataoka, Tomohiko G. Sano

**Soft Robotics powered by Rod Theory**

Hiromi Mochiyama

10:45 – 11:05 **Coffee break**

11:05 – 12:45 **Wed-f2: Analysis and reduction of multi-degree-of-freedom nonlinear systems (Chair: Oriel Shoshani, Ben-Gurion University of the Negev)**

**Data-Driven Nonlinear Reduced-Order Modeling and Control via Spectral Submanifolds**

George Haller

**Unified perspectives on model reduction of geometrically nonlinear structures**

Tieding Guo, Giuseppe Rega

**Frequency Domain Identification of Nonlinear, Multi-degree-of-freedom Oscillators**

Thomas Breunung, Balakumar Balachandran

**Compact weighted residual formulation for periodic solutions of systems undergoing frictional occurrences**

Mathias Legrand, Christophe Pierre

12:45 – 13:40 **Lunch**

13:40 – 14:30 **Wed-f3: Design of resonators and sensors (Chair: Manoj Pandey, Indian Institute of Technology Madras)**

**Design of MEMS resonators for phase noise reduction using internal resonance [online]**

Steven W Shaw, Oriel Shoshani, Scott Strachan, Daniel Lopez, David Czaplewski

**Using Self-Excited Template Dynamics and Root-Finding Algorithms for Sensor Design**

Yu Mao, Harry Dankowicz

14:30 – 15:30 **Shotgun session 2 (Chair: Shin Kawai, University of Tsukuba)**

**[3-01 Nonlinear resonance of elastic systems]**

PS33 (withdraw)

PS34 **Analysis on Nonlinear Vibrations of a Shallow Rectangular Shell-panel of which One Edge Clamped and the Others Simply-Supported**

Tomoaki Tsuji, Shinichi Maruyama, Ken-ichi Nagai, Takao Yamaguchi, Chihiro Kamio

- PS35 Dynamic characteristics of a long-period, cable-stayed bridge infrastructure subjected to seismic waveforms**  
Kakeru Sagara, Hiroharu Utsunomiya, Gaku Shoji
- PS36 Real-time additive sound synthesis of plucked strings considering inharmonical geometrical nonlinearity using the method of multiple scales**  
Shoya Saito, Naoto Wakatsuki, Tadashi Ebihara, Yuka Maeda, Koichi Mizutani
- PS37 Non-planar self-excited oscillation of a string due to velocity feedback control**  
Xinzhe Xu, Hiroshi Yabuno

### [3-02 Vibration control]

- PS38 Active Wave Control of a Mass–Spring–Damper System using Filtered PI-Controller**  
Kairi Okamura, Natsuki Kawaguchi, Masaharu Kuroda
- PS39 Oscillator design for energy harvesters with nonlinear snap-through motion**  
Takumi Furihata, Akira Saito
- PS40 Experimental Study of Vibration Control Using Autoparametric Vibration Absorber**  
Yuma Kawasumi, Kenji Yasui, Hiroshi Yabuno
- PS41 Influence of viscous damping in autoparametric vibration absorber on its performance at the anti-resonance point (Experimental study by a simple apparatus)**  
Chao Zhang, Hiroshi Yabuno
- PS42 Study on Box-shaped Jig for a Vibration Test (Reinforcement of a Resin Jig by Metal Parts for a Heavy Test Object)**  
Ayato Toriya, Shinichi Maruyama, Yukinori Suzuki, Tetsuya Nakamura, Tomoaki Sakata, Hiroshi Aoyagi

### [3-03 Fundamental mechanics]

- PS43 Bifurcation phenomena and hyperbolic Lagrangian coherent structures in Rayleigh-Bénard convection**  
Yuta Haga, Yudai Mohri, Yuta Nakahara, Yutaro Ohtsuka, Masahito Watanabe, Hiroaki Yoshimura
- PS44 The influence of accuracy of initial values on the discrete energy in variational integrator**  
Mamoru Gunji, Yusuke Ono, Linyu Peng

### [3-04 Fluid-conveying pipes]

- PS45 Experimental study on non-planar motions of a standing pipe conveying fluid**  
Buana Mahkota Raja, Kiyotaka Yamashita
- PS46 Analysis of 1:1 internal resonance of a flexible pipe conveying fluid**  
Tong Shen, Eisuke Higuchi, Hiroshi Yabuno, Kiyotaka Yamashita

### [3-05 Self-excited oscillations]

- PS47 Vibration energy flow behaviour of self-excited dynamic systems**  
Jian Yang, Cui Chao

- PS48 **Observation of Self-Excited Vibrations of Strings on Bowed String Instrument Using Displacement Measurement Method Based on Light Intensity**  
Yuto Hara, Ryodai Izaki, Naoto Wakatsuki, Tadashi Ebihara, Yuka Maeda
- PS49 **Selective self-excited oscillations in a two-degree-of-freedom spring-mass-damper system in two modes by using band-pass filter**  
Mari Nishijima, Hiroshi Yabuno

### [3-06 Sensing devices]

- PS50 **Liquid density measurement using a microchannel stainless cantilever**  
Takumi Nakamura, Hiroshi Yabuno, Yasuyuki Yamamoto, Sohei Matsumoto
- PS51 **Dynamic Behavior of an Acoustic Warning Device Utilizing Impact Vibration**  
Hideaki Nishio, Shinichi Maruyama, Kenta Watanabe
- PS52 **Effect of Contact Pressure on Reflective Photoethismogram and Waveform Parameters**  
Yuka Maeda, Masaki Sekine, Toshiyo Tamura, Koichi Mizutani

### [3-07 Acoustic applications]

- PS53 **Modulation and Demodulation Techniques for Indoor Acoustic Communications Using Parametric Loudspeaker**  
Tadashi Ebihara, Naoto Wakatsuki, Koichi Mizutani, Riku Fukuda
- PS54 **Utilization of biomimetic pulse trains using cetacean vocalizations for acoustic localization in coastal areas**  
Hanako Ogasawara, Saki Watanabe, Eri Sato, Takanobu Kuroyama, Kazuyoshi Mori

### [3-08 Motion control]

- PS55 **Stability and nonlinearity in the flapping flight of butterfly**  
Narumi Fujii, Kei Senda
- PS56 **Trajectory Control of Manipulator's End-effector using SDRE Method**  
Ryosuke Kita, Natsuki Kawaguchi, Masaharu Kuroda

### [3-09 Predictive control]

- PS57 **Sample-Based Adaptive Monte Carlo Model Predictive Control and Its Experimental Verification for Swing-up and Stabilization of a Pendulum on a Cart**  
Koki Tachibana, Hisashi Date
- PS58 **Performance evaluation of model predictive control for active suspension systems employing an inerter with road preview**  
Wanshu Wang, Takehiko Asai
- PS59 **A Study on Damping Characteristics of Accelerator Pedal Operating Leg for Vehicle Driving**  
Kazuhiro Tanaka, Takashi Tsuchiya

### [3-10 Discrete time systems]

- PS60 **Discrete-time state observer for nonlinear continuous-time systems**  
Triet Nguyen-Van

**PS61 Matched Pole–Zero Model for Multi-Input and Multi-Output Systems**

Shin Kawai, Keisuke Yagi

**PS62 Interpretation of frequency transfer functions based on discrete-time response**

Yuichi Tokutomi, Triet Nguyen-Van, Shin Kawai

**PS63 Discrete-time state feedback control for continuous-time system transformations**

Tatsuya Oshima, Shin Kawai, Triet Nguyen-Van

**PS64 State estimation and control considering nonlinear characteristics of stepper motor with noise**

Noritaka Kinjo, Shin Kawai, Triet Nguyen-Van

**15:30 – 16:30 Poster session 2 with Coffee break****16:30 – 18:00 Short oral presentations (Chair: Valery Pilipchuk, Wayne State University & Li-Qun Chen, Shanghai University)****Differences among different types of modes in SPS modeling and model reduction by singular perturbation method**

Kei Senda, Kazuya Hata

**Nonlinear guided control of a human driver via an automated vehicle**

Bence Szakasz, Gábor Orosz, Gábor Stépán

**Estimating the Curvature of a Two Dimensional Time-Invariant External Potential through Swarm Formation: Theory and Experiments**

Yanran Wang, Takashi Hikiyara

**Bias of the steady-state averaged solutions of a strongly overdamped particle in a cosine potential under harmonic excitation**

Attila Genda, Alexander Fidlin, Oleg Gendelman

**Inter-modal interactions in a chain of mass-in-mass non-linear oscillators**

Jean Flosi, Alireza Ture Savadkoobi, Claude-Henri Lamarque

**Rigorous forward numerical integration of general evolutionary partial differential equations based on semigroup theory**

Akitoshi Takayasu, Gabriel W. Duchesne, Jean-Philippe Lessard

**18:00 – 18:20 Coffee break****18:20 – 20:00 Wed-f4: Multistability (Chair: Ivana Kova Kovačič, University of Novi Sad)****Bistable Microstructures and their Implementation in Sensors**

Slava Krylov, Dan Refaeli, Alex Liberzon

**Nonlinear dynamics and energy harvesting from multi-stable shells**

Jerzy Warminski, Andrzej Mitura, Lukasz Kloda, Francesco Romeo, Matteo Brunetti

**Modelling and Design of Straw-based Truss Metamaterials**

Dotan Ilssar, Dennis M. Kochmann

**Nonlinear dynamics of ball rolling of radial bearings in an assembly with an unbalanced multi-stage rotor [online]**

Katica R. (Stevanović) Hedrih

## **Aug. 3rd, 2023**

8:45 – 9:05 **Registration**

9:05 – 10:20 **Thu-f1: Vibration control and energy harvesting (Chair: Jerzy Warminski, Lublin University of Technology)**

**Tailoring the dynamical response of a mechanical resonator via nonlinear coupling to secondary resonators**

Oriel Shoshani

**Developments of energy flow theory for nonlinear dynamical systems and applications to relativistic dynamics**

Jing Tang Xing

10:20 – 10:40 **Coffee break**

10:40 – 11:55 **Thu-f2: Metamaterials and soft matter (Chair: Dotan Ilssar, ETH Zürich)**

**Coarse-graining for bridging spatio-temporal scales of soft matter dynamics for engineering science**

Itsuo Hanasaki

**Energy absorbing devices and metamaterials using properties of soft-walled billiards**

Valery Pilipchuk

**Numerical and Experimental Study of Spatially Variant Truss-based Metamaterials under Dynamic Loading**

Kaoutar Radi, Dennis M. Kochmann

11:55 – 12:50 **Lunch**

12:50 – 16:30 **Science Tour**

**19:00 – Banquet**

## **Aug. 4th, 2023**

8:45 – 9:05 **Registration**

9:05 – 9:55 **Keynote 4: Melnikov's methods and nonintegrability of forced nonlinear oscillators (Chair: N Sri Namachchivaya, University of Waterloo)**

Prof. Kazuyuki Yagasaki

**Graduate School of Informatics, Department of Applied Mathematics and Physics Professor, Kyoto University**

<https://kdb.iimc.kyoto-u.ac.jp/profile/en.9388421097ed837e.html>

9:55 – 10:45 **Fri-f1: Fractional calculus (Chair: Tomaz Kapitaniak, Technical University of Lodz)**

**Autotuners and fractional calculus. Applications to the control of nonlinear processes**

Cristina I Muresan, Isabela R. Birs, Robin De Keyser

**Fractional-order Servo LQR Control for a Magnetic Levitation System**

Yuki Moriguchi, Masaharu Kuroda, Natsuki Kawaguchi

10:45 – 11:05 **Coffee break**

11:05 – 12:45 **Fri-f2: Energy transfer (Chair: Jian Yang, University of Nottingham Ningbo China)**

**Energy transfer in a tree-structured multi-DoF oscillator**

Tamás Kalmár-Nagy, Róbert Rochlitz, Bendegúz Dezső Bak

**Chimera States in Elastically Coupled Self-Excited Underactuated Rigid-Body Arrays**

Yuval Levi, Gilad Yakir, Oded Gottlieb

**Modal analysis for localization phenomena of parametric resonance in pendulum arrays subjected to vertical excitation**

Yuji Harata, Takashi Ikeda

**Integrated nonlinear design of vibration isolation and energy harvesting**

Ze-Qi Lu, Li-Qun Chen

12:45 – 13:40 **Lunch**

13:40 – 15:10 **Short oral presentations (Chair: Paulo Goncalves, Pontifical Catholic University of Rio de Janeiro)**

**Vibration Design of Composites with Nonlinear Fiber Shapes Fabricated by Tailored Fiber Placement Machine and Electrodeposition Resin Molding Method**

Shinya Honda, Isamu Saiwaki, Kazuaki Katagiri, Katsuhiko Sasaki, Ryo Takeda

**Numerical Study of Chatter Control in End Milling Process by Workpiece Excitation**

Yutaka Nakano, Satoshi Sekikawa, Hiroki Takahara

**Inverse Magic Formula Capable of Tire Performance Requirement Analysis at Early Stage of Vehicle Development [online]**

Takao Kobayashi

**Linear/Nonlinear system identification based on response probability density function of 1-DOF system which is subjected to white noise excitation**

Soichiro Takata, Kaito Araki

**Evaluation method for the effectiveness of ultrasonic vibration assisted drilling**

Shigeru Aoki

**Frequency and amplitude dependence of self-tuning resonance**

Tatsuki Tagashira, Toshihiko Sugiura

15:10 – 15:30 **Coffee break**

15:30 – 16:20 **Fri-f3: Wave and propagation in practical systems (Chair: Keita Ando, Keio University)**

**Study on Unstable Oscillation of Pantograph under Friction**

Yuki Amano, Shigeyuki Kobayashi, Hiroki Mori, Nobuyuki Sowa

**Theoretical and numerical analysis on nonlinear propagation of focused ultrasound in bubbly liquids toward cancer treatment by microbubble-enhanced HIFU**

Tetsuya Kanagawa, Shunsuke Kagami

16:20 – 16:30 **Closing address**

The scientific committee in this symposium was appointed by the Bureau of IUTAM including the following members: Hiroshi Yabuno (University of Tsukuba, Japan, Chair), Walter Lacarbonara (La Sapienza University of Rome, Italy, Co-Chair), Giuseppe Rega (La Sapienza University of Rome, Italy, IUTAM Representative), Balakumar Balachandran (University of Maryland, United States), Felix Chernousko (Russian Academy of Sciences, Russia), Alexander Fidlin (Karlsruhe Institute of Technology, Germany), Marian Wiercigroch (University of Aberdeen, United Kingdom), Steven Shaw (Florida Institute of Technology, United States), and Masaharu Kuroda (University of Hyogo, Japan). There were regular and short presentations registered participants from 14 different countries according to the following geophysical distribution: Belgium, Canada, China, Germany, Hungary, India, Israel, Italy, Japan, Poland, Serbia, Switzerland, UK, and USA. We thank all presenters and participants for their valuable contributions.

The financial support of IUTAM and Tsukuba Tourism and Convention Association is most gratefully acknowledged. Finally, we would like to express our gratitude to Springer, especially to Dr. Mayra Castro and Mr. Ramasubramaniyan Velu for their support in producing this volume of IUTAM Bookseries.

May 2024

Hiroshi Yabuno

20-12 *IUTAM Symposium on Creep in Structures*

Chairperson: Holm Altenbach      Location: Magdeburg, Germany      18-22 September, 2023

To be inserted.