



# THE INTERNATIONAL SYMPOSIUM ON MECHANICS 1

Conference Guide  
9-12 July 2018

# WELCOME

Distinguished Delegates,

Welcome to Britain! These lands have nurtured many generations of famous mechanicians including Sir Isaac Newton PRS FRS, James Clerk Maxwell FRS FRSE, Sir William Thomson Lord Kelvin, and James Watt FRS FRSE. This month also marks 331 years since the publication of *Mathematical Principles of Natural Philosophy* by Newton, the book that laid the foundations for modern mechanics.

This conference arose from the International Symposium on Energy Challenges and Mechanics, the highly successful symposium series that covered an even broader range of topics. This gathering will explore the frontiers of mechanics, with a focus on applications and the interactive boundaries with many other disciplines.

We trust you will foster new relationships and collaborations during your time here over the next few days. Feel free to contact the conference organiser or staff if we can help at any time.

Welcome to Aberdeen and The First International Symposium on Mechanics!

Best Regards,



**Dr. Henry Tan**  
M1 Chairman  
University of Aberdeen

## IMPORTANT POINTS

### Transportation

#### Venue Address:

DoubleTree by Hilton Aberdeen Treetops  
161 Springfield Road, Aberdeen, AB15 7AQ  
**Tel:** 01224 313377

#### Local Taxi Services:

- » Rainbow – 01224 87 87 87 or 01224 49 49 49
- » ComCab – 01224 35 35 35
- » Aberdeen Taxis – 01224 68 68 68

#### Bus Service:

The No 5 bus stops outside the front of the hotel on the main road and connects in the city centre. An adult day ticket is £4.00, and an adult evening ticket is £3.00. Further details including timetables can be found at [www.firstgroup.com](http://www.firstgroup.com)

### Identification

All delegates must wear their lanyard name badge at all times. Your badge is your ticket and therefore gives you access to all sessions, lunch catering and the social programme.

Badges are strictly non-transferable. Please ensure you keep these safe. If you cannot provide a badge or identification to verify your booking, then you may be asked to leave the event.

### Certificate Of Attendance

All delegates had the opportunity to request a certificate during the online booking process (see your registration packet). If you did not request a certificate during booking, an electronic version can be sent to you following the conference. Please notify the organisers at the Information Desk if you will require an electronic certificate.

### Session Etiquette

**Speakers:** During the 20-minute break before your session slot, find your presentation room and upload your presentation files to the provided laptop. **Please ensure that you remain within your time slot for your presentation and the allowed time for Q&A.** It is essential that the conference runs on time.

**Moderators:** Please arrive for your session at least 5 minutes in advance, so you are prepared and ready to begin the session on time. Please complete the Moderator's Report Form which can be picked up from the information desk, and return it back after the session is over.

**Audience:** Please note that the use of photography during presentations is strictly forbidden. **It is unethical to take photographs without the consent of a speaker** (you may be asked to delete images). Please respect the speakers and limit your photos to before/after the talks.

**Slide Copyright:** All slides presented are the sole property of each speaker and cannot be copied or redistributed without permission.

### Presentation & Technology Tips

The conference room is equipped with a laptop, projector, and clicker for controlling the PowerPoint presentations.

**(1)** To access the Microsoft suite, press the windows key (lower left on the keyboard). A start menu will appear where you can click the program you need. Each laptop/projector will be pre-set to the "extend" display setting, which



# SCHEDULE

Monday, 09 July

## PRE-REGISTRATION

16:00-19:00

Reception Foyer

## DAY 1

Tuesday, 10 July

## REGISTRATION

8:00-9:00

Reception Foyer

## OPENING REMARKS

9:00-9:40

## OPENING LECTURE

9:40-10:20

## BREAK

10:30-10:50

## PARALLEL A1, A2

10:50-12:30

## LUNCH

12:30-13:50

## PLENARY B

13:50-15:30

## WELCOME RECEPTION

15:30-17:00

Reception Foyer

15:30

Poster Session

16:00

Group Photo

## DAY 2

Wednesday, 11 July

## PRINCIPAL LECTURE

8:00-8:40

## BREAK

8:40-9:00

## PARALLEL C1, C2

9:00-10:40

## BREAK

10:40-11:00

## PLENARY D

11:00-12:40

## LUNCH

12:40-14:00

## PARALLEL E1, E2

14:00-15:40

## CONFERENCE TRIP OLD ABERDEEN TOUR

16:00-18:00

## DAY 3

Thursday, 12 July

## CLOSING LECTURE & AWARDS BANQUET

9:00-9:40

Closing Lecture

10:15-10:30

Closing Remarks

10:30-10:45

Group Photo

10:45

Break

11:00-12:20

Lunch Banquet

## CONFERENCE TRIP GLAMIS CASTLE\*

12:30 - 18:30

\*Registered participants only.  
Bus transportation will be  
provided.

12:30

Depart Hotel

17:00

Meet in the castle car  
park for the Return  
Journey

18:30

Arrive Back at Hilton  
Treetops



means the laptop will function as one screen and the projector will function as another. When you open a PowerPoint presentation, it will only appear on the laptop screen.

**(2a)** View the presentation in full-screen mode in order to utilise both screens. Choose full screen mode within the slideshow menu or by pressing the F5 key on the keyboard.

**(2b)** If you are using an Adobe PDF presentation, move the whole PDF window onto the 2nd screen, which is the projector. This is done by clicking and holding onto the title bar of the window and dragging it to the right until it appears on the projector screen.

**Please Note:**

- » Our computers are not connected to the Internet and are unable to do so during presentations.
- » All presentations and data left on the Laptops after each day WILL be erased from the computer. However, we strongly encourage erasing all data at the end of your session.

## Smoking Policy

It is forbidden to smoke anywhere inside a building in the UK. Please smoke outside at a good distance from the hotel entrance and make use of the cigarette disposal areas.

# SCHEDULE NOTES

## Lunch

A lunch buffet will be served each day for all Delegates in Springfield's Restaurant. Your name badge serves as your lunch ticket on all three days.

## Welcome Reception & Poster Session

We welcome you to our gathering with a reception in the foyer on Day 1 at 15:30 where you can relax and network with your fellow delegates. Tea and coffee will be provided alongside a cash bar for additional beverages.

An official Mechanics1 group photo will be taken at 16:00 for all who wish to join. In addition, the poster session will begin at 15:30. Please take the opportunity to view these as part of the afternoon.

## Refunds

All refund payments and/or reimbursements will be issued at the conference information table during the hours below:

- » Tuesday 10 July, 10:00-12:00
- » Wednesday 11 July, 10:00-12:30

# CONFERENCE TRIPS

Your badge is your ticket and must be worn at all times during the outings. If you are unable to attend the tours, please notify the organisers at the Information Desk.

## Old Aberdeen Tour



### Wednesday 11 July 2018, 16:00-18:00

Transportation will be provided at the front car park. We will meet at 16:00 and depart at 16:15 sharp, so please do not be late.

## Glamis Castle



### Thursday 12 July 2018, 12:30-18:30

Transportation will be provided at the front car park. We will meet at 12:30 and depart at 12:45 sharp, so please do not be late. We will meet at the castle park at 17:00, depart at 17:15 and return to Hotel by 18:30.



## OPENING PLENARY LECTURE



**A Galilean Dance: On the Dynamics of Jupiter and His Galilean Moons**

**Prof. Dr. Henk W. Broer**

*University of Groningen, The Netherlands*

Hendrik Wolter Broer is a Dutch mathematician known for contributions to the theory of nonlinear dynamical systems. Broer is well-known for having developed the parametrised Kolmogorov-Arnol'd-Moser (KAM) theory. He also contributed to the general theory of bifurcations. Apart from developing theory, together with colleagues, he also worked on applications in the fields of classical and quantum mechanics, population dynamics and climate modelling. In 2008 Broer became a member of the Royal Netherlands Academy of Arts and Sciences, and in 2015 he was made a Knight of the Order of the Netherlands Lion.

## PRINCIPAL LECTURE



**Molecular Events Governing Self- Healing in Polymeric Materials**

**Prof. Dr. Marek W. Urban**

*Clemson University, United States*

Prof. Dr. Marek W. Urban is the Sirmine Foundation Endowed Chair and Professor of Materials Science and Engineering at Clemson University. He is the author of many research publications and patents, author of four books (Wiley, Royal Society of Chemistry, and Oxford University Press) and editor of seven American Chemical Society Advances in Chemistry Series as well as Wiley Handbook on Stimuli-Responsive Materials. His research on antimicrobial polymers and self-healing polymers has been featured by numerous media, including NY Times, Forbes, BBC, NBC, Discovery, USA Today, Yahoo, many TV and radio stations around the World. He is the Fellow of American Chemical Society PMSE Division and recipient of numerous awards, most recently the 2017 Chemical Pioneer Award from American Institute of Chemists. Current research efforts focus on understanding molecular level processes governing responsiveness in materials, development of novel polymeric nanomaterials with 'living-like' functions, and the design of self-healing materials that utilize natural sources of energy.

## CLOSING PLENARY LECTURE



**Theory and Applications of Self-Similar Hydrodynamics in Astrophysics**

**Prof. Yu-Qing Lou**

*Tsinghua University, China*

Dr Yu-Qing Lou is a Distinguished Yangtze Professor at the Physics Department, Tsinghua University, China. He completed his Physics PhD in 1987 from Harvard University and became the High Altitude Observatory and Advanced Study Program Fellow at National Center for Atmospheric Research (NCAR) 1987-1989. Dr Lou has published in more than 140 international journal papers, including Nature, Science, The Astrophysical Journal (Letters).



## PROCEEDINGS

High-quality papers will be selected and published in Journal of Energy Challenges and Mechanics (JECM). The on-site session proceedings can be downloaded at <https://mechanics.nscj.co.uk/sessions/Plenary.pdf>

## ORGANISERS

### Scientific Committee

Dr Henry Tan, UK, Chairman  
Dr. Laurence Girolami, France  
Prof. Olga Hachay, Russian Federation  
Dr. Ruth Herrero, Spain  
Dr William Dai, USA  
Prof. Donatella Termini, Italy  
Prof. Yu-Qing Lou, China  
Prof. Ivan Kazachkov, Ukraine  
Prof. Ítalo Batista da Silva, Brazil  
Dr. Juan P Solano, Spain  
Prof. Tomas Fischer, Czech Republic

### Organiser

North Sea Conference & Journal Ltd  
Aberdeen, Scotland, UK  
**Emergency Phone:** +44 (0)7898 700203

## THANK YOU

To all the delegates and committee members of MechanicsI: We thank you for your support! It is only through your dedication, commitment and tireless work that this conference could be a success..

## CONFERENCE SONG

### We Are The Light

#### Music & Lyrics by Nils Elders

We'll find our destiny  
We were born in the stars  
This opportunity to know who we are  
Let the world know that we can make a change this year  
Let time show that we made a difference here

When we feel that we've got a lot to prove  
Take a look at everyone around you  
Never give up, together we're strong  
Just see how far we've come

We are the light  
bright like the sun  
We are the light  
that shines for everyone  
We are the sparks that inspire  
The flames that keep you right  
So let's stand together  
We are the light

An idea is a seedling  
that you can sow  
Determination is a sun beam  
That can help it to grow

Let the world know that our intention's clear  
Let time show that we made a difference here

When we feel that we've got a lot to prove  
Take a look at everyone around you  
Never give up, together we're strong  
Just see how far we've come

We are the light  
that's bright like the sun  
We are the light  
that shines for everyone  
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The flames that keep us right  
So let's stand together  
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We are the light  
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We are the light  
that shines for everyone  
We are the sparks that inspire  
The flames that keep us right  
So let's stand together  
We are the light

yeah Together we stand  
Together we stand  
Together we stand





## SESSION TOPICS

<b>Bagnold</b>	Mechanics of granular materials
<b>Richardson</b>	Computational fluid dynamics
<b>Terzaghi</b>	Porous media
<b>Mori</b>	Mechanics of electronics
<b>deGennes</b>	Mechanics of soft materials
<b>Navier</b>	Hydrodynamics
<b>Griffith</b>	Friction, Fracture, and Damage
<b>Jones</b>	Mechanics of composite materials
<b>Fourier</b>	Heat transfer
<b>Hooke</b>	Computational mechanics of materials and structures
<b>daVinci</b>	Biomechanics
<b>Langevin</b>	Functional materials and structures
<b>Jacobi</b>	Fluid-structure interaction
<b>Darcy</b>	Multiphase flows
<b>Reynolds</b>	Turbulence
<b>Cleland</b>	Nanomechanics
<b>Hertz</b>	Sound and vibration
<b>Wright</b>	Biomimetics
<b>Archimedes</b>	Experimental mechanics
<b>Newton</b>	Aerodynamics
<b>Mandelbrot</b>	Surface roughness

## WANT MORE DETAILS?

For speaker bio sketches, detailed session descriptions and abstracts, please visit our website at:

<https://mechanics.nscj.co.uk/Sessions.html>

## PRESENTATION SCHEDULE

### Opening Session

**10th July 2018, 09:40 - 10:20**

Room: Beechwood Suite

Moderator: Dr Henry Tan, School of Engineering, University of Aberdeen, UK

- A Galilean dance: on the dynamics of Jupiter and his Galilean moons (40 minutes) - Prof. Henk W. Broer, Johann Bernoulli Institute for Mathematics and Computer Science, University of Groningen, Netherlands

### Session A1

**10th July 2018, 10:50 - 12:20**

Room: Beechwood Suite

Moderator: Dr. Suraj Rawal, Lockheed Martin Space, United States

- Short-lived dam-break flows of particulate suspensions (20 minutes) - Dr. Laurence Girolami, University of Tours, France
- Predicting Shock Propagation within Bolted-Joint Structures under Impact (20 minutes) - Prof. Mohamed Trabia, Department of Mechanical Engineering, University of Nevada, United States
- Analysis of natural convection on enhanced solar latent-thermal energy storage (20 minutes) - Dr. Ruth Herrero, Universidad Polit cnica de Cartagena, Spain
- Effect of Shape and Bonding of Granular Material on Particle Crushing (20 minutes) - Prof. Seok-Won Lee, Department of Civil and Environmental Engineering, Konkuk University, Korea South

### Session A2

**10th July 2018, 10:50 - 12:20**

Room: Rowan Suite

Moderator: Prof. Martina Gerken, Kiel University, Germany

- Interface- and Discontinuity-aware Numerical Schemes for Plasma 3-T Radiation Diffusion in Multi-physics Simulations (20 minutes) - Dr. William Dai, Los Alamos National Laboratory, United States



- Nondestructive investigation of wall thinning in ferromagnetic material by Magnetic Adaptive Testing: influence of measuring conditions (20 minutes) - Dr. Gabor Vertesy, Centre for Energy Research, Institute of Technical Physics and Materials Science, Hungary
- Highly textured silicon [111] crystalline thin-film on buffered soda-lime glass by e-beam evaporation (20 minutes) - Mr. Ashok Chaudhari, Solar-Tectic LLC, United States
- Effect of Nb, Cr, and Si alloying on the microstructure and fracture behavior of the gamma-TiAl based alloys (10 minutes) - Ms. Maria Mathabathe, Counsel of Scientific Industrial Research (CSIR), South Africa

## Session B

**10th July 2018, 13:50 - 15:30**

Room: Beechwood Suite

Moderator: Dr. Xesús Nogueira, Group of Numerical Methods in Engineering, Universidade da Coruña, Spain

- MEMS-Based Differential Calorimetry for Characterization of Biomolecular Interactions (30 minutes) - Prof. Qiao Lin, Columbia University, United States
- Peridynamic Modeling of Materials and Structures (30 minutes) - Dr. Erkan Oterkus, University of Strathclyde, United Kingdom

## Principal Session

**11th July 2018, 08:00 - 08:40**

Room: Beechwood Suite

Moderator: Dr. Juan P. Solano, Universidad Politécnica de Cartagena, Spain

- Molecular Events Governing Self-Healing in Polymeric Materials (40 minutes) - Prof. Marek W. Urban, Department of Materials Science and Engineering, Clemson University, United States

## Session C1

**11th July 2018, 09:00 - 10:40**

Room: Beechwood Suite

Moderator: Prof. Tomas Fischer, Charles University, Czech Republic

- A Mathematical Model and Experimental Study of Marine Current Turbines under Conditions of Wave and Turbulence (20 minutes) - Prof. Tianzhen Wang, Shanghai Maritime university, China

- Proper orthogonal decomposition analysis of heat transfer in oscillatory flow tubes with helical coil inserts (20 minutes) - Dr. Juan P. Solano, Universidad Politécnica de Cartagena, Spain
- Numerical analysis of fluid flow and heat transfer inside the cylinder of reciprocating compressor (20 minutes) - Dr. Jan Tuhovcak, Brno University of Technology, Czech Republic

## Session C2

**11th July 2018, 09:00 - 10:40**

Room: Rowan Suite

Moderator: Dr Henry Tan, School of Engineering, University of Aberdeen, UK

- Surfaces Functionalized with Photo-Switchable Molecules for Optical Biosensors (25 minutes) - Prof. Martina Gerken, Kiel University, Germany
- Applied Functional Materials and Structures for Spacecraft (25 minutes) - Dr. Suraj Rawal, Lockheed Martin Space, United States
- High mobility crystalline silicon film growth below 600°C from an Au-Si eutectic melt for TFTs (20 minutes) - Mr. Ashok Chaudhari, Solar-Tectic LLC, United States
- Effect of the orientation of the applied magnetic field on the imbalance of MHD flows in a multiple-channel system with locally different electric conductivities (10 minutes) - Miss XUEJIAO XIAO, Kyung Hee University, Korea South
- Effect of mechanical load on optical properties of un-doped and Eu 3+ -doped Y 2 SiO 5 at the quantum scale (10 minutes) - Mr. Amin Mirzai, Lund University, Sweden

## Session D

**11th July 2018, 11:00 - 12:40**

Room: Beechwood Suite

Moderator: Dr. Erkan Oterkus, University of Strathclyde, United Kingdom

- Elastic response of confined amorphous nanolayers in semi-crystalline polymers (30 minutes) - Prof. Olivier Lame, INSA de LYON, France
- A high-order finite volume scheme with adaptive numerical dissipation of the Riemann solver for the computation of compressible turbulent flows (30 minutes) - Dr. Xesús Nogueira, Group of Numerical Methods in Engineering, Universidade da Coruña, Spain





## Session E1

**11th July 2018, 14:00 - 15:40**

Room: Beechwood Suite

Moderator: Dr. Laurence Girolami, University of Tours, France

- Modeling of acoustic wave in heterogeneous block layered medium with porous hierarchic oil and water saturated inclusions (20 minutes) - Prof. Olga Hachay, Institute of Geophysics UB RAS, Russia
- Using Tonal Harmony Level to Measure Subjective Perception of Music Quality: An Psychoacoustic Approach (20 minutes) - Prof. Kuo-Hao Tang, Feng Chia University, Taiwan
- Modeling Filtered Building Effluent Stack Sampling Points for Qualification Criteria (20 minutes) - Ms. Sarah Suffield, Pacific Northwest National Laboratory, United States
- Dynamic moments to characterize complex dynamic systems: an example in gas solid fluidization (20 minutes) - Dr. Miquel F. Llop, University of Girona, Spain

## Session E2

**11th July 2018, 14:00 - 15:40**

Room: Rowan Suite

Moderator: Dr. William Dai, Los Alamos National Laboratory, United States

- Ultimate Design of RC Sections – comparison of different design codes (20 minutes) - Prof. Helena Barros, Civil Eng Department, Univ Coimbra, Portugal
- Seismic velocity ratio in earthquake source points to compressible fluids in the fault (20 minutes) - Prof. Tomas Fischer, Charles University, Czech Republic
- Combining interface damage and friction in cohesive element model (10 minutes) - Mrs. Marwah Hameed, the University of Manchester, United Kingdom

## Closing Session

**12th July 2018, 09:00 - 09:40**

Room: Beechwood Suite

Moderator: Dr Henry Tan, School of Engineering, University of Aberdeen, UK

- Theory and Applications of Self-Similar Hydrodynamics in Astrophysics (40 minutes) - Prof. Yu-Qing Lou, Physics Department, Tsinghua University, China

## POSTER EXHIBITION

### Mori Session: Mechanics of Electronics

- A New Electrical Energy Capturing method from Vibrating Mechanical Energy of Rotating Tires - Prof. Hanju Cha, Chungnam National University, South Korea

### Newton Session: Aerodynamics

- Numerical Simulation of Rotor Downwash Effect on Projectiles Air-Launched From a Helicopter - Prof. Oh Joon Kwon, KAIST, South Korea

### Richardson Session: Computational Fluid Dynamics

- Effect of the orientation of the applied magnetic field on the imbalance of MHD flows in a multiple-channel system with locally different electric conductivities - Xuejiao Xiao, Kyung Hee University, South Korea

## PARTICIPANT LIST

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