Introduction to the Applied Mechanics Group.

http://amg.iop.org

The Applied Mechanics Group represents all interests concerned with the experimental, analytical and numerical analysis of static and dynamic behaviour of mechanical systems.

The understanding of stresses, deformational processes and failure of components, structures and materials exposed to various types of loading and service conditions is the key motivation for the activities of the group.

The scope of the group covers a wide range of topics such as materials characterisation; measuring and modelling residual stresses; damage assessment, identification and control; multi-functional and smart structures; multi-scale analyses; damping materials; mechanics of advanced materials under vibro-impact loading. The remit of the group covers the enabling technology that underpins analysis such as sensor development; full-field optical systems for experimental analysis; development and application of modal analysis; inverse methods; advances in finite element and boundary element analysis. The application range covers design, manufacture and vibration behaviour of aerospace components; composite materials and structures; bonded and bolted joints and connections; medical devices, surgical simulation and biological systems; energy technologies; automotive design; marine systems. An overarching theme is the synergy between experimental, numerical and analytical studies.

One-day meetings, with an appeal to both academia and industry, are a feature of the Group's activities. Recent meeting topics are listed in the Group calendar. The Group has an active involvement in three major international conferences: Modern Practice in Stress and Vibration Analysis, DAMAS - Damage Assessment of Structures and MoSS – Mechanics of Slender Structures.
The Group’s Committee has a strong link with the ASME Technical Committee of Vibration and Sound in the coordination of events.

The group is represented on the UK Forum for Applied Mechanics (FAM). FAM coordinates the UK activities in the area of applied mechanics and elects the UK representatives for the European Association for Experimental Mechanics that organises the major European conference on experimental mechanics at four yearly intervals.

On more general issues, members may wish to know more about the management restructuring at the IOP,


and details of the 2015 move to the new Headquarters in King’ Cross


**Group Committee**

**Chairman:** Dr Cristinel Mares MInstP  
Brunel University

**Secretary:** Dr Jack Hale FInstP  
University of Newcastle

**Treasurer:** Dr Carol Featherston MInstP  
Cardiff University

**Ordinary Members:**

- Dr Inna Gitman MInstP  
  University of Sheffield.

- Paul Tatum MInstP  
  AWE Plc

- Professor Huajiang Ouyang FInstP  
  University of Liverpool

- Dr Anish Roy MInstP  
  Loughborough University

- Professor Daniel G Gorman FInstP  
  University of Strathclyde

- Dr Arthur Jones MInst P  
  University of Nottingham

- Dr Sophoclis Patsias MInstP  
  Rolls Royce Plc.
Reports of Previous Events.

DAMAS 2013
10th International Conference on Damage Assessment of Structures

July 2013
Trinity College Dublin Ireland
www.damas2013.org

This was the tenth in a series of biennial international conferences, which bring together the expertise of scientists and engineers in academia and industry in the field of damage assessment, structural health monitoring and non-destructive evaluation. The conference covered all research topics relevant to damage assessment of engineering structures and systems including numerical simulations, signal processing of sensor measurements and theoretical techniques as well as experimental case studies.

The DAMAS conference is now well established as a major forum for discussion and dissemination of recent advances in damage detection, assessment and quantification. The 2013 conference returns to Dublin where it is being hosted by Trinity College. Previous conferences have been held in: Pescara (Italy, 1995), Sheffield (UK, 1997), Dublin (Ireland, 1999), Cardiff (UK, 2001), Southampton (UK, 2003), Gdansk (Poland, 2005), Torino (Italy, 2007), Beijing (China, 2009), Oxford (UK, 2011).

AMG is a key sponsor to this event. Current Committee member Prof. Huajiang Ouyang is a member of the International Organising Committee. Former Committee members, Profs. Janice Barton, Karen Holford, Arthur Lees, Vadim Silberschmidt and Keith Worden are members of the International Scientific Committee. 179 full papers were received of which 159 were accepted. 170 delegates attended. The papers were published as a Special Issue of the Key Engineering Materials Journal by Trans Tech Publications Inc.

International Symposium on
Dynamic Deformation and Fracture of Advanced Materials
D2FAM 2013

September 2013
Loughborough, UK

http://www.lboro.ac.uk/departments/mechman/news/conferences/d2fam2013/

This symposium brought together specialists in mechanics of materials, applied mathematics, physics, continuum mechanics, materials science as well as various areas of engineering to discuss advances in experimental and theoretical analysis, and numerical simulations of dynamic mechanical phenomena.
The materials of interest range from traditional ones such as metals, alloys, ceramics, polymers and composites to advanced and emerging materials as well as bio-materials and materials for sports applications.

A Special Session entitled “Parametric Resonance, Vibro-impact and Related Phenomena” was introduced which covered a range of specific topics directly related to the FP7 IAPP project PARM-2: “VIBRO-IMPACT MACHINES BASED ON PARAMETRIC RESONANCE: Concepts, mathematical modelling, experimental verification and implementation.”

The peer-reviewed papers presented at this Symposium were published in a Special Issue of the Open Access Journal of Physics: Conference Series (JPCS), which is part of IOP Conference Series. All papers published in IOP Conference Series were free to download.

9th International Conference on Advances in Experimental Mechanics

September 2013
University of Cardiff
http://www.bssm.org/conf2013

The British Society for Strain Measurement's (BSSM) 9th International Conference on Advances in Experimental Mechanics gave industry and academia the opportunity to discuss advances in experimental mechanics.

Set against one of the most vibrant and beautiful cities in the world, the conference combined the modern facilities of the Cardiff School of Engineering with the traditional surroundings of the Viriamu Jones Gallery and one of Europe’s finest art collections at the National Museum Cardiff, where the conference dinner was served.

Papers were welcomed from any area of experimental mechanics within the theme of integrating simulation and experimentation for validation.

High Speed Imaging for Dynamic Testing of Materials and Structures
21st DYMAT Technical Meeting

November 2013
Institute of Physics, London
http://aptd.iopconf.s.org/home

The conference themes were:

- Metrology
  - Camera/equipment assessment
  - DIC, grids, etc: metrological evaluation for full-field strain and acceleration measurements
  - High and ultra high speed full-field thermal measurements.
• Methodology
  – Full-field measurements data processing
  – Parameter identification/inverse problems
  – Innovative test design

• Applications
  – Constitutive behaviour
  – Failure/fracture
  – Observation of damage and failure processes
  – All types of materials/structures will be considered

The conference took place over three days in single-session format to maximise interaction between speakers and audience. The conference also include interactive poster sessions, an exhibition of high-speed camera manufacturers and a roundtable session on current challenges and future developments in high-speed imaging.

Four-page abstracts for oral and poster presentations were invited. In parallel, some authors were asked to contribute to a themed issue on the meeting topic, to be published in Strain (Wiley-Blackwell).

Co-sponsors included the British Society for Strain Measurement (BSSM, the European Physical Society, the Imaging Science Group, the Royal Photographic Society, the Institute of Measurement and Control, the Institution of Mechanical Engineers and the Society for Experimental Mechanics, Inc (SEM).

**Multi-scale modelling & experiment and musculoskeletal applications (one day workshop)**

January 2014
University of Sheffield, UK

Multi-scale modelling & experiment and musculoskeletal applications workshop hosted by the University of Sheffield provided a forum for discussion and exchange of information about leading-edge research and activities in the area. Main focus of the workshop was placed on the musculoskeletal applications (bones), although traditional materials were also considered. Numerical and experimental techniques and approaches were be discussed throughout the day. The workshop consisted of presentations and discussions from 9 invited lectures and distinguished researchers; 30 participants attended. Informative networking sessions took place throughout the day. The workshop was co-sponsored by EPSRC.

Organiser: Dr Inna Gitman, I.Gitman@sheffield.ac.uk
Forthcoming Events.

Workshop on Lightweight Structures
Cardiff University
17th September 2014

Lightweight structures are essential in a range of industries and applications. For example, in the aerospace industry the need to minimise structural mass in order to reduce fuel burn and hence cost and emissions is a continuous driver in meeting the needs of both customers and legislative requirements. This leads to the design of a range of slender, lightweight structures comprising stiffened plates and shells which can become unstable under loadings which involve a compressive component. The consequent local or global buckling can cause catastrophic failure, and must be fully understood in order to use such structures in optimised designs. Manufacturing slender structures from materials such as fibre composites and fibre metal laminates with attractive specific properties provides further potential to reduce weight, and also the opportunity to tailor the material by using optimised lay-ups to meet the required load cases. This tailoring can be further explored in the design of structures capable of morphing to improve structural or even aerodynamic performance. However the added complexity introduced by using these materials must also be considered. In cases where initial buckling is localised and results in a stable postbuckling path which can provide additional load carrying capacity, the design becomes limited by material failure and this must also be incorporated into any models developed to understand the behaviour of the structure. Finally the effects of imperfections and damage originating either from the manufacturing process or events occurring during operation must be understood.

This workshop brings together leading experts in the field of lightweight structures to present the latest research being carried out in this field and covers many of the aspects described above.

To register please contact Aderyn Reid: ReidA@cardiff.ac.uk

Engineering in the face of uncertainty: stochastic solutions to structural problems.

University of Nottingham.

2015 (date to be confirmed)

Engineers have traditionally designed systems according to deterministic methods and have coped with uncertainty via “factors of safety”, “reserve factors” and similar techniques. Such approaches do not deal elegantly with the issue that dimensions, material properties and load values are all subject to statistical distributions. Where sensitivity to random factors has been analysed, it has typically been via Monte Carlo simulations. There is now increasing interest in probabilistic design in order to take account of practical randomness in system parameters and loads, and this
interest is addressed with techniques such as stochastic finite element formulations which avoid the need for brute-force Monte Carlo reconstructions of distributions.

This seminar aims to explore techniques both for probabilistic analysis of engineering designs and for solution of numerical problems in a stochastic manner. These will be complemented by industrial and academic examples.

Organiser: Dr Arthur Jones, Arthur.jones@nottingham.ac.uk

**Modern Practice in Stress and Vibration Analysis 2015**

Venue to be confirmed

Summer 2015

The Modern Practice in Stress and Vibration Analysis Conferences offer a showcase for the best international research in the fields of vibration analysis and stress analysis and technical areas where they intersect.

Organiser: Dr Cris Mares cristinel.mares@brunel.ac.uk

**Symposium on Mechanics of Slender Structures (MoSS 2015)**

University of Northampton

September 2015

The scope covers analytical, numerical, and experimental research into the mechanics of ropes, pipes, chains, fibres, etc, and their interactions with host structures in various engineering applications.

Organiser: Prof Stefan Kaczmarczyk stefan.kaczmarczyk@northampton.ac.uk

**Seminar on Damping in Materials and Structures**

2015 (date and venue to be confirmed)

This one-day seminar will highlight energy dissipation mechanisms in a variety of different damping materials and structures. The aims are to help explain the way in which different damping materials work, as well as introduction of damping mechanisms into engineering structures. Presentations will include the latest research on fibre and metal matrix composite systems, particulate enhanced polymers, micro-friction processes in coatings and thin air films. The main driving forces behind this seminar are the engineering needs to increase the operating range and performance of damping technologies model or estimate the vibration
performance of damped components. The organisers expect the seminar to be equally relevant to industry-based engineers involved in improving the vibration performance of machinery and components and to academics.

Organiser: Dr Sophoclis Patsias, Sophoclis.Patsias@rolls-royce.com

**Bursaries**

1. **C R Barber Trust**

The C R Barber Trust Fund is open to Associate Members of the Institute, who are in the early stages of their career, and who wish to attend an overseas conference. The support given to successful applicants will normally cover only part of the expenses incurred in attending a conference and are intended to supplement grants from other sources. Grants can be used to cover any part of the conference attendance (travel, registration fees, accommodation). Grants are fixed and are dependent on where the conference is located. For applications based in the UK the following amounts apply:

- £100 for conferences in Europe
- £175 for conferences in the USA/Canada
- £300 for conferences in the rest of the world

Detailed information can be found at:
[http://www.iop.org/about/grants/barber/page_38812.html](http://www.iop.org/about/grants/barber/page_38812.html)

2. **Research Student Conference Fund**

The Institute of Physics provides financial support to research students to attend international meetings and major national meetings. Research Student Conference Fund (RSCF) bursaries are available to only to research students who are a member of the Institute and of an appropriate Institute group. RSCF applications are considered on a quarterly basis and should reach the Institute by: 1 March, 1 June, 1 September or 1 December; a decision will be made within eight weeks of the closing date.
Supporting research students

Research Student Conference Fund

Providing financial support to research student members, to attend international conferences and major national meetings.

Apply for up to £250 during the course of your PhD.

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For further information see www.iop.org or contact supportandgrants@iop.org

Detailed information can be found at:
http://www.iop.org/about/grants/research_student/page_38808.html

Items for the newsletter

Please send items for the newsletter to Daniel Gorman
daniel.gorman@btinternet.com or any other committee member

This newsletter is also available on the web and in larger print sizes

The contents of this newsletter do not necessarily represent the views or policies of the Institute of Physics, except where explicitly stated.
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