

Research Newsletter

The School of Mechanical, Aerospace and Civil Engineering

Issue 7 – Spring 2015



Spotlight on:

- Water Energy Food Nexus
- Manchester Biomanufacturing Centre
- KTP Project with KEK-Gardner Ltd

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Nuclear research continues to be a strength and in this issue it is reported that Prof Tim Abram has been awarded an EPSRC grant to explore the performance of composite silicon carbide (so called SiCSiC composite) as a potential novel cladding material for nuclear fuel. Eric Lou of the Project Management Group deserves a special mention as he just became a father and was awarded his first large grant through the Newton Fund.

These newsletters are circulated far and wide in the UK and overseas but we are always trying to extend our reach so we would be grateful if you could pass this newsletter onwards or provide us with new interested contacts. We would also be very interested in your feedback and ideas for future issues. I hope that you enjoy this newsletter and we hope to bring you more exciting research news again in the Autumn of 2015.

It is a great pleasure to welcome you to the Spring 2015 edition of our research newsletter. Over the last three years the School has grown significantly with a large number of academic appointments and in this edition we introduce six more people in research areas that cover machining, spacecraft engineering and materials for demanding environments. This newsletter is packed with news about grant awards, research and postgraduate research activities. In this edition, sustainability features strongly with articles on smart grids, the two degree climate target, the future climate for Africa and the water, food energy nexus. The Manchester Biomaterials Centre is introduced as a world leading research centre with state-of-the-art equipment.

Hot off the press but too late for this issue is news from the recent EdF/UoM Strategy meeting. The purpose of the meeting was to review the performance of the EdF Modelling and Simulation Centre and to negotiate a second phase of funding. I can report that the meeting went very well and that the company have agreed to another five year funding period which will take us into our new building phase - the Manchester Engineering Campus Development MECD. We move into MECD in 2019 together with the Schools of Materials, Chemical Engineering and Electrical & Electronic Engineering. There will be more about this £353M investment in a future issue.

Professor Andrew Gibson

MEng, PhD, DSc, FIET, SMIEEE, FIMechE, C.Eng

Research News



Water Food Energy Nexus

Dr Alice Bows-Larkin has secured a £1.4m EPSRC award following participation in a recent Water-Food-Energy Nexus Sandpit event. The project is called 'STEPPING UP' and will examine the potential of niche innovations at small/local scale to be replicated or upscaled to bring about a step-change across the domains of water, food and energy.

Project partners in this new collaboration are the Universities of Cranfield, Surrey, Abertay, Exeter, Glasgow, Loughborough as well as HR Wallingford and the Science and Technology Facilities Council (STFC) who are supplying a further £140k contribution to computing, modelling and big data support.

The research in Manchester will involve assessing whether or not an innovation really is 'low impact', Manchester is also going to play a key role in aspects of stakeholder engagement.

For further information:

<http://www.mace.manchester.ac.uk/our-research/centres-institutes/tyndall-manchester/>

Manchester Biomaterials Centre

The Manchester Biomaterials Centre was recently established to be a world leading research centre in this new field. It integrates a group of multidisciplinary researchers, led by Prof Paulo Bartolo, and state-of-the-art equipment. The research program focus is, among other topics, on computer-aided design and manufacturing of medical devices, biomaterials, tissue scaffolds, tissue constructs and drug delivery systems, cell- and organ printing. An ageing population, high expectations for better quality of life and the changing lifestyle of modern society require an improved, more efficient and affordable health care, which poses new challenging problems regarding the increasing number of implants required, new diseases to be treated and organ shortage. The mission of the Manchester Biomaterials Centre is to contribute to the advancement of science and technology leading to more suitable, effective and efficient medical devices.

Biomaterials integrates life science and engineering fundamentals to produce biocompatible products enhancing the quality of life. It is an emergent domain defined as the design, fabrication, assembly and measurement of bio-elements into structures, devices, and systems, and their interfacing and integration into/with larger scale structures *in vivo* or *in vitro*. Prof Bartolo is also the Editor-in-Chief of the new Journal "Biomaterials Reviews" published by Springer.

This journal aims at providing a peer-reviewed forum for the publication of authoritative state-of-the-art review papers in the field of biomaterials, for tissue engineering and regenerative medicine. It will build a link between original articles, innovations published in patents, and up to date knowledge on materials (e.g. bio-polymers, hydrogels, bioceramics, biocomposites, cells), technology (e.g. electrospinning, additive fabrication, cell printing, patterning and organ printing), computer science (e.g. medical imaging, computer-aided biomaterials and tissue engineering), cell-integrated biological systems and its applications (e.g. bone, cartilage, nerve and skin regeneration).

For further information: <http://www.mace.manchester.ac.uk/our-research/centres-institutes/mbc/>



Nerve regeneration through biomaterials
©Tufts University

New Seminar Series

Tyndall Manchester hosted the first presentation in a new seminar series by **Dr Tim Foxon** on 19th February.



Dr Foxon presented on 'Transition pathways for a UK low carbon electricity future' which explored the role of actors and governance framings in a low carbon transition, by developing and analysing scenarios or pathways to a low carbon electricity future, as well as potential branching points along these pathways.

The next seminar in this series will be held on Wednesday 22nd April. Professor Peter Pearson, from the Centre for Environmental Policy at Imperial College London, will talk about 'Past and Prospective Developments in Gas Networks in Britain'.

Future seminars are planned for May and June 2015 with further details to be posted on www.tyndall.manchester.ac.uk as soon as they are available.

'Don't drop the two-degree climate target'

An opinion piece by Dr Alice Bows-Larkin was recently published in New Scientist magazine. In this article, Alice argues that 'The global climate target of 2°C has been criticised as scientifically and politically meaningless, but we ditch it at our peril. Abandoning 2°C, with its simplicity and value as an anchor point for debate, isn't a prerequisite for getting smarter with targets, and risks a further delay in delivering change at a point when the planet is already at breaking point'.

Read the full article here: <http://www.newscientist.com/article/mg22429982.100-dont-drop-the-twodegree-climate-target.html#.VQrqCl6sWAU>



Prof Kevin Anderson gives evidence to the House of Lords Select Committee on Science and Technology



Prof Kevin Anderson gave oral evidence to the House of Lords Select Committee on Science and Technology at the Palace of Westminster, as part of its inquiry into the resilience of electricity infrastructure.

Prof Anderson was invited as a representative from the Resilient Electricity Networks for Great Britain (RESNET) project. This follows a joint response to the Call for Evidence from members of the RESNET project research team.

<http://www.mace.manchester.ac.uk/our-research/centres-institutes/tyndall-manchester/major-research-projects/resnet/>

Capacity2Customers

The Electricity North West smart grid project **Capacity 2 Customers (C2C)** is drawing to a close and John Broderick reported on the carbon impacts of the technique at their Knowledge Sharing event in London on Jan 27th.

The headline finding is that a combination of smart and traditional network reinforcement leads to the lowest overall impact from the distribution grid. The project also identified that emissions from civil engineering works had been overlooked in previous studies and could double estimates per metre of reinforcement.



Dr Carly McLachlan expert witness for Sheffield Green Commission

Dr Carly McLachlan gave evidence as an expert witness to The Sheffield Green Commission at Burngreave Vestry Hall in February. The hearing was focused on Communication, Engagement and Behaviour Change. Carly outlined a range of ways of thinking about pro-environmental behaviour (information deficit, economic rationality, attitudes & values and social practices). She argued that policy makers should consider which models are implicit in how they are defining sustainability problems and ways of tackling them and whether considering other ways of understanding behaviour might open up new policy options. The hearing was co-hosted by Sheffield Climate Alliance who facilitated a public workshop following the evidence session.

Information about this and future sessions can be found at:

<http://www.sheffieldismyplanet.co.uk/news/2015/2/second-green-commission-hearing-report>

Designing consumer engagement with the smart grids of the future: bringing active demand technology to everyday life

Dr Dana Abi Ghanem and **Dr Sarah Mander** have published in *Technology Analysis and Strategic Management*. Automated control of consumer electricity loads, or active demand (AD) management, is a key component of many smart grid futures. The paper explores the expectations of the behaviours of end users, envisaged by the designers and engineers of an active demand project.



Dr Dana Abi Ghanem



Dr Sarah Mander

Grants and Awards

Vertical Lift Network

Dr Antonio Filippone has been awarded an **EPSRC grant** to gather the national expertise in rotary wing systems: The Vertical Lift Network (VLN). The network addresses technical problems for a special class of vehicles powered by direct lift: conventional helicopters, compound helicopters, tilt-rotors, fan-in-wing vehicles, unmanned air vehicles powered by rotors.

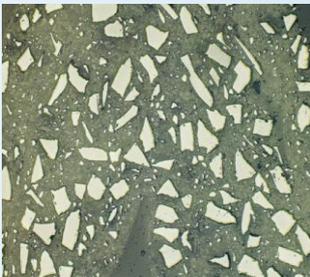
This project brings together expertise across the full spectrum of aerospace engineering, including aerodynamics, computational fluid dynamics, wind tunnel testing, aeroelasticity, aeroacoustics, materials, control systems, power systems, flight dynamics, handling qualities, and systems engineering.

The academic network is to work closely with industry and government stakeholders to identify the strategic directions of research in the next decade. Other key objectives include the promotion of scientific collaboration, the identification of the funding sources, training of students and scientific dissemination via an annual workshop.

Dr Filippone is organising a National Vertical Lift Workshop for UK post-graduate students in aerospace engineering. This will take place at Nunsmere, in Cheshire, on 10-12 April. The rotorcraft industry and the MoD will be in attendance. The government will be represented by Innovate UK.



Understanding the In-Reactor Performance of Advanced Ceramic Cladding Materials



SiC particles in a metal matrix
© PACE Technologies

Prof Tim Abram, together with **Dr Marialuisa Gentile**, Dr Joel Turner, and Dr Marc Schmidt, have been awarded an EPSRC grant to explore the performance of composite silicon carbide (so-called SiCSiC composite) as a potential novel cladding material for nuclear fuel. Silicon carbide has been shown to be stable under irradiation, and has very high temperature capabilities, but it has two major difficulties.

- The cladding must provide a gas-tight tube capable of accommodating the fuel pellets and retaining the gaseous fission products. This requires the sealing of the ends of the tube with a high-integrity joint. However, SiC cannot be welded, and previous attempts to produce mechanical and glued joints have failed.
- Being a ceramic, SiC has very low fracture toughness, and it must be maintained in compression to provide sufficient mechanical strength. This can be achieved by winding the hollow SiC tube with SiC fibres that keep the tube in compression. However, a suitable means must be found of bonding the fibres to the underlying tube.

Recent work at Manchester has identified two promising solutions to these difficulties: the use of laser-induced ceramic brazing to produce a gas-tight seal; and the use of Selective Area Laser Deposition (SALD) to produce a deposit of SiC that can act as a bond between SiC fibres and the underlying tube. The principal objectives of the work are to demonstrate that the brazed joints and bonded fibres are capable of surviving under in-reactor conditions.

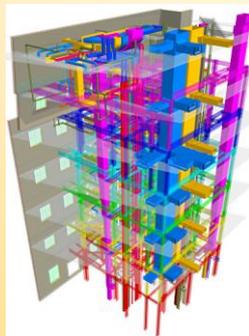
Further details about the project can be found on the EPSRC website:
<http://gow.epsrc.ac.uk/NGBOViewGrant.aspx?GrantRef=EP/M018814/1>

Sustainability-led design through BIM for existing non-domestic buildings

Dr Eric Lou has been awarded a grant through **the Newton Fund**. This will fund a collaboration with Universiti Malaya (Department of Building Surveying), More Room Limited (UK) and the Construction Research Institute of Malaysia. The aim is to translate Dr Lou's research into practice. It is anticipated that this will create a substantial impact on the Malaysian construction industry.

Building Information Modelling enables the interconnected digital design of different elements in a built environment and will extend further into the operation of assets over their lifetime. It will support the accelerated delivery of smart cities, services and grids.

It is important for the partners to sustain the collaboration, especially since this is an as yet unexplored research area in Malaysia with a lot of potential for future work, not only nationally but also internationally.



For more information:
<http://www.manchester.ac.uk/research/eric.lou/personaldetails>

Newton Research Collaboration with the University of Johannesburg

Professor Paul Mativenga (Director of Research in the School) and **Professor Charles Mbohwa** of the University of Johannesburg, have been awarded a Newton grant to fund their collaborative research. The aim of this project is to research and understand the UK and South Africa frameworks/ models that have the biggest influence in increasing responsibility for the life cycle impacts of products and business opportunity and to further focus the research on resource efficiency for composite materials.



Understanding how different countries address this, and could address this, can have a significant impact on resource efficiency and the creation of business that exploit green product principles. One system to be studied in this collaboration is Extended Producer Responsibility (EPR) which promotes total life cycle improvement of product systems by extending the responsibilities of the manufacturer to various parts of the life cycle of the product, and especially to the take-back, recycling and disposing of the product.

Uncertainty reduction in Models For Understanding development Applications (UMFULA)

Prof Julien Harou is part of a consortium that has been successful on a NERC FCFA (Future Climate for Africa) bid. The aim of the project is to evaluate Hydropower investments given future climate in the Rufiji basin in Tanzania. The consortium is led by **Prof Declan Conway** from the London School of Economics.

Support Cooperation on Water Resource Management in the Lower Mesopotamia

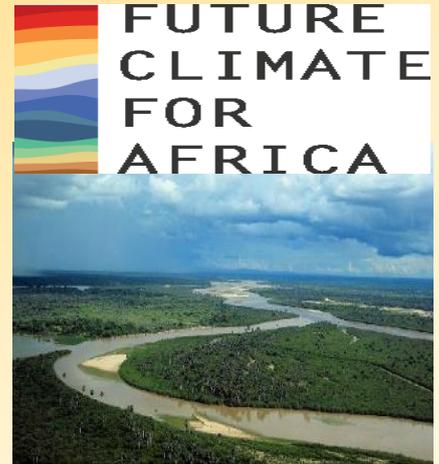
Prof Harou has also been awarded funding from the Food and Agricultural Organisation of the UN to look at Water Resource Management in the Lower Mesopotamia region.

The issues confronting this region are:

- water is scarce and is likely to impact most on food security and food production
- water scarcity is not the only threat that the region is currently facing with water management projects carried out in the Tigris-Euphrates basin but so far the little consideration given to water quality aspects causing increased salinity and concentration of pollution thus affecting negatively irrigation activities and soil productivity
- decreased water availability due to climate change effect will have important implications for the future of water resources and associated hydropower generation and land-use management and planning in a region.

Countries in the region have put water resource management at the top of their agendas and governments are now acknowledging that a better and shared understanding of the hydrology in the Mesopotamian basin is required in order to plan the region's future economic development.

Not only is it necessary to deepen the knowledge on the hydrological processes in the basin but also to better understand the interactions between water and the economy. These interactions are complex but they can be represented through mathematical models. In this regard, the FAO-Italy project GCP/RAB/012/ITA -Support Cooperation on Water Resource Management in the Lower Mesopotamia-aims to develop a hydro-economic model for the Lower Mesopotamia that will help policy design and water planning under a more integrated approach.



Selous Game Reserve Tanzania



Design and test a new generation of fine milling equipment

Kek-Gardner Ltd, **Dr Robert Heinemann**, **Prof Sri Hinduja** and **Dr Carl Diver** have been awarded a 3-year KTP Project which is going to embed 3D CAD design, Finite Element Analysis and Computational Fluid Dynamics modeling through the design, fabrication and testing of a prototype machine of a new generation of fine size reduction mills. This project also aims at embedding advanced data management within the company in order to offer enhanced customer support.

Please also visit Kek-Gardner's website: <http://www.kekgardner.com/newsarticle/328>



Early stage fault detection

Dr Jyoti Sinha and **Dr Alistair Revell** are working together on a KTP project with EDF to embed and exploit capability enabling early stage fault detection in main turbine governor valves to prevent failures by development of condition monitoring technology and standard test procedures.



KTP project with Ritherdon Ltd

Professor Yong Wang and **Dr Paul Chan** have successfully applied for funding from Innovate UK for a KTP project with Ritherdon Ltd. Through Prof Wang's previous collaboration with Ritherdon of the **Passively Safe Cabinet** this new project was started. Dr Naveed Hussain will be working through the Ritherdon range of products using Finite Element Analysis modelling software to optimise the performance of each product. This will include properties such as strength and stiffness under the various loading conditions.



<http://www.ritherdon.co.uk/news/2015/february/ritherdon-working-in-conjunction-with.html>

Methods of specifying intumescent coating on concrete filled steel tubular sections

Professor Yong Wang has been awarded a grant through the EPSRC IAA Exploitation Secondment Scheme with Tata Steel UK Ltd.



The EPSRC IAA provides flexible support for secondments between the University and external businesses and organisations that focus on the commercial development of specific EPSRC research outputs. Exploitation secondments will allow the secondment-out of RAs or academic staff to focus on the further development of research outputs emerging from EPSRC-funded research.

PGR and Conference News

The 11th Young Coastal Scientists and Engineers Conference (YCSEC) was successfully hosted here at the University of Manchester on 23-24 March. The conference was organised by Dr Fay Luxford, Dr Maurice McCabe, **Prof Peter Stansby** and **Dr Ben Rogers** with support from Michelle Mallon, Sue Davies and Melody Mahan.



Research on coastal physical processes in the UK occurs under various disciplinary labels; the conference aims to bring together young researchers and practitioners to help develop an integrated coastal research community. In his keynote lecture **Prof Vladimir Nikora** from Aberdeen University presented some very interesting results from his experiments on bed particle entrainment. 27 oral and 18 poster presentations were given by delegates from around the UK, as well as Turkey, Portugal and Trinidad and Tobago. This year we aimed to attract more delegates from outside academia; presentations were given by coastal engineering consultants and professionals from government departments, and their contributions were very well received.

The final afternoon of the conference started with a demonstration of our hydraulic laboratories, showing some of our research in the wave flumes on marine energy devices and coastal structures. The conference concluded with Dr Ben Rogers hosting a short course on SPH modelling.

REF Impact Case

Please click here to download one of the School's highly rated REF Impact cases:

Accelerated development of a tidal stream energy industry



Annual MACE PGR Conference

The annual MACE Postgraduate Research (PGR) Conference took place on 26th March 2015 with presentations from our second and third year students. The day commenced with a keynote lecture from Dr Mostafa Ahmed Nabawi from MACE who was recently awarded his PhD with no corrections and spoke about the design of insect-scale flapping wing vehicles and his experiences as a PhD student.



For the main presentations, we were treated to excellent talks drawn from the across the entire range of research conducted within the School with sessions including modelling & simulation, solid mechanics, dynamics & manufacturing, project management, nuclear graphite, energy, environment and geotechnics.



The conference finished with the evening event held in the fantastic surroundings of the Manchester Museum with prizes being awarded for best papers, best presentations, and best plans for commercialisation and impact, accompanied of course by hors d'oeuvres and drinks.



MACE is hosting the Second CIRP Conference on Biomanufacturing on July 29-31 2015

Biomanufacturing, defined as the design, fabrication, assembly and measurement of bio-elements into structures, devices, and systems, and their interfacing and integration into/larger scale structures in vivo or in vitro, is an emergent domain integrating life science and engineering principles. CIRP, the World Academy for Production Engineering, plays a key role in this area promoting multidisciplinary research towards the development of medical and welfare devices and systems for improving quality of life and reducing global healthcare costs.



The CIRP-Biomanufacturing conference was designed to be an international forum to discuss progress and future directions, and revise milestones as necessary, to facilitate exchange of information on biodesign, biofabrication and biomechanics.

For further information:
<http://www.mace.manchester.ac.uk/media/eps/schoolofmechanicalaerospaceandcivileengineering/research/conferences/cirp-biom/CIRP-BioM2015.pdf>

Recent Appointments

Dr Majid Sedighi

Lecturer in Geoengineering



As a UNESCO Research Fellow at the Geoenvironmental Research Centre, Cardiff University, Dr Sedighi has been responsible for scientific development and co-management of research programmes in the areas of geological disposal of high level radioactive waste, geological carbon sequestration, ground source heat and advanced computational modelling in geoenergy problems. He is a Civil Engineer with an MSc in Geotechnical Engineering, completed in 2002. He has a PhD on “modelling the coupled thermal, hydraulic, chemical and mechanical behaviour of unsaturated soils” from Cardiff University. Prior to his PhD, he worked for five years (2002-2007) as a senior structural and geotechnical design engineer in three consulting engineering companies. His main research interest and expertise lie in the area of “Energy and Environmental Geotechnics”. He is interested in studying the reactive transport of water, chemicals and gas in subsurface problems with the aim at providing a better understanding of coupled physical, chemical and mechanical behaviour of geomaterials.

Dr Peter Roberts

Lecturer in Spacecraft Engineering/Spacecraft Flight Dynamics

Dr Roberts specialises in spacecraft systems engineering, the dynamics of spacecraft interactions with the atmosphere, astrodynamics, and space debris mitigation. Following the completion of a BSc in Physics with Astrophysics at the University of Kent in 1994, he moved to Cranfield University to do an MSc in Astronautics and Space Engineering and then an Engineering Doctorate (studying drag free control for a space-based gravitational wave detector). He remained at Cranfield until 2014 in a variety of research, teaching and administration roles. More recently he was the lead design engineer for Icarus, the world’s first end-of-life spacecraft deorbit device, which is on-orbit awaiting deployment on the UK’s TechDemo-Sat. He was the principal investigator for a CubeSat mission which was part of a European Framework 7 project. His research has been funded by the UK Space Agency, the European Space Agency, EADS Astrium (now Airbus Defence and Space), SSBV, and the EPSRC. He was also the Associate Dean for Taught Courses within the Faculty of Engineering and Aerospace at Cranfield University, responsible for taught course QA and student concessions for the 26 MSc programmes within the Faculty.



Dr Matthew Roy

Lecturer in Materials for Demanding Environments

Dr Roy attained an undergraduate degree in Integrated Engineering and a Masters in Mechanical and Materials Engineering from Western University, followed by a PhD in Materials Engineering from the University of British Columbia in Canada. He joined the University of Manchester in 2013 as a Research Associate in weld modelling where he coordinated and undertook research into predicting and characterising residual stress and weld metallurgy. In 2014, he assumed the post of Lecturer to support a new EPSRC Centre for Doctoral Training. This new centre is aimed at developing interdisciplinary approaches required to address materials challenges in the Oil and Gas, Aerospace and Nuclear sectors. His principal research interests are advanced manufacturing and materials processing, linking processing methodology to the in-service life of resulting components. His research topics include incremental metal forming, casting, welding and other near-net shape manufacturing methods involving thermomechanical processing.



Dr David Gillen

Senior Lecturer in Laser Machining



Dr Gillen commenced his part-time appointment as a Senior Lecturer in Laser Machining in January. He specialises in laser material inter-actions with particular interest in laser processing of polymer and semiconductor materials. Following the completion of a BSc in Computer Science and Physics at Queens University Belfast in 1994, he went on to complete a PhD in Non-Resonant Multi photon Ionisation of Silicon and Copper. He then remained at Queens until 2001, researching electron transfer in highly charged ions. Dr Gillen then moved into a number of Industrial roles investigating the use of Plasmas and UV Lasers to etch semiconductor materials. In 2005 he founded and is currently Managing Director of Blueacre Technology Ltd, which supplies high precision laser micro-machining equipment to the medical device and electronic industries. Dr Gillen has a background in the industrial application of research, machine integration, motion control systems and optical design. He has commercial experience in bringing technical solutions to market along with involvement in regulatory and certification compliance.

Dr Olivier Allegre

Lecturer in Non-conventional Machining

Dr Allegre specializes in advanced laser processes, with a special interest in ultrashort-pulse laser material interactions and process control. Dr Allegre also has a background in precision motion control, optics design and microscopy. Following the completion of a “diplôme d’Ingénieur” at Polytech’ Orleans in France in 2003, Dr Allegre worked as a Design and Software Engineer for research organisations such as NCRA in India, or industrial companies such as Marinovation in France and Thorlabs in Cambridge, UK. He joined Carl Zeiss SMT Ltd in 2007, where he worked as a Systems Engineer on the design and manufacture of electron microscopes.



In 2009, he joined the University of Liverpool to complete a PhD in advanced control of laser beam wavefront and polarisation for micro-manufacturing. After his PhD in 2012, Dr Allegre managed an EU-funded project to promote the use of laser technologies to SMEs in the North-West. He is now appointed to lecture on non-conventional machining including laser processing and to continue his research in advanced laser processing.

Dr Domenico Lombardi

Lecturer in Geotechnical Engineering



After graduating with a first class honours in Civil Engineering from the University of Sannio (Italy), Dr Lombardi moved to the University of Bristol to finish his post-graduate studies, first with an MSc in Offshore Engineering and then with a PhD in Earthquake Engineering.

The major subject of his doctoral dissertation was seismic performance of pile-supported structures in liquefiable soils.

Before joining The University of Manchester, he was appointed as a Foreign Researcher in the Department of Civil and Environmental Engineering at Yamaguchi University (Japan), where he investigated the cyclic and liquefaction behaviour of soils and conducted a series of field surveys in the area hit by the 2011 earthquake and subsequent tsunami. His research includes projects on the long-term performance of offshore structures, effects of liquefaction phenomena on soil-foundation interaction and behaviour of structures under repetitive loading.

The Bigger Picture

Paul Nedwell's Ferrocement

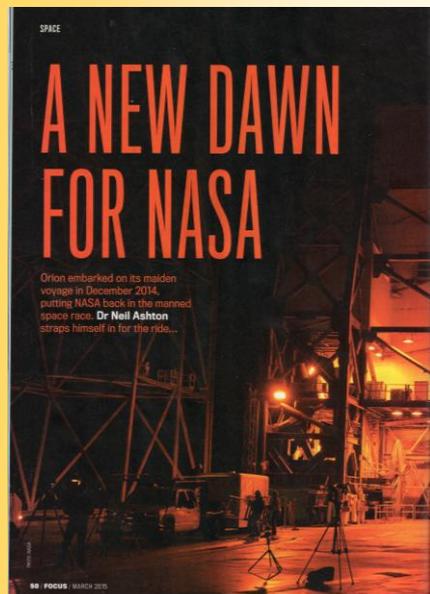
Manchester Ferrocement expert **Paul Nedwell** attended the **American Concrete Institute Fall Convention** in Washington, DC where the first draft of the new "Report on Ferrocement" was accepted by Committee 549. Committee Chairman John Jones, seen in the photograph with Paul (on the right), said that there was nobody else in the world who could have produced this document.

The report charts the use of ferrocement from its inception in 1845 to modern day projects such as the Stavros Niarchos Cultural Centre in Athens where a 100m square twin skin solar collector is currently being erected 40 m above the Main building. Consulting engineers 'Expedition' visited Manchester before the project started to learn about ferrocement and get a feeling for it in a special laboratory session run by Paul.



Spacial Awareness: A New Dawn for NASA

Dr Neil Ashton, a Research Associate in the School, wrote a feature article for the **BBC Focus Magazine** on NASA's latest Orion spacecraft. He spoke with the Chief Scientist for NASA as well the programme Managers for Orion at NASA and Lockheed Martin to understand the challenges ahead for the Orion programme.



Osborne Reynolds Paper selected as one of Phil Trans' top publications in 350 years

The journal *Philosophical Transactions of the Royal Society* is the oldest scientific journal in the world with its first issue appearing 350 years ago! To mark this special birthday, the Royal Society has just published a commemorative issue containing an appreciative assessment of some 15 of the most influential papers the journal has published over those three-and-a-half centuries (<https://royalsociety.org/publishing350/>).



One of those selected for this honour is by Professor Osborne Reynolds, Manchester's first Professor of Civil & Mechanical Engineering. His paper *On the dynamical theory of incompressible viscous fluids and determination of the criterion*, published in 1895 was destined to shape the direction of research in turbulent fluid mechanics for the next century. The Royal Society invited Professor Brian Launder, one of the current professors in fluid mechanics in MACE, to provide the assessment of Professor Reynolds' contribution which has become available on-line in the current issue of Phil Trans. (<http://rsta.royalsocietypublishing.org/content/373/2039/20140231>).

Osborne Reynolds Day

This year the national **Osborne Reynolds Day** will also be held in **MACE** on July 7th. The occasion celebrates high quality **PhD research in Fluid Mechanics** in the UK with prizes for the best entries. The deadline for entry is **May 5th**; further details from Professor Brian Launder (brian.launder@manchester.ac.uk).

REAM MSc launches new video conferencing platform for teaching distance learning students

The School has successfully incorporated a video conferencing platform for teaching distant learning (DL) students into its Reliability Engineering and Asset Management (REAM) MSc programme, during residential days held from 9-10 March 2015. The e-learning session was joined by more than 25 participants from 9 different countries, including; Argentina, Canada, Indonesia, Italy, Mexico, USA, Saudi Arabia, UAE, and USA. This new initiative provides the opportunity for distant learning students to interact with the instructors and residential colleagues in real-time. This initiative will save time and expenses related to travelling to Manchester for the DL students from now onwards. <http://www.mace.manchester.ac.uk/news/recent-news/ream-msc-launches-a-new-video-conferencing-plaform-for-teaching-distance-learning-students.htm>

Dr Mei Ren appointed Royal Academy of Engineering Visiting Professor

Dr Mei Ren of Burohappold has been appointed Royal Academy of Engineering Visiting Professor in Environmental Sustainability.



Dr Mei Ren is Technical Director at Burohappold Engineering and already has strong ties with the School, being the Environmental Sustainability Advisor to the MECD project.

The Manchester Engineering Campus Development is the largest capital project ever undertaken by the University. We will bring you more news on this development in the next Research Newsletter.

For further information: <http://www.estates.manchester.ac.uk/services/capitalprojectsunit/futureprojects/mecd/>

Dr Ben Parslew is a winner !

Dr Ben Parslew entered a competition for early career engineers who were invited to present their posters to Fellows, members and guests of the Royal Academy of Engineering in their North West meeting hosted by Liverpool University in March. The Universities of Manchester, Liverpool, Leeds and Sheffield all took part and Ben's poster on *Bird Flight Mechanics* was voted first by the RAEng Fellows.

The photo shows Ben with Prof Dame Ann Dowling, President of the Royal Academy of Engineering. For further information please visit: <http://www.flappingwings.co.uk/>



Managing the urgent and unexpected

Sometimes unanticipated threats or opportunities create a situation in which work is required unexpectedly. On these occasions, such work demands an instant start, in contrast to the often lengthy processes of investigation, evaluation, development, selection and planning normal in businesses and public services before the start of a project. **Professors Stephen Wearne and Keith White-Hunt's** book *Managing the Urgent and Unexpected* explores what is different managerially if work is unexpected, its implementation is urgent and an immediate start it is required.

