ACCIS has been pleased to host research visitors from a wide range of international institutions during the past year including: Virginia Tech; RMIT University Melbourne; Institute of Carbon Composites, Technical University of Munich; Dalian University of Technology, China; Budapest University of Technology and Economics; Ecole Centrale de Nantes; Beihang University; the Federal University of São João del Rei in Brazil; The University of British Columbia; Delft University of Technology; Dresden University of Technology and Albert-Ludwigs-University of Freiburg.

Regular joint seminars have been held between ACCIS and the National Composites Centre (NCC) over the course of the year to exchange scientific and engineering challenges, promoting interactions between the two centres. These were held alternately at the University and the NCC featuring talks by NCC and University research staff, as well as external speakers including Professor Anoush Poursartip from the University of British Columbia.

Another successful conference of the ACCIS CDT was held in April 2014 - more details are in the ACCIS CDT update.

We are looking forward to hosting the Composites 2015 5th ECCOMAS Thematic Conference on The Mechanical Response of Composites at the University next year (7-9 September 2015), which Professor Stephen Hallett is co-chairing with Professor Joris Remmers (TU Eindhoven, Netherlands). The conference will focus on theoretical and numerical modelling and prediction of the performance of composite components, also covering experimental validation and challenging industrial applications or recent developments. Further details of the conference can be found at www.composites2015.info

The International Conference on Manufacturing of Advanced Composites (ICMAC 2015) will also take place in Bristol on 24-25 June 2015, and will provide a forum where all those interested in composites manufacturing from the academic and industrial worlds can meet to interact and discuss their common interests. Themes will include assembly and metrology, automation, manufacturing design and sustainability. The event is being coordinated by the British Composites Society and will be chaired by Professor Kevin Potter. Full details can be found at www.icmac2015.org
New Appointments and Promotions

- Professor Kevin Potter has been appointed as NCC Professor in Composites Manufacture. This is a part-time role supporting developments in new research and technology at the NCC and the University of Bristol. Kevin will also continue with his research and teaching duties within the University.

- Dr Eric Kim has taken up the new position of Lecturer in Composites Design, Processing and Manufacture from August 2014.

- Dr Carwyn Ward has also been appointed as Lecturer in Composites Design, Processing and Manufacture from August 2014.

- Dr Alberto Pirrera joined the ACCIS academic team as Lecturer in Composite Structures.

- Dr Mark Schenk will join the ACCIS academic team in October 2014 as a Lecturer in Aerospace Engineering.

- Alison Denny has been appointed as ACCIS and UTC Project Manager to cover Katharine Blackwell’s maternity leave.

- Allison McIntosh-Smith joined the administration team in the role of ACCIS Senior Administrator and Project Coordinator on a job-share basis alongside Katie Drury.

Leavers

We would like to say goodbye to the following members of the ACCIS academic team and wish them every success in their new posts:

- Dr Giuliano Allegri, who has taken up a post as a Senior Lecturer in the Department of Aeronautics at Imperial College London but will continue with research collaborations at the University of Bristol.

- Professor Hua-Xin Peng is starting a new job in Zhejiang University (PR China) under the national 1000 Talent Plan. He holds a Visiting Professor position with Bristol and his primary research remains on functional materials and composites.

- Dr Carwyn Ward has also been appointed as Lecturer in Composite Structures.

- Dr Mark Schenk will join the ACCIS academic team in October 2014 as a Lecturer in Aerospace Engineering.

- Alison Denny has been appointed as ACCIS and UTC Project Manager to cover Katharine Blackwell’s maternity leave.

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National Composites Centre Update

The NCC will shortly be opening its doors to Phase 2 of the building project, providing increased capacity and a dedicated high speed composite manufacturing technology facility. Part of the new building will also be utilised to ensure a sustainable future for composites manufacturing skills in the UK workforce by bringing together leading businesses, colleges and universities at a world-class training facility. ACCIS will have a greater presence in the new extension, where the Research Engineers from the Industrial Doctorate Centre will be based, and the knowledge-based processing equipment from the EPSRC “Atoms to Applications” grant will be located.

Key Publications

- Fabrizio Scarpa & Richard Trask both had articles selected for the Smart Materials and Structures ‘Highlights of 2013’ brochure. Fabrizio’s article titled ‘Composite flexible skin with large negative Poisson’s ratio range: numerical and experimental analysis’ and Richard’s article titled ‘Morphing structures using soft polymers for active deployment’.

- Journal articles featuring work by Alberto Pirrera, Paul Weaver and ACCIS researchers featured in Science Direct’s Top 25 Most Downloaded Articles. The articles covered ACCIS research topics including ‘Bistable plates for morphing structures’, ‘Multi-stable cylindrical lattices’ and the ‘Structural efficiency of a wind turbine blade’.


New Grants

- EPSRC Centre for Doctoral Training in Advanced Composites for Innovation and Science - Paul Weaver (EPRSC) 2014-2022 Value: £4.9m.

- EPSRC Centre for Doctoral Training in Composites Manufacture - Ivana Partridge (EPSRC) 2015-2022 Value: £3.7m.


- Manufacturing of High Performance Cellulose Fibres to Replace Glass Fibres and non-Renewable Precursors of Carbon fibres - Kevin Potter & Sameer Rahatekar in collaboration with Exeter and Imperial (EPSRC) Value: £2.1m.

- Auxetic Foams for Dynamic Load Alleviation in MS Patients - Fabrizio Scarpa (Elizabeth Blackwell SARTRE) Value: £12k.

- Morphing Enabling Technologies for Propulsion System Nacelles (MORPHELLE) - Fabrizio Scarpa (EU) Value: £154k.

- Robustness-Performance Optimisation for Automated Composites Manufacture – Kevin Potter (EPSRC) Value: £138k.

- New Generation of Manufacturing Technologies: Liquid Print of Composite Matrices - Dmitry Ivanov (EPSRC) Value: £125k.

- Ivana Partridge & Paul Weaver have been successful in securing £700k by way of an EPSRC Capital bid to support the Centres for Doctoral Training. This will enable the provision of new equipment, considerably strengthening facilities for composites research.
PhD Successes

**Fabio Agnese**
Enhanced Vibration Damping Materials and Structures for Wind Blade Vibration Inspired from Auxetic Configurations
(Supervisor: Fabrizio Scarpa)

**Alex Brinkmeyer (ACCIS CDT 2009)**
Time-Dependent Bistable Morphing Structures
(Supervisors: Paul Weaver and Fabrizio Scarpa)

**Neil Buckney (ACCIS CDT 2009)**
Optimisation of Wind Turbine Blade Structural Topology
(Supervisors: Paul Weaver and Giuliano Allegri)

**James Lightfoot (ACCIS CDT 2009)**
Mechanisms of Defect Formation in Carbon Fibre Composites
(Supervisors: Kevin Potter and Michael Wisnom)

**Joseph Mills-Brown (ACCIS CDT 2009)**
High Temperature Composite Materials and Structures
(Supervisors: Kevin Potter and Paul Weaver)

**Oliver Nixon-Pearson (ACCIS CDT 2009)**
An Investigation into the Fatigue Damage Development in Open and Bolted-Hole Composite Laminates
(Supervisor: Stephen Hallett)

**Matt O’Donnell**
Exploiting Non-Symmetry in Composite Laminates
(Supervisors: Paul Weaver and Ian Bond)

**Damien Pain**
Detection and Quantification of Fibre Waviness in Composite Laminates using Ultrasonic Array
(Supervisors: Bruce Drinkwater and Michael Wisnom)

**Joel Ross**
Local and Global Load Responses of a Traffic Bridge Comprising GFRP Cellular Decking Bonded to Pre-tensioned Concrete Beams
(Supervisors: Wendel Sebastian and Giuliano Allegri)

**Alex Shaw (ACCIS CDT 2009)**
Vibration Isolation Utilising the Nonlinear deformation of Anisotropic Plates
(Supervisors: Simon Neild and Paul Weaver)

**Daniel Thompson**
Damage Modelling and Prognosis in Composite Materials
(Supervisor: Michael Wisnom)

**Sepideh Vali-Shariatpanahi**
Damage Mechanisms Arising from Advanced Fasteners for Aerospace
(Supervisor: Stephen Hallett)

**John Williams (ACCIS CDT 2009)**
Plasma Treatment of Carbon Nanotubes and Carbon Fibre for use in Composite Materials
(Supervisors: Sameer Rahatekar and Hua-Xin Peng)

**Khong Wui Gan**
Effect of High Through-Thickness Compression on Composite Failure
(Supervisors: Michael Wisnom and Stephen Hallett)

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### IDC Update

The Industrial Doctorate Centre (IDC) in Composites Manufacture is now in its second year and has secured a further £3.7m from EPSRC, in addition to its initial £3.8m award, to fund a total of 70+ Research Engineers over the full duration of the two EPSRC awards, to 2022. The IDC is an integral activity of the EPSRC Centre for Innovative Manufacturing in Composites (CIMComp), and is also run as a collaboration between the CIMComp Universities (Bristol, Cranfield, Manchester and Nottingham). The IDC now has EngD students registered with three of the four member universities, and is seeking to broaden the partnership to include other universities. In total, the IDC has seven Research Engineers registered to the EngD programme, with further projects being negotiated on an ongoing basis. Current EngD projects are sponsored by Rolls-Royce, Jaguar Land Rover, Hexcel and the National Composites Centre (NCC). The NCC, which provides a hub for the UK composites industry as part of the HVM Catapult, is also the home-base for all current IDC Research Engineers.

As well as providing project supervision, staff from member universities contribute to the delivery of the taught units. This specialist training ensures that Research Engineers are able to bring considerable cutting-edge technical knowledge and capability to their industry-based EngD projects. The IDC ran four technical taught units in 2013/14, namely ‘Constituents of Composites’, ‘Manufacture of Composite Structures’, ‘Laminate Analysis, Modelling and Design of Composites’ and ‘Mechanical Performance of Composites’. Several researchers from the CIMComp partner universities and industry partners were able to join the units, giving them the opportunity to enhance their own research. IDC Research Engineers also attended the first of two business skills courses which is run by the University of Bath. IDC Research Engineers are continuously encouraged to participate in opportunities to further their professional and career development by attending training courses, workshops and conferences. Laura Pickard (first year EngD) claimed first prize in the ‘2014 Engineering Professors’ Council and Hammermen of Glasgow Student Awards’ having submitted an essay addressing the question: ‘How does engineering contribute to the UK economy and how can that contribution be increased? Is there a role for UK engineering in higher education in making this happen?’.

A group of four Research Engineers also participated successfully in this year’s Engineering Young Entrepreneur Scheme, a training competition for postgraduate students and post-doctoral researchers to develop and present a business plan to a group of investors and industry experts.
CDT Update

The EPSRC Centre for Doctoral Training (CDT) in Advanced Composites for Innovation and Science has secured £4.9m of renewed funding from the EPSRC. With this award and continued support from the University and its industrial partners, the CDT will continue to train outstanding science and engineering graduates from all over the world until 2022. Strong applications, especially from outstanding international candidates, have resulted in fierce competition for places. On 22 September 2014 the CDT will welcome its sixth cohort of students.

The first piece of work our new CDT students will undertake is a literature review assignment on a specific area of composites research, and we are very excited that this year’s assignment on ‘composites for automotive’ is going to be set in conjunction with our colleagues at BMW. Previous literature reviews have been submitted as journal papers; the papers produced by the 2010 and 2012 cohorts are currently the 21st and 8th most downloaded papers in their respective journals.

From those just starting out to those coming to the end of their studies, the CDT’s first graduates in 2013-2014 found themselves in very high demand, securing positions in both academia and industry. Graduate destinations have included: Blade Dynamics, Frazer-Nash Consultancy, HiETA Technologies, Sahara Force India F1 Team, Reaction Engines, Swansea University and the University of Bristol. Neil Buckney’s thesis was awarded a prestigious Faculty of Engineering Commendation.

Six-month extended research projects and PhD projects which started in 2014 have involved collaborations across faculties, with other Universities (Imperial) and with a number of industrial partners (Airbus Group Innovations, Arup, BAE Systems ATC, BMW, DNV GL, EOARD, Dstl, Rolls-Royce, RNL). The call for PhD projects starting in January 2015 was announced at the annual ACCIS Conference.

Our students continue to travel the world to share and support their research. In 2014, students presented papers and posters at major international conferences in Belgium, Canada, China, France, Germany, Italy, Spain, the Netherlands and the USA. In June 2014 a delegation of 11 students (the biggest to date) attended the 16th European Conference on Composite Materials (ECCM16). A number of students also scooped prizes for their conference papers, including:

- Broderick Coburn - Won the Harry Hilton Student Paper Award in Structures at the 55th AIAA/ASME/ASCE/AHS/ASC SDM Conference, Jan 2014. Awarded a cash prize of 500 USD.
- Rainer Groh - Won the Ian Marshall’s Award for Best Student Paper at ICCS17 (announced Dec 2013). Awarded 1000 Euros.
- Marc Scholz - Finalist in the 2014 IEEE IUS Student Paper Competition, May 2014. Awarded 750 USD travel support.

Robin Neville, Isabel Qamar, and Simon White have also undertaken international placements at leading international research organisations: Harbin Institute of Technology, University of Massachusetts Lowell and NASA Langley Research Center, respectively.

Closer to home, our students have been sharing their research in new and innovative ways. Rafael Luterbacher Mus and Laura Edwards reached the finals of the University’s inaugural Three Minute Thesis Competition, which challenged PhD students to give an engaging and accessible summary of their PhD research in just three minutes. Eric Eckstein and Helene Jones took part in the 2014 Pint of Science Festival, which brings scientific experts to pubs to discuss their research with the general public. The CDT will be establishing a student led committee to coordinate public engagement activity for the CDT, allowing students to develop their own innovative activities to raise public awareness of the research being carried out at the CDT.

To increase industrial awareness of the CDT’s research, our students have been visiting our industrial partners, including Airbus, Hexcel and the NCC. Videos of the students’ presentations from these visits are available on the ACCIS YouTube Channel. Companies interested in hosting a visit from the students are asked to get in touch with Dr Alberto Pirrera or Sarah Hallworth.

Our students continue to publish their research in leading journals; between January and September 2014 our students published 14 papers in eight different journals, bringing the total number of CDT publications to 39 across 18 different journals.

Finally, the CDT is pleased to announce that the next CDT Conference will take place on 14 April 2015. In April 2014 the CDT welcomed over 100 delegates, including representatives from 24 companies and eight Higher Education institutions, to its third annual CDT Conference. The students showcased their research through a series of short presentations and interactive poster displays, and the CDT Director, Professor Paul Weaver, provided an update on the CDT’s activities over the past year. All of the presentations delivered on the day can be accessed from the CDT website at www.bristol.ac.uk/composites/cdt

www.bris.ac.uk/composites