5th Annual Conference of the CDT in Advanced Composites for Innovation and Science (ACCIS CDT)

www.bris.ac.uk/composites
Introduction and Update on ACCIS CDT Activities

Professor Paul Weaver
(CDT Director)
EPSRC Centre for Doctoral Training in Advanced Composites for Innovation and Science

**Vision:** To develop the next generation of technical leaders in advanced composites by stimulating adventurous interdisciplinary research, which bridges the length scales, connects to and interfaces between the disciplines of engineering, chemistry, physics and life sciences, and bestows enhanced and added functionality to composite materials.

- Established in 2009 with £7.1 million award from the EPSRC
- Funding secured to continue training outstanding graduates until 2022
- Embedded within the Advanced Composites Centre for Innovation and Science
- Funded by EPSRC, University and industrial partners
- Significant industrial support
- National and international academic collaborations
- Memorandum of Understanding with the National Institute of Aerospace, USA
EPSRC Centre for Doctoral Training in Advanced Composites for Innovation and Science

- 4-Year PhD in Advanced Composites
- Cohort-driven training approach
- Transferable skills training
- Public engagement
- At least 10 funded places per year (UK/EU and International)

**Taught components (Year 1)**
- Choice of PHD project (Years 2-4)

**Integrated taught component**
- Small group teaching
- Flagship group design, build and test (DBT) project
- Individual 6-month exploratory research project

**Wide choice of cutting-edge PhD projects – blue skies and applied**

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YouTube  LinkedIn  composites-cdt@bristol.ac.uk  www.bristol.ac.uk/composites/cdt/
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<thead>
<tr>
<th>Role</th>
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<tr>
<td><strong>CDT Chair</strong></td>
<td>Prof. Michael Wisnom</td>
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<td><strong>CDT Director</strong></td>
<td>Prof. Paul Weaver</td>
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<td><strong>Head of the Queen’s School of Engineering</strong></td>
<td>Prof. Ian Bond</td>
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<td><strong>Teaching Co-ordinator</strong></td>
<td>Dr Ian Farrow</td>
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<td><strong>CDT Lecturer</strong></td>
<td>Dr Dmitry Ivanov</td>
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<td><strong>CDT Lecturer</strong></td>
<td>Dr Sameer Rahatekar</td>
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<td><strong>Research Co-ordinator</strong></td>
<td>Dr Ian Hamerton</td>
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<td><strong>ACCIS Project Manager</strong></td>
<td>Dr Katharine Blackwell</td>
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<td><strong>CDT Manager</strong></td>
<td>Ms Sarah Hallworth</td>
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<td><strong>PG Administrator</strong></td>
<td>Miss Elizabeth Hull</td>
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<td><strong>DTC12 Reps</strong></td>
<td>A Baker H Jones</td>
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<td><strong>DTC13 Reps</strong></td>
<td>J Hartley S Kularatna</td>
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<td>R Tapper M Tolladay</td>
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<td><strong>CDT15 Reps</strong></td>
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Applications to the CDT

<table>
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<tr>
<th>Year</th>
<th>Applications</th>
<th>Offers</th>
<th>Starters</th>
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<td>2009</td>
<td>20</td>
<td>14</td>
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<td>2015</td>
<td>180</td>
<td>80</td>
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<tr>
<td>2016</td>
<td>200</td>
<td>90</td>
<td>20</td>
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(2015 entry is closed to applications 29 Jan)
Our Students

- 7th cohort of 12 students started Sept 2015
- Academically gifted first/high 2:1 graduates
- Range of academic backgrounds
  - Engineering (aerospace, civil, mechanical, manufacturing, materials, textile), biochemistry, chemistry, physics and mathematics
- From all over the world!
Building Strong Cohorts

- Inter-cohort design challenge – ‘Highway to Shell’ (design, build, destroy!)
- Team design, build, test project
- Inter cohort sporting events
- Social events
- Co-located
- Mentoring scheme

“Friendly and supportive atmosphere”

“Cohort culture really cultivates positive competition and mutual learning”

“Good sense of being part of a team”

“The first year builds a strong team, whose support I have found to be invaluable throughout the following years of the PhD”
Our Graduates

Destinations

- Arup
- Blade Dynamics
- Blue Origin
- Cambridge Mechatronics
- Decision Analysis Services
- Exova
- Frazer-Nash Consultancy
- Force India F1 Team
- HiETA Technologies
- Honeywell Aerospace
- Inductosense
- Ipeco Composites
- McLaren Applied Technologies
- NCC Operations Ltd
- Oxford Space Systems
- Reaction Engines
- Rolls-Royce
- Swansea University
- University of Bath
- University of Bristol
Extended Research Projects

Extended Research Projects (XPs)

- Undertaken in the first year
- Duration: 6 months (June to December)
- Co-supervised by ACCIS and collaborator(s)
- Significant piece of work/in-depth exploration of a subject
- Can develop into a PhD project
- Fully funded by the ACCIS CDT
- Previous project partners include:
  - AgustaWestland, Airbus, Arup, BAE Systems, BMW, Crompton Technology Group, DNV GL, dstl, EMBRAER, EOARD, GKN Aerospace, Imperial College London, Rolls-Royce, RNLI, University of Cambridge, University of Exeter, University of Manchester, Vestas

Call for proposals open: Deadline Fri 22nd April 2016

Collaboration with Industry & Academia

**PhD Projects**
- Undertaken in years 2-4
- Co-supervised by ACCIS and collaborator(s)
- Academic collaborations:
  - UoB Depts/Schools (Aerospace, Biological Sciences, Chemistry, Electrical & Electronic, Eng. Mathematics, Mathematics, Mechanical, Oral & Dental, Physics)
  - Bath, Cardiff, Imperial, Cambridge, Manchester, Nottingham, Rome La Sapienza, Southampton
- Funding awards made by industry in support of projects:
  - AgustaWestland, Airbus, dstl, Embraer, EOARD, Formula One Company, GE-Aviation, Haydale, Permali, Rolls-Royce, RNLI, Vestas
- Next project call: **Sept/Oct 2016**
- International placement scheme
  - Photo: Eric Eckstein during his 4 week placement at the NASA Glenn Research Center (May-June 2015)
Public Engagement

- Student led public engagement committee
- **Composite HUB** - spreading knowledge about composite materials to the general public via social media applications such as YouTube and Facebook

Coming soon . . .

- £1450 Faculty funding secured for ambitious plastic recycling project. An all-in-one recycling unit will be developed to turn plastic waste into 3D printed gadgets!
- 8\textsuperscript{th} Annual Skirting Science Day workshop based on the theme "Smart plastics from everyday life"
Achievements

• Publications
  - 72 journal papers (see delegate pack for a full list)
  - 28 different journals, including the leading composite journals: Composite Structures, Composites Part A: Applied Science and Manufacturing, and Smart Materials and Structures

• Conference participation
  - 167 conference presentations delivered at major national and international conferences in 19 different countries
  - Recent and upcoming conferences:
    ➢ Smart Structures/NDE 2016 (SPIE 2016), March 2016
    ➢ Mach Conference 2016, April 2016
    ➢ SAMPE Long Beach 2016, May 2016
    ➢ 10th World Biomaterials Congress (WBC 2016), May 2016
    ➢ 17th European Conference on Composite Materials (ECCM17), June 2016
Achievements

• Awards
  – Brodie Coburn, Rainer Groh and Simon White were awarded Faculty of Engineering Commendations for their doctoral theses

• Other
  – As finalists in the 2015 Western Aerospace Competition Laura Edwards and Rafael Luterbacher were treated to a day to remember with the Red Arrows
  – Robin Neville was a finalist in the 2015 BDC/Bristol SU Postgraduate Network 3 Minute Thesis Competition
  – Evangelos Zympeloudis won the local WEMMA heat of the IOM3 2016 Young Persons’ Lecture Competition
  – Guillaume Francois won a full scholarship to attend the 2015 International Graduate Summer School at Beihang University (BUAA), China
Achievements

− Jamie Hartley completed a two month secondment (Oct-Nov 2015) at TNO Netherlands working on an innovative study for using composites in the impact protection of vehicles
− Bassam El Said secured £22,000 EPSRC Impact Acceleration funding for his multi-scale modelling software package
− Tom Llewellyn-Jones has developed a new 3D printing technique . . .

**New 3D printing technique**

- First demonstration of 3D printing of composite materials
- Ultrasonic waves produce a pattern of microscopic glass fibres which give the component increased strength
- It will enable a much greater range of things to be 3D printed at home and at low-cost

“We have demonstrated that our ultrasonic system can be added cheaply to an off-the-shelf 3D printer, which then turns it into a composite printer” (Tom Llewellyn-Jones)