7th Annual Conference
EPSRC CDT in Advanced Composites for Innovation and Science (ACCIS CDT)

bristol.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 Bristol Composites Institute (ACCIS)
- Funded by EPSRC, University and industrial partners
- Significant industrial support
- National and international academic collaborations
- Memorandum of Understanding with the National Institute of Aerospace
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)

- 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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<td>CDT Chair</td>
<td>Prof. Michael Wisnom</td>
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<td>CDT Director</td>
<td>Prof. Paul Weaver</td>
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<td>Deputy Director and Research Co-ordinator</td>
<td>Dr Ian Hamerton</td>
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<td>Head of School</td>
<td>Prof. Ian Bond</td>
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<td>Teaching Co-ordinator</td>
<td>Dr Ian Farrow</td>
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<td>CDT Lecturer</td>
<td>Dr Dmitry Ivanov</td>
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<td>Dr Alberto Pirrera</td>
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<td>Dr Valeska Ting</td>
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<td>ACCIS Project Manager</td>
<td>Mrs Katie Drury</td>
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<td>CDT Manager</td>
<td>Ms Sarah Hallworth</td>
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<td>PG Administrator</td>
<td>Mrs Kathinka Watts</td>
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Our Students

- 109 PhD students since 2009
- 18% female
- Currently recruiting for last intake under current CDT grant – Sept 2018 start
- 43 graduates; 9 in February 2018
- Recent destinations: NCC, Royal DSM, Ultrahaptics, University of Bath, University of Bristol, Zodiac Seats UK

Our 2017 entry cohort

- 10 students
- Funded by EPSRC, industry, NPIF, UoB, and external scholarships
- UK & international (India, Italy, Mexico, Romania, Pakistan)
- Engineering (aerospace, civil, materials, mechanical) and chemistry backgrounds
Innovative Teaching

2017 short courses

- Chauncey Wu - NASA Langley Research Center
  Systems, systems engineering and aerospace design
- Darren Hartl - Texas A&M University
  Behaviour of active materials and fundamentals of macroscopic phenomenological modelling from the perspective of continuum thermodynamics

Design Build & Test

- Team project
- Hands-on experience
- 2018 = UAV box-spar demonstrator

- Materials testing
- Refined design
- Manufacturing trials
- Final structural test

- Knowledge sharing
- Skill development
- Documented on film

Watch on YouTube

The DBT project continues to distinguish itself in engaging students and providing learning outcomes which one student referred to as 'the worthiest of them all'. Over the years the comments I have received from students during interview have been consistent in their praise. (Prof. Brian Falzon, External Examiner)
Industrial Seminar Series

• Entirely student run – speaker selection, organisation (advertising, logistics, catering) & hosting
• Develops communication, organisational and networking skills
• Valuable insight into changing needs of the composites community

Dr Steffen Czichon
Fraunhofer IWES
Lightweight Construction vs. Design to Cost: Challenges for stress engineers from an industrial perspective

Dr Broderick Coburn
McLaren Applied Technologies
Introduction to MAT and two case studies: collaboration with a luxury Swiss watch manufacturer and a personalised protection system for a billionaire

Dr Andrew Norton
Renuables
Life Cycle Assessment - The basis of a carbon footprint and how they can be applied to the composites world
International Placements

• One week to three months
• World-leading academic, industrial and research organisations
• Students bid for funding – proposal and presentation
• Voting panel of staff and students

Recently completed placements

- ONERA (Office National d’Etudes et Recherches Aérospatiales), France
- Ningbo Institute of Materials Technology & Engineering, Chinese Academy of Sciences, China
- Universität Bayreuth, Germany
- University of Illinois at Urbana-Champaign, USA

Upcoming

- N12 Technologies, Boston, USA
Industry Sponsored CDT Prizes

- Hexcel: Best extended research project (XP)
  
  * Winner:*
  Noémie Fedon

- Victrex: Best journal paper
  
  * Winner:*
  Jamie Hartley

- ORE Catapult: Best taught mark
  
  * Winner:*
  Chris Hunt

- Imetrum: Best DBT team performance
  
  * Winner:*
  Team Athena
Other Collaboration Opportunities

Six-month Extended Research Projects (XPs)

- Undertaken in the first year (June to December 2018)
- Can develop into a PhD project
- Fully-funded by the ACCIS CDT

PhD Projects

- Undertaken in years 2-4 (1st January 2019 – 17th September 2021)
- Next project call: Sept/Oct 2018

Talks, site visits, research showcase, hack-a-thons

  E.g. December 2017 site visit to RNLI All Weather Lifeboat Centre and RNLI HQ

Input into taught component (literature review topic)
Achievements

- 108 journal papers
- 44 different journals
- 229 contributions to major national and international conferences
- 20 different countries

Recent conferences

- 32nd American Society for Composites Technical Conference
- 28th International Conference on Adaptive Structures and Technologies
- 9th World Congress of Biomimetics, Artificial Muscles and Nano-Bio
- 6th ECCOMAS Thematic Conference on the Mechanical Response of Composites
- ASME 2017 Conference on Smart Materials, Adaptive Structures and Intelligent Systems
Achievements Cont . . .

- Finalist in 2018 IMechE Western Aerospace Centre prize *(to be held 23rd April)* - Andres Rivero
- Semi-finalists in 2018 Three Minute Thesis Competition *(to be held 18th April)* - Steven Grey & Andres Rivero
- Finalists in 2018 JEC World Composite Challenge - Xun Wu & Evangelos Zympeloudis
- Top 100 read chemistry paper in *Scientific Reports* in 2017 - Michael Dicker
- Journal paper featured in *Nanotechnology* Highlights of 2017 - Mat Tolladay
- Won the 2017 Institute of Materials Students' Seminar - Evangelos Zympeloudis
- Faculty thesis commendations - Michael Dicker & Mark Hazzard

Outreach

- Rocket building day at City Academy, Bristol
- Talk at former 6th form about life as an engineering student
- 6th form Extended Project Qualification mentor
- Panel member for Women in Engineering event
- Stand at St Werburgh’s Primary Careers day
- Participation in:
  - “Sea”gulls to Drones outreach events at local schools
  - My Future My Choice outreach events at local schools
Spotlight on Alumni – Rainer Groh

- MEng Mechanical Engineering (Bath)
- PhD thesis awarded January 2016
  "Non-classical effects in straight-fibre and tow-steered composite beams and plates"

University of Bristol

Research Associate 2016 to 2018
Nonlinear structures / Lightweight design and optimisation of thin-walled structures by elastic tailoring / Computing accurate 3D stress fields from numerically efficient computational models to predict damage onset in composite structures

Research Fellow 2018 to present
Awarded prestigious 5 year Royal Academy of Engineering Fellowship (£451,202) - "Robust computational methods and design paradigms for spatially chaotic structures"

- Co-supervising 3 PhDs, including 2 CDT students
- NASA Langley visiting researcher in 2015 & 2016
- aerospaceengineeringblog.com - 15,000 visitors/mth

Awards:
- Clean Sky Best PhD Award 2018
- ICCS17 Ian Marshall's Award
- Collier Research HyperSizer/AIAA Structures Best Paper Award 2015
Spotlight on Alumni – Joe Mills-Brown

- MEng Materials Engineering (Loughborough)
- PhD thesis awarded September 2013
  “High temperature composite materials and structures”
- CEng with IMechE – July 2017

Sahara Force India F1
Senior Stress Engineer 2013 to 2016
- Responsible for the analysis of all parts critical to the performance and reliability of the car
- Duties included analysis of both composite and metallic components and assemblies using a range of techniques from hand calculations to FEA

Mercedes AMG High Performance Powertrains
Lead Composite Structural Engineer 2016 to present
- Responsible for all structural composite components used in the F1 power unit
- Duties include design, analysis, sign-off and monitoring of composite components throughout their life
- Day-to-day activities include detailed design and analysis of components, material selection, failure and data analysis, creating and checking technical drawings