SPOTLIGHT on Bristol Composites Institute (ACCIS)
Bristol Composites Institute (ACCIS) was established in 2017, building on the expertise and 10-year track record of the Advanced Composites Collaboration for Innovation and Science. We aspire to be a world-leading institute for composites research and education, combining cutting-edge fundamental science with strong industrial links for exploitation and technology transfer.

We are delighted to welcome Ole Thomsen as NCC Professor of Composites Design and Manufacture, a joint appointment to strengthen the links between Bristol Composites Institute and the NCC. He leads the composites manufacturing and design activities here and Bristol’s contribution to the EPSRC Future Manufacturing Research Hub. We also warmly welcome Janice Barton as Professor of Experimental Mechanics, and Deputy Director of the EPSRC Industrial Doctorate Centre in Composites Manufacture.

In September the first cohort started of the new EPSRC Centre for Doctoral Training in Composites Science, Engineering and Manufacturing, led by Professor Steve Eichhorn. This builds on the two previous ACCIS CDTs, bringing to over 130 the number of PhD students on the programmes, a substantial contribution to the national need for highly skilled researchers in the field of composites.

This brochure highlights some of our many exciting research activities and we welcome the opportunity to discuss them with you.

Professor Michael Wisnom
Director of Bristol Composites Institute

Q: Professor, what are you most proud of at Bristol Composites Institute?
A: What we are really proud of here in Bristol are our people. We work closely with our industrial partners to learn about their current and future needs, and then build these into our research and teaching to prepare the next generation of engineers for their work-related challenges. We also invest in soft skills that will help them build a successful and balanced career.

Q: Could you highlight one particular example?
A: Matthew Thomas’ case is a fantastic example of collaboration with industry, personal development and knowledge transfer. Matt was a PhD student in the ACCIS Centre for Doctoral Training, supported by Rolls-Royce who did his project on Variable Angled Tow Laminates for Fan Blade Elastic Tailoring. This focused on advanced numerical optimisation techniques for novel curved fibre path composite plies, to take advantage of the mechanical performance benefits that this could bring. After finishing his PhD, Matt continued developing his numerical optimisation techniques as a Research Associate in ACCIS, funded by an EPSRC Impact Acceleration Award. The software tools that Matt’s IAA project developed aimed to close the gap between fan blade design and manufacturing constraints. This work was done in close collaboration with Rolls-Royce where his talent was recognised, helping Matt land a job in Rolls-Royce.

Q: What are the industrial partners gaining from such a collaboration?
A: Supporting a PhD student within ACCIS means that they can be closely involved in setting up a project and have access to both cutting edge research and the brightest minds. The University liaises with the company’s legal teams to set up the right framework for the collaboration and the PhD student focuses on that particular project. A PhD project such as Matt’s can bring new ideas and technology to a product or process, or help scale up early stage technology to show how it can be applied in new areas.

Q: This all sounds great for the industry and Matt but how does ACCIS benefit from this knowledge transfer?
A: Our goal is generation of new knowledge and impact for the academic, industrial and wider communities. We are also preparing our talented graduates for starting their own career and we have to let them go. So by these measures of success, there has already been great benefit to ACCIS from Matt’s project. Also, the work that Matt started has many aspects that need further exploration, this will feed into new projects that other researchers will carry forward. Another benefit is that we have closer contacts with the companies we work with, both through the project work and now in Matt’s case, as a new, but familiar face at Rolls-Royce. Having our alumni out in our partner companies means they can act as ambassadors and points of contact, knowing what our strengths and capabilities are, thus facilitating even stronger collaborations in the future.
The Materials team brings together academics with interdisciplinary backgrounds enabling us to approach challenges from different angles and come up with extraordinary solutions. We research advanced composites for extreme engineering environments and various multifunctional smart materials.

Our research areas

- High performance polymers
- Multifunctional smart materials
- Nanoporous materials
- Energy materials
- Innovative multi-materials manufacturing
- Materials variability in processing
- Lignocellulosic materials and natural fibres
- Cellulose nanomaterials
- Auxetics
- Self-healing materials

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Our Team

We develop novel generations of composites with a broad range of multiscale reinforcements, from nanostructures to carbon and natural fibres, involving design, modelling, manufacturing and testing.
The ACCIS Structures team combines data-rich experimentation with novel numerical methods development and application to study the mechanical performance of composite structures. An understanding of the driving physical phenomena helps us build and validate models to predict the characteristics of composite structures. This research is deployed in a range of activities from blue sky projects to industrial applications.

Our research areas

- Numerical and multi-scale modelling
- Textile composites
- Structural optimisation
- Elastic tailoring
- Effects of defects and features
- Through-thickness reinforcement
- Fatigue
- Ductility in composites
- Morphing and nonlinear structures

Our research into the mechanical performance of composites encompasses novel numerical methods, novel structural configurations, advanced analysis techniques, multi-functionality and data rich experimentation.
Work with us

work-with-accis@bristol.ac.uk
+44(0)117 331 5311
www.bristol.ac.uk/composites/workwithus

Extend your R&D

Collaborative research – new funding opportunities

Use our lab facilities

Impact acceleration projects

Patenting/licensing

Spin-outs

Knowledge Transfer Partnerships

Secondments and placements

Tap into the academic expertise

Propose Masters and undergraduate student projects

Summer internships

Fund a PhD student working on your dedicated project

Engage with our Doctoral training centres

Tap into the academic expertise
The Manufacturing and Design team focuses on developing the means to turn ideas into hardware through efficient design and manufacturing practices. We build an in-depth understanding of current processes and develop novel and innovative manufacturing approaches, to deliver improvements in cost, quality and functionality across a range of industries.

Our research areas

- Process automation – automated fibre placement
- Robotics and cobotics
- Continuous tow shearing
- Graded multi-matrix composites
- Defects in composites manufacturing
- Understanding lay-up processes
- Design for manufacture
- Supporting manufacturing via Virtual and Augmented Reality tools
- Composites recycling
- Numerical modelling of manufacturing processes
- Manufacturing of functional composites
- Closed-loop process control

Our Team

- **Professor Ole Thomsen**
  NCC Professor of Composites Design and Manufacture,
  Head of Manufacturing and Design
  Modelling and design of lightweight composite structures, experimental characterisation and validation of composite materials and structures

- **Professor Ivana Partridge**
  Professor of Composites Processing,
  Director of Industrial Doctorates Centre in Composite Manufacturing
  Polymer composites, processing for high performance

- **Dr Ian Farrow**
  Senior Lecturer in Composites Manufacturing
  Acoustic emission monitoring, damage thresholds, fatigue damage accumulation processes

- **Dr Dmitry Ivanov**
  Senior Lecturer in Composites Manufacturing
  Multi-scale analysis, damage mechanics, textile composites, mechanics of prepregs, liquid moulding, additive manufacturing, innovative manufacturing

- **Dr Paul Harper**
  Teaching Fellow
  Design and analysis of composite structures, renewable energy systems

- **Dr B.C. Eric Kim**
  Lecturer in Composites Design, Processing & Manufacture
  Design & manufacturing, automated processes, astatic design, computer aided design, bonded joints, tribology

- **Dr Carwyn Ward**
  Lecturer in Composites Design, Processing & Manufacture
  Manufacturing technology, automated processes, factory processes/operations, process optimisation, costs, recycling, assembly and repair

Our research centres around Design for Manufacture, from novel material forms that facilitate forming, through detailed process understanding and novel machines to factory operations.
Composites University Technology Centre

The Composites University Technology Centre (UTC) at the University of Bristol was established in 2007, supported by Rolls-Royce to advance composite materials technology and to support their insertion into components, structures and systems. The centre conducts research in a wide range of composites related areas such as through-thickness reinforcement, defects and features, vibration and fatigue, novel structures and materials, woven textiles and composites manufacturing.

www.bristol.ac.uk/composites/collaboration/utc

Wind Blade Research Hub

The Wind Blade Research Hub is a five-year research partnership between the Offshore Renewable Energy Catapult and the University of Bristol looking into developing larger and more powerful wind turbines than ever before. The Hub is investigating blade materials and manufacturing technology, blade integrity, blade design and performance.

www.ore.catapult.org.uk/work-with-us/our-collaborations/wind-blade-research-hub

National Composites Centre

The National Composites Centre opened in 2011 and is hosted by the University of Bristol. It is an independent, open-access national centre translating world-renowned innovation into manufacturing excellence. The centre brings together dynamic companies and world-class academics to develop new technologies for the design and rapid manufacture of high-quality composite products.

www.nccuk.com

Future Composites Manufacturing Hub

The Future Composites Manufacturing Hub is an EPSRC-funded collaboration led by the Universities of Nottingham and Bristol and also involves a number of other universities as spokes. The Hub aims to increase the potential of composite materials manufacturing within the UK by revolutionising performance and expanding applications into new markets. The Hub also provides training for the next generation of engineers in composites manufacturing.

www.cimcomp.ac.uk
We are proud of the following publications:

**Materials & Design, 163.**


**Dr B.C. Eric Kim**

**Dr Dmitry Ivanov**

**Dr Grey, S., Scarpa, F., & Schenk, M. (2019). Strain Reversal in Actuated Origami Interfaces, 5.**

**Dr Benjamin Woods**


**Dr Carwyn Ward**

**Dr Michael Wisnom**

**Dr Janice Barton**


**Dr G. F. Sanderson, A. H. M. Al-Bender, and M. S. Albakry.**

**Dr Dmitry Ivanov**

**Dr B.C. Eric Kim**

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