



# Advanced Composites in Construction 2015

## Programme

With special thanks to



## Who is NetComposites?

NetComposites was established in 2000 in Chesterfield in the UK, initially as a news and information portal for the composites industry. Since then, the company has grown year-on-year; its activities broadening to include applied research and development, conferencing and training.

Today, NetComposites remains a privately-owned company with around 25 staff (including 8 PhDs) and a well equipped development centre.

NetComposites also has a sister company, Composites Evolution, that sells the materials developed by NetComposites. Composites Evolution's current products include the Biotex range of natural fibre reinforcements, and Ecopreg bio-based prepregs.

## Venue

ACIC 2015 will be hosted by St John's College, Cambridge and the conference will take place in the beautiful, newly refurbished Divinity School. St John's College is one of the oldest and largest colleges in Cambridge. Famous alumni include business and political leaders, as well as renowned scientists and artists.



## Conference Dinner

The conference dinner will take place in St John's College Hall, St John's College, Cambridge on 10th September. Arrival from 19:30, seats are to be taken by 20:00.

With limited places remaining, last bookings will be taken at lunch on 9th September. The 3 course meal can be booked for just £40.

### Jambon Perseille

a French style terrine served with warm toasted brioche, okra and tomato tabbouleh and creamed garden peas and mint

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### Roast Rack of Suffolk Lamb

served with spiced tomato chutney, summer squash and black olives and a Robert sauce

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### Black Sesame Bavaois

with strawberry compote and black sesame meringue

\*Vegetarian option is also available.



# Programme

Day 1	
09:00	<b>Registration and Networking</b>
09:45	<b>Welcome and Introduction</b> Cambridge University
10:00	<b>A.M. Sessions Chaired by Dr Janet Lees, University of Cambridge</b> <b>Keynote: The Future of Construction Sector Composites Research and Usage in the Post-NGCC Era</b> Neil Farmer, Executive Director, Tony Gee and Partners
10:30	<b>Session 1: FRP Structures</b> <b>Development of A Resin Infused FRP Road Bridge Deck</b> Lee Canning – Jacobs, Martin Halpin – J Murphy
10:50	<b>Elastic Gridshells in Composite Materials</b> O. Baverel, J.F. Caron, C. Douthe, L. Du Peloux, F. Tayeb – Université Paris-Est, Laboratoire Navier
11:10	<b>Continuous Monitoring and Lorry Testing of the Frampton Cotterell FRP Road Bridge</b> Wendel Sebastian, Joel Ross – University of Bristol, Mike Johnson, Shaun Wilson – South Gloucestershire Council, Craig Twyman, James Henderson – Atkins Global
11:30	<b>Break</b>
12:00	<b>Session 2: Material Properties and Natural Materials</b> <b>Probabilistic Structural Analysis of Composite Structure Using a Stochastic Multi-scale Finite Element Method</b> Xiao-Yi Zhou, Peter D. Gosling – Newcastle University
12:20	<b>CFRP Fabrics as Internal Reinforcement in Concrete Beams</b> Mithila Achintha, Fikri Alami, Alan Bloodworth – University of Southampton
12:40	<b>Natural Fibre Composites: Engineered Bamboo for Construction</b> Bhavna Sharma, Ana Gatóo, Michael Ramage – University of Cambridge
13:00	<b>Experimental Study on the Shear Behaviour of RC Beams Reinforced by Natural Composite Materials (Linen Fibres)</b> M.D.Ngo, Emmanuel Ferrier and L. Michel – Université Claude Bernard Lyon
13:20	<b>Lunch</b>
14:20	<b>P.M. Sessions Chaired by Dr Antony Darby, University of Bath</b> <b>Session 3: FRP Reinforcement or Prestressing</b> <b>Bending Creep Behaviour of CFRP Prestressed Slender Concrete Elements</b> Tobias Dominik Lämmlein, Giovanni Pietro Terrasi – Swiss Federal Institute of Technology
14:40	<b>The Flexural Behaviour of SCC Beams Pre-stressed with BFRP</b> Philip Crossett, S. Taylor, D. Robinson, M. Sonebi, E. Garcia-Taengua – Queen's University Belfast

15:00	<b>GFRP Hollow-Core Bars as Internal Reinforcement for Concrete Slabs</b> Guillermo Claire, Francisco De Caso y Basalo, Antonio Nanni – University of Miami. Presented by Antony Darby
15:20	<b>Basalt Fibre Reinforced Polymer Rods for Glued Connections in Low Grade Timber</b> Caoimhe O'Neill, Dr D. McPolin, Prof. Su Taylor – Queen's University Belfast
15:40	<b>Break</b>
16:10	<b>Panel Discussion – Challenges for FRP Composites in New Construction</b> Chair: Mark Hobbs – Premier Composite Technologies Panel: Neil Farmer – Tony Gee and Partners, Kent Harries – University of Pittsburgh, Emma McIntyre – University of Edinburgh
17:00-19:00	<b>Drinks Reception</b>

Day 2	
09:00	<b>Registration and Networking</b>
09:30	<b>A.M. Sessions Chaired by Professor Su Taylor, Queen's University Belfast</b> <b>Session 4: Durability/Elevated Temperature</b> <b>Accelerated Testing of the Long-term Shear/Bending Behaviour of GFRP Bars</b> Lars Cusnick, Matthias Pahn – Technical University of Kaiserslautern
09:50	<b>Elevated Temperature Performance of Concrete Beams Reinforced with FRP Bars</b> Emma R.E. McIntyre, Luke A. Bisby, Tim J. Stratford – University of Edinburgh
10:10	<b>Post-Fire Residual Strength of GFRP Reinforced Concrete Slabs</b> Guillermo Claire, Francisco De Caso y Basalo, Antonio Nanni – University of Miami. Presented by Pierluigi Colombi
10:30	<b>Characterisation of Pultruded Fibre Reinforced Polymers</b> Behrouz Zafari, J. Toby Mottram – University of Warwick
10:50	<b>Effects of Hygrothermal Aging on Pultruded Glass Fibre Reinforced Polymers: A Complimentary Study</b> Sotirios A. Grammatikos, Mark Evernden, Richard J. Ball – University of Bath
11:10	<b>Break</b>
11:40	<b>Session 5: Strengthening of Reinforced Concrete (Part 1)</b> <b>Experimental Study of Moment Redistribution in Reinforced Concrete Slabs Strengthened with CFRP Sheets</b> A. Tajaddini, T.J. Ibell, A.P. Darby, M. Evernden – University of Bath

# Programme

12:00	<b>Experimental Study on Bond-Slip Behaviour Between CFRP Sheets and Lightweight Concrete</b> <u>Mustafa Hameed Al-Allaf</u> , Laurence Weekes, Levingshan Augustus-Nelson – University of Salford
12:20	<b>Fatigue and Flexural Behaviour of Reinforced Concrete Beams Strengthened with Fibre Reinforced Cementitious Matrix</b> Zena R. Aljazaeri, <u>Dr. John J. Myers</u> – Missouri University of Science and Technology
12:40	<b>Literature Review on Reinforced Concrete Members Strengthened with FRP at Room and Elevated Temperature</b> <u>Alessandro Proia</u> , Stijn Matthys – Ghent University
13:00	<b>Lunch</b>
14:00	<b>P.M. Sessions Chaired by Professor J. Toby Mottram, University of Warwick</b> <b>Session 6: Confinement and Prestressed Systems</b> <b>Numerical Modelling of CFRP Shear-Strengthened Prestressed Concrete Beams</b> <u>Michael Qapo</u> , Samir Dirar, Jian Yang, Mohammed Elshafie – University of Birmingham
14:20	<b>Time-Dependent Load-Sharing in RC Beams Strengthened with CFRP Straps</b> <u>Feifei Jin</u> , Janet M. Lees – University of Cambridge
14:40	<b>Lateral-to-Axial Strain Relation of Confined Concrete</b> <u>C.X. Dong</u> , A.K.H. Kwan – University of Hong Kong
15:00	<b>Design Formula for the Flexural Strengthening of RC Beams using Prestressed NSM CFRP Reinforcement</b> Mohammadali Rezazadeh, <u>Joaquim Barros</u> – University of Minho
15:20	<b>Break</b>
15:40	<b>Session 7: Strengthening of Masonry or Steel (Part 1)</b> <b>Fabric Reinforced Cementitious Matrix (FRCM) Systems for Strengthening of Masonry Elements Subjected to Out-of-Plane Loads</b> Francesca Giulia Carozzi, <u>Pierluigi Colombi</u> , Carlo Poggi – Politecnico di Milano
16:00	<b>Fatigue Crack Growth in Cracked Steel Beams Strengthened Using CFRP Strip</b> <u>Pierluigi Colombi</u> and Giulia Fava – Politecnico di Milano
16:20	<b>Panel Discussion – Opportunities and Challenges for Strengthening Applications</b> Chair: Mithila Achintha – University of Southampton Panel: James Henderson – Atkins Global, John Myers – Missouri University of Science and Technology, Mark Evernden – University of Bath, Robert Foster – University of Cambridge
17:00	<b>Networking and Close</b>
19:30	<b>Conference Dinner</b>

<b>Day 3</b>	
09:00	<b>Registration and Networking</b>
09:30	<b>Sessions Chaired by Dr Joe Carruthers, NetComposites</b> <b>Keynote: Recent Projects and GFRP Market Challenges</b> Jan Pasfall, Vice President, Fiberline Composites
10:00	<b>Session 8: Strengthening of Masonry or Steel (Part 2)</b> <b>Out-of-Plane Strengthening of Reinforced Masonry Walls using Near-Surface Mounted (NSM) FRP Bars with Epoxy and Cementitious Materials</b> Zuhair Al-Jabari, <u>Dr. John J. Myers</u> , Dr. Mohamed ElGawady – Missouri University of Science and Technology
10:20	<b>Buckling Strength of Slender Steel Plates Stiffened with Preformed Corrugated FRP Panels</b> Zaid Al-Azzawi, <u>Tim Stratford</u> , Michael Rotter, Luke Bisby – University of Edinburgh
10:40	<b>Session 9: Strengthening of Reinforced Concrete (Part 2)</b> <b>An Experimental Investigation into the Effect of Externally Bonded CFRP Fabrics on the Shear Behaviour of Reinforced Concrete T-Beams</b> <u>Robert M Foster</u> – University of Cambridge
11:00	<b>Shear Strengthening of Exterior Beam-Column Joints Using Embedded Carbon Fibre Reinforcement Polymer Bars</b> <u>Ridwan Abdul Rahman</u> , Samir Dirar, Yaser Jemaa, Jian Yang, Mohammed Elshafie – University of Birmingham
11:20	<b>Break</b>
11:40	<b>Session 10: FRP Structures and Joints</b> <b>River Chor Aqueduct Reconstruction</b> <u>Lee Canning</u> – Jacobs, Martin Halpin – J Murphy
12:00	<b>Open Hole Tension Capacity of Pultruded GFRP Plate Having Staggered Hole Arrangement</b> <u>Kent A. Harries</u> , Donald Cunningham – University of Pittsburgh
12:20	<b>Fatigue Durability of GFRP T-Joints for Wave Energy Devices</b> <u>Joel Ross</u> and Wendel Sebastian – University of Bristol
12:40	<b>Lunch</b>
14:00	<b>Close</b>

# Scientific Committee

The following people make up the 2015 Advanced Composites in Construction Scientific Committee, led by Dr. Janet Lees University of Cambridge.

## International Committee

Dr. Giovanni Terrasi,	EMPA
Dr. Stijn Matthys	Ghent University
Prof. Tamon Ueda	Hokkaido University
Prof. Jin-Guang Teng	Hong Kong Polytechnic University
Prof. Renata Kotynia	Lodz University of Technology
Dr. Anders Carolin	Lulea University of Technology
Prof. Bjorn Taljsten	Lulea University of Technology
Dr. John Myers	Missouri University of Science & Technology
Prof. Sami Rizkalla	North Carolina State University
Prof. Charles Bakis	Penn State University
Prof. Mark Green	Queen's University
Prof. Neil Hoult	Queen's University
Prof. Su Taylor	Queen's University
Dr. Andre Weber	Schöck Bauteile
Dr. Scott Smith	Southern Cross University
Dr. Laura De Lorenzis	Technische Universität Braunschweig
Dr. Feng Peng	Tsinghua University
Prof. Matthias Pahn	TU Kaiserslautern
Dr. Raafat El-Hacha	University of Calgary
Dr. Chris Burgoyne	University of Cambridge
Dr. Pieter Desnerck	University of Cambridge
Dr. Chris Morley	University of Cambridge
Dr Mauro Overend	University of Cambridge
Prof. Emmanuel Ferrier	Université Lyon
Prof. Tony Nanni	University of Miami
Prof. Joaquim Barros	University of Minho
Prof. Thanasis Triantafillou	University of Patras
Dr. Kent Harries	University of Pittsburgh
Prof. Pierre Labossiere	University of Sherbrooke

## Industry Committee

John Hartley	Exel Composites
Neil Loudon	Highways Agency
Lee Canning	Jacobs

Jim Quinn  
Paul Russell  
Dr. Graham Sims  
David Kendall  
Dr. Mark Hobbs  
Will Duckett  
Sam Luke  
Neil Farmer

James Quinn Associates  
Mapei  
National Physical Laboratory  
Optima Projects  
Premier Composite Technologies  
Ramboll  
SKM  
Tony Gee and Partners

## Academic Committee

Dr. Geoff Turvey	Lancaster University
Dr. David Tann	London South Bank University
Dr. James Broughton	Oxford Brookes University
Dr. Antony Darby	University of Bath
Dr. Mark Evernden	University of Bath
Prof. Tim Ibell	University of Bath
Dr. Wendel Sebastian	University of Bristol
Prof. Luke Bisby	University of Edinburgh
Dr. Tim Stratford	University of Edinburgh
Dr. Maurizio Guadagnini	University of Sheffield
Dr. Mithila Achintha	University of Southampton
Dr. James Blake	University of Southampton
Dr. Alan Bloodworth	University of Southampton
Prof. Ajit Sheno	University of Southampton
Prof. Marios Chryssanthopoulos	University of Surrey
Prof. Toby Mottram	University of Warwick

# Exhibitors

## Premier Composite Technologies

A global supplier and manufacturer of advanced composite components for the architectural design, transportation and boatbuilding markets.

## Com&Sens

Specialists in applying fibre optic sensors to monitor composite structures.

## Composites UK

UK composites industry trade body.





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## Consultancy from

NetComposites is a trusted provider of independent, expert advice in the field of polymer composites.

We offer a full range of specialist services that companies, trade bodies, universities and governments access in order to support the pursuit of their strategic objectives. These services include:

- Market intelligence.
- Material development.
- Process evaluation and development.
- Testing and analysis.
- Part prototyping.
- Design and finite element analysis (FEA).

Contact us today to discuss your consultancy requirements:  
[consultancy@netcomposites.com](mailto:consultancy@netcomposites.com)

## Training from

NetComposites provides modular training courses in both classroom and online formats - each module and course is designed with a specific audience in mind.

Introductory modules are designed for people working within the composites industry in sales, marketing, finance, human resources or administration roles and who need to be conversant with composite materials and their terminology, but who don't necessarily have a technical background.

The more in-depth modules are aimed at engineers and designers requiring a working knowledge of composite materials, their properties and their manufacturing.

Contact us today to discuss your training requirements: [training@netcomposites.com](mailto:training@netcomposites.com)

### Upcoming dates:

**Live Online Training:** Introduction to Nanocomposites - 16th September  
**Classroom Training:** An Introduction to Composites for Commercial Staff - 14th October, An Introduction to Composites for Engineers - 21st October

# Delegates

The following people make up the 2015 Advanced Composites in Construction delegates as of 1st September 2015.

Carlo Pauletto	Acciona Infraestructas
Harry Giblin	Atkins Global
James Henderson	Atkins Global
Mark Evernden	Bath University
Ramiro Gonzalez Mendoza	Carbures
Eli Voet	Com&Sens
Sue Halliwell	Composites UK
Claire Whysall	Composites UK
Suzanne Wood	Construction Composites
Jean-François Caron	Ecole des Ponts ParisTech
Tobias Lämmlein	EMPA
Jan Pasfall	Fiberline Composites
Stijn Matthys	Ghent University
Alessandro Proia	Ghent University
Martin Halpin	J. Murphy & Sons Limited
Lee Canning	Jacobs
David Simmons	Mafic
John Myers	Missouri University of Science and Technology
Nigel Keen	National Composites Centre
Xiaoyi Zhou	Newcastle University
Casper Kruger	Pipex px
Pierluigi Colombi	Politecnico di Milano
Mark Hobbs	Premier Composite Technologies
Des Robinson	Queen's University Belfast
Phillip Crossett	Queen's University Belfast
Su Taylor	Queen's University Belfast
Mithila Achintha	Southampton University
Erik Kostson	Strand7
Lars Cusnick	Technical University Kaiserslautern
Neil Farmer	Tony Gee and Partners
Kaloyana Kostova	Tony Gee and Partners
Lewis Melia	TRB Lightweight Structures
Geert Luyckx	Universiteit Gent
Ngo Minh Duc	Université Lyon
Ferrier Emmanuel	Université Lyon
Antony Darby	University of Bath
Abbas Tajaddini	University of Bath
Ridwan Abdul Rahman	University of Birmingham
Samir Dirar	University of Birmingham
Michael Qapo	University of Birmingham

Andi Saputra  
Joel Ross  
Christopher Morley  
Robert Foster  
Bhavna Sharma  
Luke Bisby  
Emma McIntyre  
Tim Stratford  
Chunxiao Dong  
Joaquim Barros  
Kent Harries  
Mustafa Al-Allaf  
Stuart Moy  
Toby Mottram  
Behrouz Zafari

University of Birmingham  
University of Bristol  
University of Cambridge  
University of Cambridge  
University of Cambridge  
University of Edinburgh  
University of Edinburgh  
University of Edinburgh  
University of Hong Kong  
University of Minho  
University of Pittsburgh  
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COMPOSITES IN  
CONSTRUCTION 2015



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# INC 2015



**24 - 25 November 2015**  
SpOrt Stuttgart, Germany  
[www.industrialnanocomposites.com](http://www.industrialnanocomposites.com)

Exploring the current and future uses of nanocomposites in a variety of applications; defining the challenges being faced in mass production, use, and future innovations.

Hear presentations from Fiat, BAE Systems, Nanocyl, Haydale, Carbodeon, Promolding, Melodea, Imerys Graphite & Carbon, Queen Mary University London, D'Appolonia, Institute of Occupational Medicine, Cambridge Nanomaterials, NCCEF, University of Exeter, KTN UK, BSI and the European Commission.



# Composites Innovation 2016



**22 - 23 June 2016**  
AMRC, Sheffield, UK  
[www.compositesinnovation.com](http://www.compositesinnovation.com)

This conference will explore developments in new and advanced manufacturing processes for products made of composite materials.

Focusing on innovations in the automation of processes for light-weighting and increased composite production rates, this conference is designed to inform and educate visitors on the new ways to process composite materials.



# CompIC ME 2015

**CompIC ME** **9 - 10 February 2016**  
Dubai, UAE  
[www.mecompositesin.construction](http://www.mecompositesin.construction)

CompIC ME will explore and educate delegates on the current and future use of fibre reinforced composites in construction, detailing:

- Innovations and trends in the industry,
- Potential for weight saving on large span structures,
- Economic advantages; whole life cost,
- Architectural freedom and diversity,
- Challenging traditional architectural design.



**COMPOSITES EUROPE**  
22-24 Sept 2015 | Messe Stuttgart  
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[www.composites-europe.com](http://www.composites-europe.com)

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NetComposites would like to thank Dr. Janet Lees of the University of Cambridge for her support in the planning of the 2015 conference.

NetComposites would also like to thank the scientific committee who provided expertise in the peer review of all the papers within the conference proceedings.

Final thanks go to the Bill Brogan and his team at St. John's College, Cambridge for their help in organising ACIC 2015.



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