




# Design for AM in Redistributed Healthcare

# Design for AM in Redistributed Healthcare

This event brings together the research communities from Redistributed Manufacturing in Healthcare and Design for Additive Manufacture to explore the synergies and opportunities for new, exciting research directions and applications that aim to address the future needs of healthcare.

Redistributed manufacture using Additive Manufacture processes offers potential new ways to reach patients but requires a different mindset in product design to deliver products at scale. This event will explore how that mindset can be embedded into the product development process.

# About the DfAM Network

The purpose of the EPSRC Design for AM Network is to connect the wider UK Design for AM academic research community alongside those in industry that are experienced practitioners of additive manufacturing technologies, such that we can benefit from sharing knowledge, developing research themes and working collaboratively to ensure that Design for AM is given the best platform possible.

By bringing together the Design for AM community, the network aims to reach out to the widest possible audience that might benefit from Design for AM research; identify future research directions and facilitate larger and more adventurous research collaborations.
See more information at designforam.ac.uk

# About RiHN

Redistributed Manufacturing (RDM) in healthcare involved moving production closer to the point-of-care, helping clinicians to deliver better outcomes through medical products, technologies and therapies that are available on-demand and tailored to the patient's needs.

The Network seeks to identify, fund and advance high value applications of redistributed manufacturing research that will transform future deployed medical care capability.

See more information at rihn.org.uk

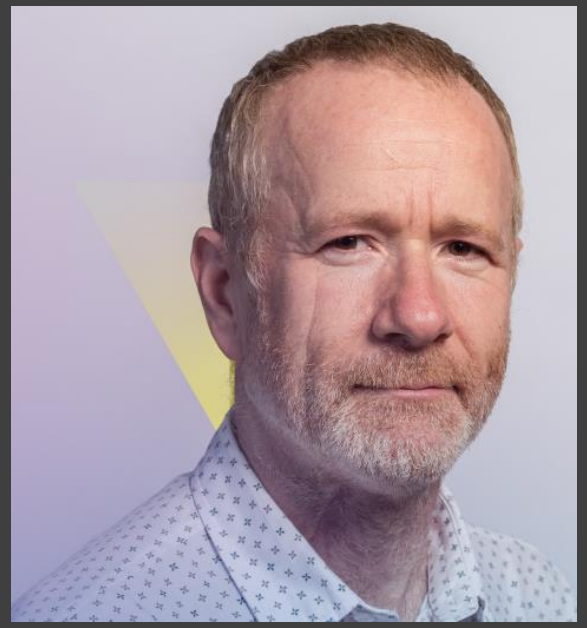
# Agenda Day 1

| Thursday 17th February | |
|---|---|
| 2.00pm | Introductions |
| 2.15pm | Ian Rees, MHRA |
| 2.30pm | Military Medicine |
| 2.45pm | Andrew Lamb “AM in disaster relief’” |
| 3.00pm | Discussion on user needs, opportunities and challenges for DfAM |
| 3.30pm | Dr Simin Li, Loughborough University “Development of a digital design & manufacturing workflow for personalised paediatric prosthetic sockets” |
| 3.45pm | Dr Andy Gleadall, Loughborough University “Additive manufacturing of intricate personalised wound dressings” |
| 4.00pm | Discussion on opportunities and challenges for DfAM |
| 4.20pm | Closing remarks |
| 4.30pm | Close |

# Agenda Day 2

| Friday 18th February | |
|---|---|
| 2.00pm | Introductions |
| 2.10pm | Dr Sheng Qi, University of East Anglia "Additive manufacturing of personalised medicine: Triangle dilemma of quality, cost & speed" |
| 2.25pm | Dr Laura Ruiz Cantu, University of Nottingham “Ultrafast volumetric printing of wound fillings for immediate stabilization of soft tissues" |
| 2.40pm | Discussion on common problems, challenges for DfAM |
| 3.10pm | Dr Jari Pallari, Taika3D "Delivering Design Automation for 3DP Foot Orthoses" |
| 3.25pm | Dr Abby Paterson, Loughborough University "Wrist splint design automation software case study " |
| 3.40pm | Dr Connor Myant, Imperial College London "The Mensura Mask Project: mass customisation of respiratory protective equipment during the COVID19 pandemic" |
| 3.55pm | Prof Dominic Eggbeer, PDR International Centre for Design & Research "Lead user design for performance adaptive cycling products" |
| 4.10pm | Discussion on common problems, challenges for DfAM |
| 4.30pm | Closing remarks – Prof Kenny Dalgarno |

# Key Research Theme Leaders



Prof Richard Bibb, Professor of Medical Applications of Design

Loughborough University

Prof Kenny Dalgarno, Sir James Woodeson Professor of Manufacturing Engineering

Newcastle University

# Presenters

## Prof Wendy Phillips – RiHN

***"The Redistributed Manufacturing in Healthcare Network – RiHN"***

- An introduction to RiHN
- Overview of RiHN programme
- Redistributed Manufacturing in Deployed Operations

**Biography:**

Wendy Phillips is Professor of Innovation at Bristol Business School UWE. Wendy has spent over 15 years advancing the disciplines of innovation studies and supply chain management. Prior joining UWE, she worked at the ESRC Centre for Innovation and Competition at the University of Manchester and the Centre for Research in Strategic Purchasing and Supply (CRiSPS) at the University of Bath, School of Management. Wendy's research impacts policy and practice in procurement in complex public sector supply networks such as the NHS, the Welsh NHS, and UK Higher Education Institutions (HEIs). Wendy currently leads a large scale EPSRC funded collaborative network funded supporting research into redistributed manufacturing (RDM) in healthcare, the RiHN Programme, with a focus on deployed operations.

# Presenters

**Ian Rees – MRHA**

**Biography:**

Ian joined the MHRA as a GMP inspector in 2001, prior to this Ian was a GMP inspector with the Veterinary Medicines Directorate for 2 years and before this worked for a start-up biopharmaceutical firm for 14 years.

In 2004, Ian became an Operations Manager responsible for the team of GMP inspectors based in London, was promoted to Expert GMP Inspector in 2006 then became the Unit Manager Inspectorate Strategy and Innovation managing a team of Expert Inspectors and led the development of the Inspectorate strategy across GXP disciplines.

Between 2008 and 2015, Ian was the MHRA representative on the EMA's GMDP Inspectors Working Group whose focus is the development and maintenance of EU GMP and GDP.

Ian has been part of the MHRA team behind the Innovation Office and the UK cross-regulatory Regulatory Advice Service for Regenerative Medicines. In the current restructuring of MHRA Ian is moving to the Innovation Accelerator section of the Science Research and Innovation Group. Ian currently leads a project developing a new medicines manufacturing framework for point of care products under the Medicines and Medical Devices Act.

# Presenters

## Andrew Lamb – Field Ready

***"AM in Disaster Relief"***

**Biography:**

I work with Field Ready, a humanitarian organisation that has pioneered the application of making in disaster response. I am also a Shuttleworth Fellow focusing on open approaches to Massive Small Manufacturing – the concept of complementing innovative local manufacturing with traditional global manufacturing. I live in London and love Lego.

# Presenters

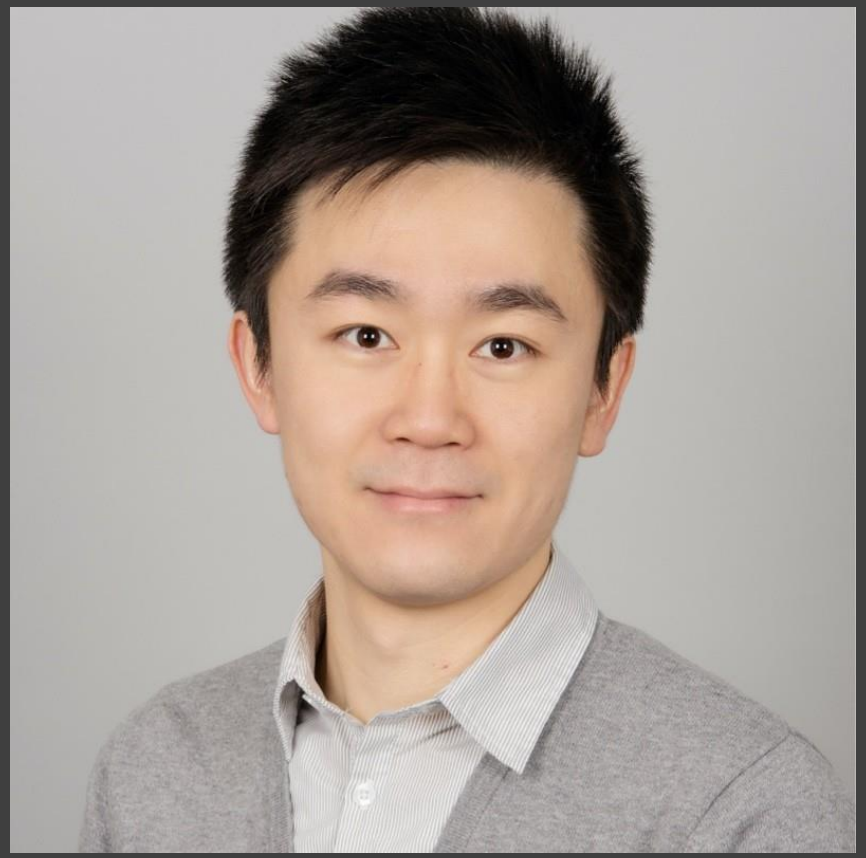
## Dr Simin Li – **Loughborough University**

*“Development of a digital design and manufacturing workflow for personalised paediatric prosthetic sockets”*

- The challenges in prosthetic socket manufacturing
- Our approach toward digital design-to-manufacturing workflow
- The results so far

**Biography:**

Dr Simin Li is senior lecturer in mechanics of biomaterials at Loughborough University, he is expert in mechanical testing and modelling of biomaterials across length-scales. He has developed novel capabilities for multi-scale modelling of damage and fracture in biological tissues. His research covers a broad area of mechanics of biomaterials, including musculoskeletal tissue modelling; characterization of tissue engineered constructs; damage and fracture propagation of bone; wound healing; prosthetic socket design and optimization.



# Presenters

## Dr Andy Gleadall – Loughborough University

*“Additive manufacturing of intricate personalised wound dressings”*

- Challenges and opportunities for additive manufacturing of wound dressings
- Customised additive manufacturing tool paths for new structures
- Additive manufacturing of wound dressings

**Biography:**

Andy has developed expertise and simulation/design capabilities for material extrusion additive manufacturing including:
- VOLCO (a new simulation method for microscale geometry prediction)
- FullControl GCode Designer (software that allows design with incomparably greater control than normal slicer software)
- Models to predict mechanical properties of biodegradable polymers during their degradation lifetime

His research has predominantly focused on biomedical polymers and additive manufacturing, but the understanding and principles translate broadly. His group have developed new fundamental understanding of additive manufacturing mechanical properties by creating a microscale tensile testing specimen. They also have expertise in short fibre reinforcement (fibre orientation), process control/optimisation and precise lattice structures. Andy is keen to collaborate in areas where microscale geometry is important (research applications, filters, scaffolds, fluid mixers, printed electronics, stents, or macroscale concrete, etc.).

# Presenters

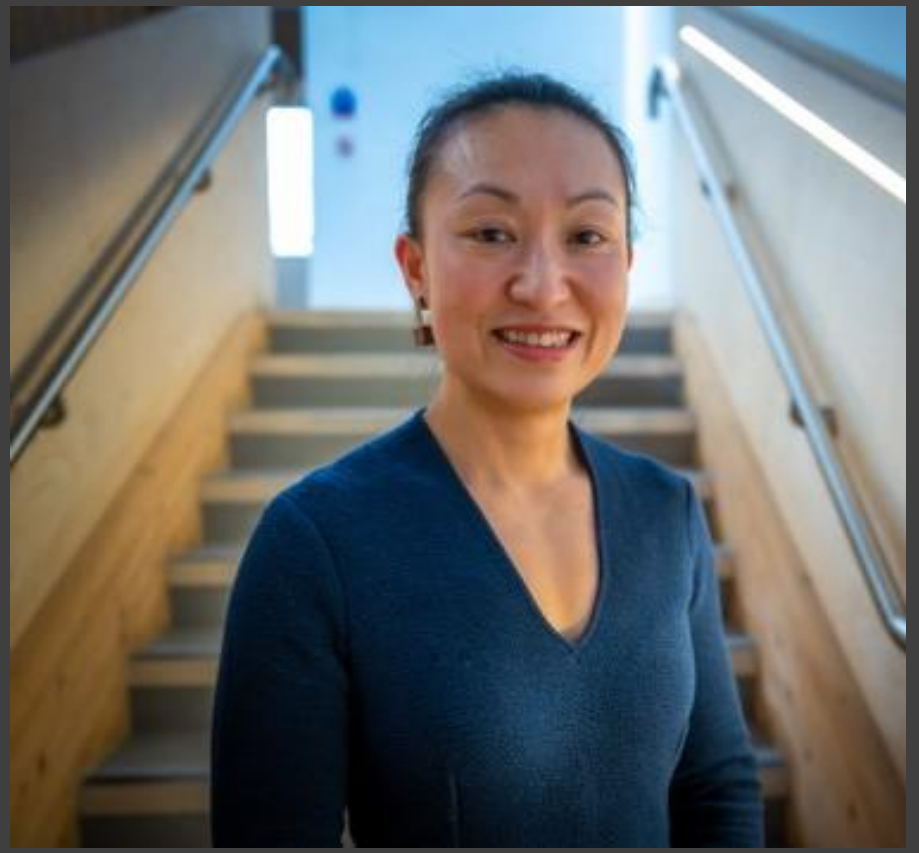
## Dr Sheng Qi – University of East Anglia

*"Additive manufacturing of personalised medicine: Triangle dilemma of quality, cost & speed"*

- Introduction of additive manufacturing used in pharmaceutical industry and the state of art of the development of 3D printing for the manufacturing of personlised medicine
- Highlight the current challenges in design of workflow, supply chain and product to make the point-of-care manufacturing of personlised medicine viable
- Giving demo examples on balancing clinical needs, manufacturing throughput, and product quality.

**Biography:**

Professor of Pharmaceutical Material Science and Technology at the School of Pharmacy of the University of East Anglia. Prof. Qi's lab has great interests in material science and processing, and passion in innovation. She is the winner of 2019 and 2021 UEA Innovation and Impact Awards. By working closely with industrial partners as well as cross-discipline collaborators, her research has contributed to product development and innovations in many industrial sectors, from pharmaceutical, medical device to food, cosmetic, agri-tech and sustainable packaging. Recently through the support of UEA Health and Social Care Partners, she founded Point of Care 3D Printing Research Group to allow the scientists from UEA and other academic collaborators to work closely with clinicians, pharmacists, and patients in Norfolk and Suffolk to identify and develop efficient and cost-effective uses of 3D printing in acute hospital environments.



# Presenters

## Dr Laura Cantu – University of Nottingham

*"Ultrafast volumetric printing of wound fillings for immediate stabilization of soft tissues"*

- Description of ultrafast volumetric printing
- Challenges and opportunities of volumetric printing in battlefield medicine
- Designing and screening materials for printing wound fillings

**Biography:**

Dr Laura Ruiz is a Transitional Assistant Professor at the Centre for Additive Manufacturing. Laura has a Clinical Dental background, expertise in Regenerative Medicine and Additive manufacturing (AM) technologies. Her research is focused on the use of AM technologies for Regenerative Medicine and drug delivery applications. Laura has extensive expertise in several AM technologies including micro extrusion printing, inkjet 3D printing, projection micro stereolithography and most recently volumetric additive manufacturing. Some of her work includes, developing libraries of photocurabe biomaterials for 3D printing subdermal implants, 3D bioprinting cartilage for facial reconstruction, developing methodologies for rapid screening of inks and 3D printing of long-term subdermal implants for chronic diseases. Currently, Laura and her team are working on developing smart photocurable biomaterials for bioprinting vascularised tissues.

# Presenters

## Dr Jari Pallari – Taika3D

*"Delivering Design Automation for 3DP Foot Orthoses"*

- Why design automation is necessary in the orthotics and prosthetics industry?
- How is this done in practice
- 3DP foot orthoses and integrated design opportunities

**Biography:**

Jari has been working on medical applications utilising additive manufacturing since 2003 and has worked in the orthotics and prosthetics industry in four countries from large industry to start-ups. He co-founded Taika 3D in 2018 wher he works as a Research Director. Jari is also a visiting professor of practice at Newcastle University.

# Presenters

## Dr Abby Paterson – Loughborough University

"*Wrist splint design automation software case study*"

- Understanding problems that patients and medical practitioners currently face in the context of bespoke splinting
- Proposing a novel, simplified and automated design workflow for practitioners to adopt new technologies
- Evaluation methods, weaknesses and areas for future development.

**Biography:**

Abby is a Senior Lecturer in Digital Design and Fabrication within the School of Design and Creative Arts at Loughborough University. Her teaching and research interests include the automation of custom digital workflows to help novice users adopt 3D scanning, Computer Aided Design and Additive Manufacture. Her prior work has sought to benefit healthcare professionals as well as product, industrial and vehicle designers/engineers to optimise and improve their design practices for novel, safe solutions to design problems.

# Presenters

**Dr Connor Myant – Imperial College London**

"*The Mensura Mask Project: mass customisation of respiratory protective equipment during the COVID19 pandemic*"

- Developing an automated design-through-manufacture mass customisation pipeline
- Challenges, testing and validation
- Degrees of automation; when do we want a system to be fully automated?

**Biography:**

Connor is a Senior Lecturer (Assistant Professor) and group led in the Advanced Manufacturing Group at the Dyson School of Design Engineering. His general research interests include: Design for Additive Manufacture, Mass Customisation, development of 3D Printing technology and software, and Tribology.
He is currently module leader for Solid Mechanics 2 (Core 2nd yr module), and Design for Additive Manufacture (3rd/4th yr elective) on the Design Engineering Masters Degree.
Prior to starting his lectureship he worked in the ICL Tribology Group, where he held a Junior Research Fellowship studying synovial fluid lubrication of artificial articular joints. He gained his PhD from Imperial College London in 2010 on the development of experimental techniques for investigating lubricated, compliant, bearing contacts and graduated from the University of Exeter in 2006 with a Bachelors (BEng) in Mechanical Engineering.

# Presenters

**Prof Dominic Eggbeer –** PDR International Centre for Design & Research

"*Lead user design for performance adaptive cycling products*"

**Biography:**

Dominic is Professor of Healthcare Applications of Design at PDR, Cardiff Metropolitan University. He has nearly 20 years' experience of Research and Innovation projects that aim to improve design performance within both public and private sector organisations on subjects around custom medical device design, user centred design and advanced manufacturing technologies. His expertise centres on surgical implants, facial prosthetics, dental devices, physical medicine and rehabilitation. He is also Co-Director of Trinity Creative Ltd, a company set up to meet the needs of cyclists with brachial plexus injuries and upper limb difference.

# Contact information

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