



**Aerospace Research Institute,
Northwest Composites Centre & i-Composites Lab**

The University of Manchester

Neha Chandarana

PhD Researcher in NDT/SHM of Composite Materials

The University of Manchester

- ~ £1 billion per annum turnover
(£345 million from research)
- > 40,000 students
- > 11,000 international students
- > 12,000 FTE staff, 22% international

One of the most targeted universities
by the UK's top 100 graduate
employers

Alumni community > 380,000

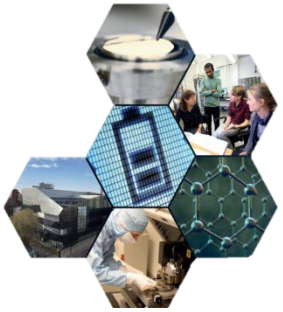
Research and teaching in all major
subjects



World-class research

Research beacons

GLOBAL CHALLENGES
MANCHESTER SOLUTIONS



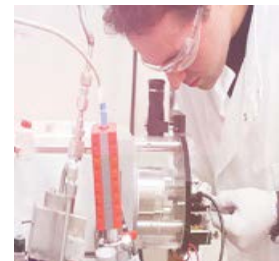
Advanced
materials



Global
inequalities



Cancer

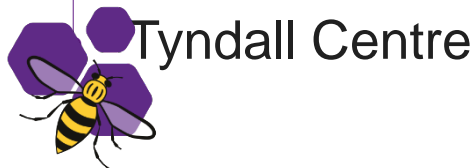


Industrial
biotechnology



Energy

- **Aerospace Research Institute**
- BP International Centre for Advanced Materials (BPICAM)
- Dalton Nuclear Centre
- **Graphene Engineering Innovation Centre**
- Jodrell Bank
- Manchester Institute of Biotechnology (MIB)
- National Graphene Institute
- **Northwest Composites Centre**
- Photon Science Institute (PSI)
- Sir Henry Royce Institute for Advanced Materials





Aerodynamics, fluid dynamics and flow control



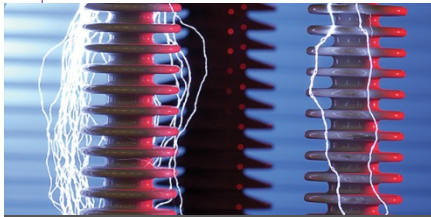
Aerospace light alloys



Aerospace structures

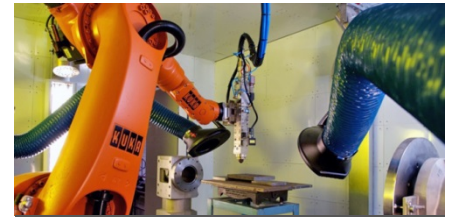


Autonomous systems



Advanced electrical power systems

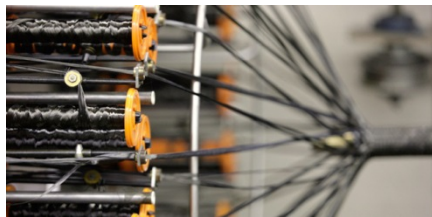
Aerospace Research Themes



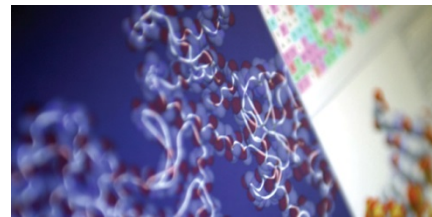
Advanced manufacturing



Aviation security, imaging and non-destructive testing



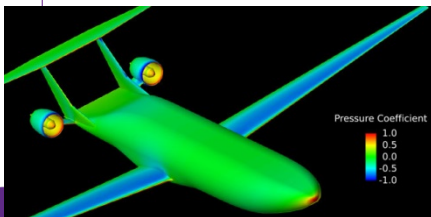
Composites



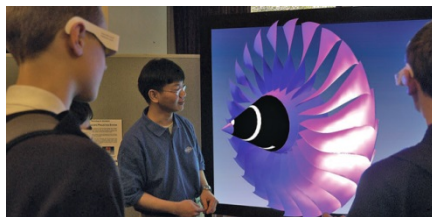
Enterprise



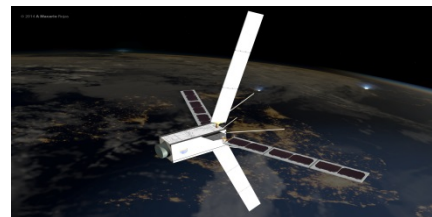
Environmental sciences



Modelling and simulation



Synthetic environments and systems simulation



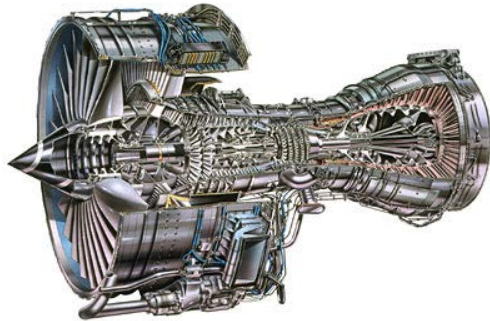
Space



The University of Manchester
Aerospace Research Institute

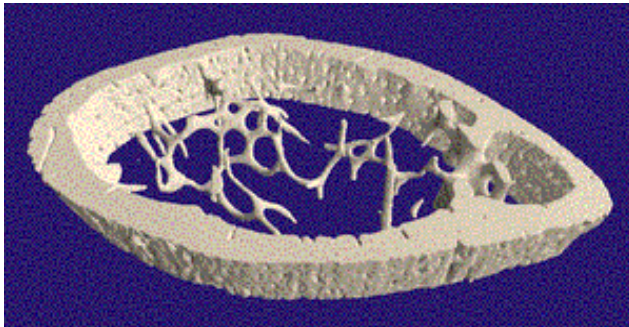
Materials Research

From lightweight alloys and composites for planes, trains, ships and cars...



...to high temperature materials for jet engines and power generation

...to electronic ceramics and polymers



...to biomedical materials for implants and tissue engineering

...to engineered 'smart' textiles and 3D Woven composites

A Materials Powerhouse



Manchester Engineering Campus Development (c.£400m)



Henry Royce Institute (c.£235m)



BP International Centre for Adv Materials (\$100m)



Graphene Engineering Innovation Centre (c.£60m)



National Graphene Institute (c.£60m)

Composites

Focus of the **Northwest Composites Centre** includes low cost, low energy, low cycle time manufacture of composites, Non Destructive Testing of materials, SHM, composite matrix chemistry and damage, design and failure analysis in polymer composites, repairs.

National Composites Certification & Evaluation Facility

- ❑ UKAS Accredited testing laboratory
- ❑ Full range of mechanical and physical testing equipment and non-destructive evaluation facilities



Director: Prof Costas Soutis
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Composites

It is widely accepted within the aerospace industry that the key to achieving target composite materials performance can be found by employing:

- Improved design techniques to optimise structural layout
- Reduced labour intensive and high cost manufacturing techniques

Composites research at The University of Manchester has particular emphasis on:

- Low cost, low energy, low cycle time manufacture of composites
- Non-destructive testing of materials
- Deformation mechanics in composites
- Composite matrix chemistry
- Textile structures for composite materials
- Durability and ageing of composites
- Damage and failure in polymer composites
- Modelling, simulation and structural analysis of damage in laminated composites due to various loading conditions, such as impact, blast and fire
- Micromechanics of composite materials
- Characterisation of composite materials and structures

- £2.1 million Northwest Composites Centre (NWCC) collaboration with Liverpool, Lancaster and Bolton universities
- European Centre of Excellence for Quickstep
- £1.5 million Manchester Seattle Composites Partnership

www.manchester.ac.uk/umari

Industry funds more research at Manchester than anywhere else

MANCHESTER
1824



James Walker



syngenta



Johnson Matthey



green biologics



Neometals

alpha



SHARP



QinetiQ



MorganAM&T

ITM POWER
Energy Storage | Clean Fuel

JFE



bp



WEIR



Waters
THE SCIENCE OF WHAT'S POSSIBLE



TATA STEEL

THALES

SIGMA-ALDRICH



dyson

HMGCC
Her Majesty's Government Communications Centre

orion



AIRBUS
AN EADS COMPANY



SIEMENS



Thomas Swan
Chemical manufacturing since 1926

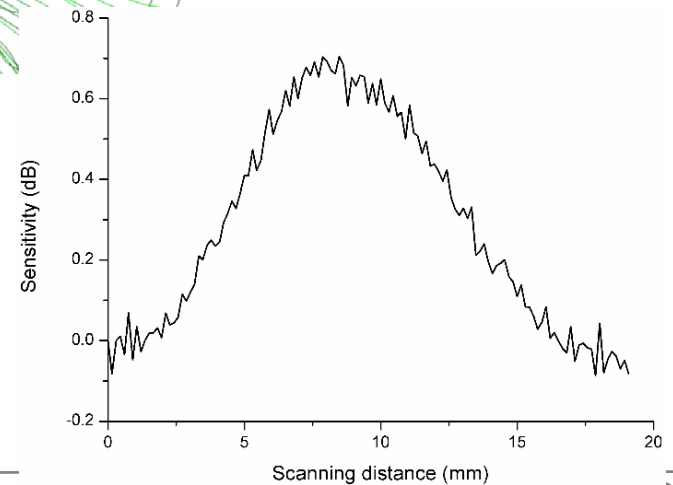
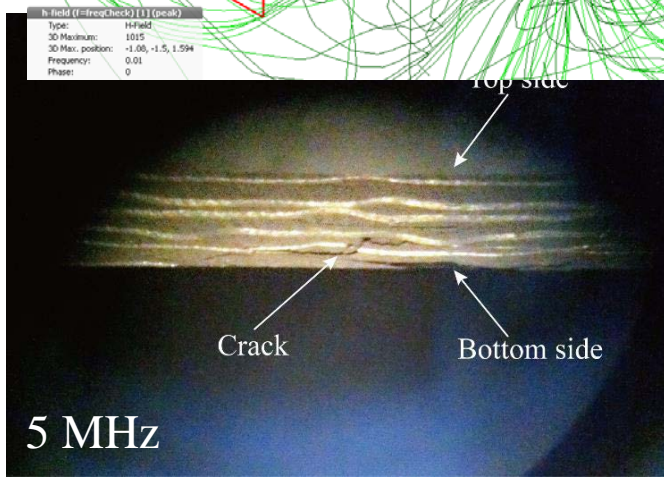
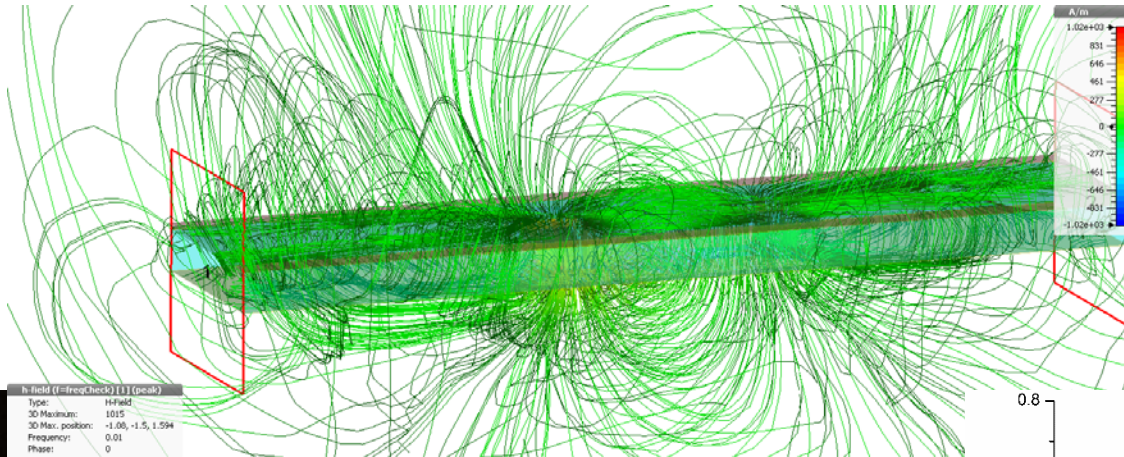
LOCKHEED MARTIN

Electromagnetic sensor for NDE of composites

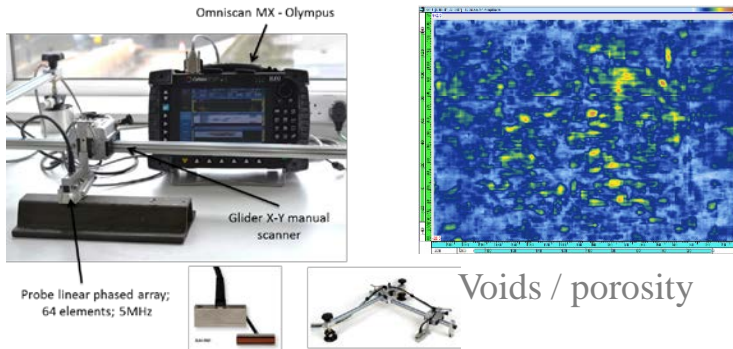
Zhen Li, Soutis, et.al.



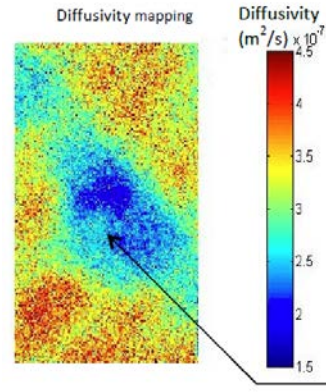
Electromagnetically coupled spiral inductors, home made!



Ultrasound-phased array

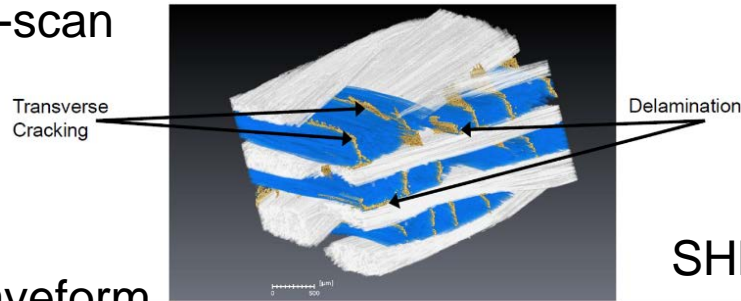


Infra-red thermography



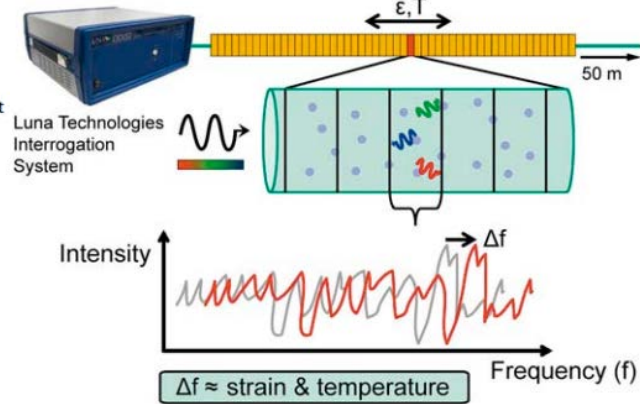
X-Ray CT

Ultrasonic A, B, S, C-scan

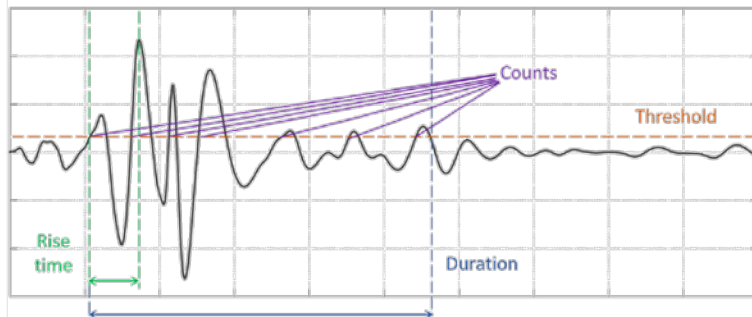


[Yu, B. et al., 2015]

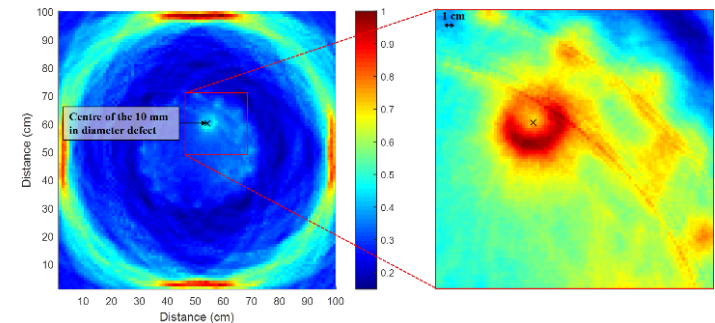
Distributed optical fibre



Typical AE signal waveform



SHM Lamb waves tomography



MANCHESTER
1824

The University of Manchester

Thank you
Any questions?

