



Introducing GERI

“Providing world class research solutions to engineering problems”

Anthony Walker

General Engineering Research Institute
Liverpool John Moores University



Introducing GERI

A world of manufacturing expertise right here in the Northwest

Outreach Project

FREE R&D support to NW organisations

The Structure of GERI



Formed in 2002 – amalgamating existing research groups



40-50 full and part time expert staff
Unique research capability

What is GERI all about?



Research really is...Excellent!

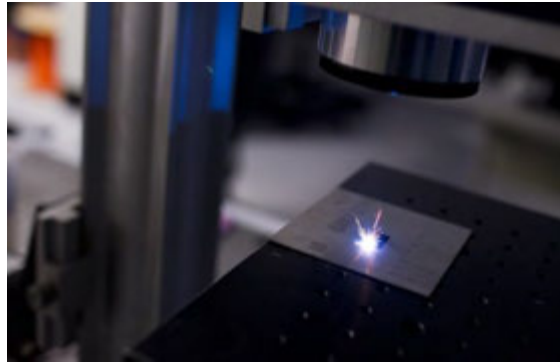
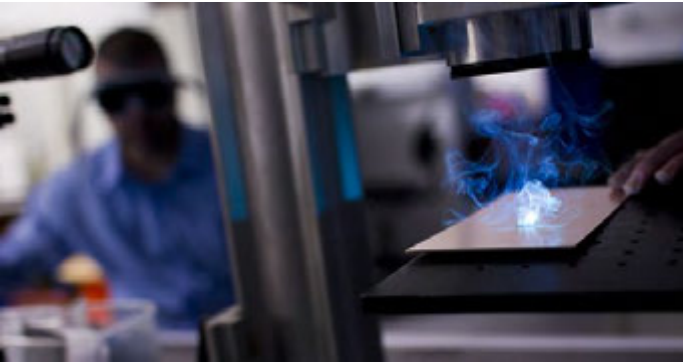


- Awarded Grade 5 in recent RAE
- RAE 2008: 60% of research is deemed to be internationally excellent or higher
 - 20% of research considered world-leading
 - 40% was viewed as internationally excellent

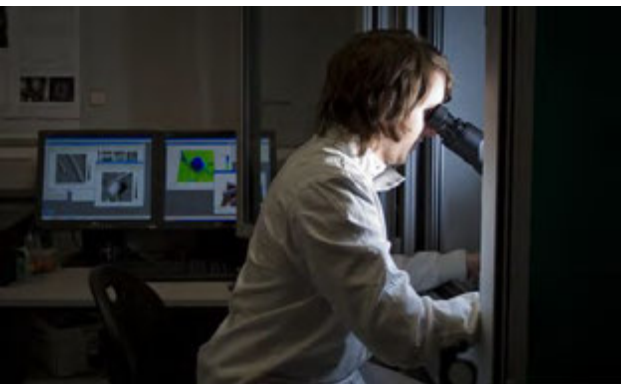
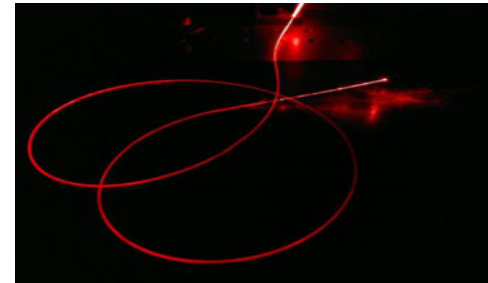
***“In the top quarter of the
General Engineering UoA”***

***“Ranked 11th in All Engineering
and ‘1’ in our specialist areas”***

What makes GERI special



Its quality....
Allied to its uniqueness...





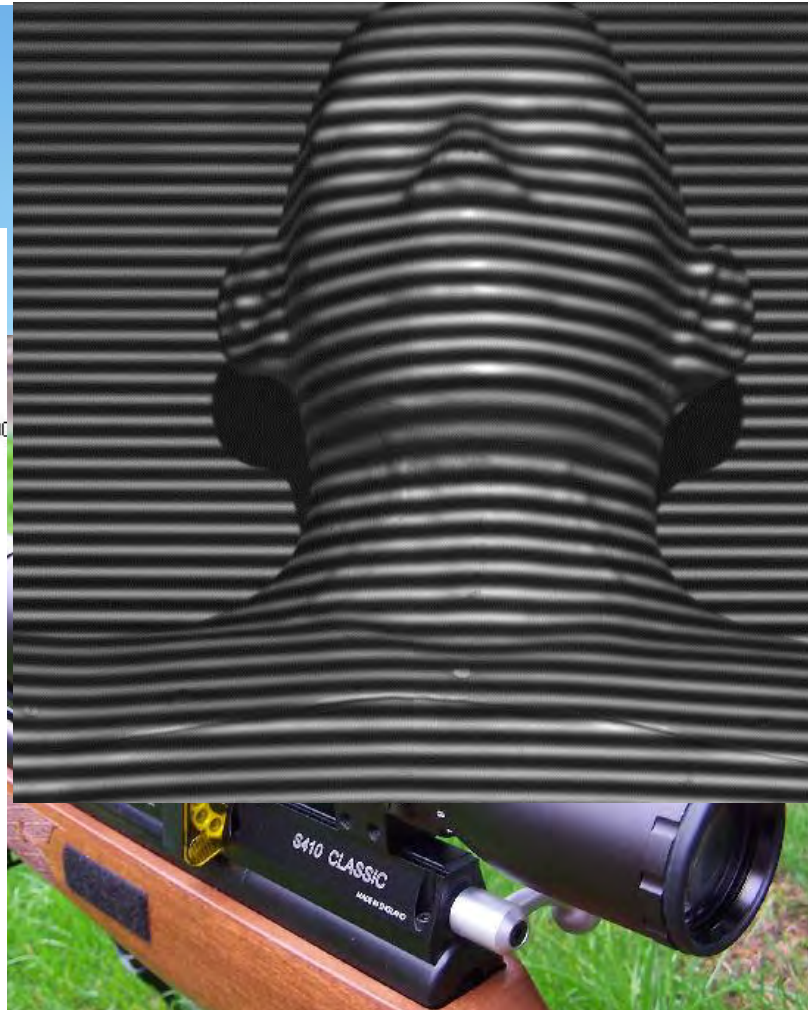
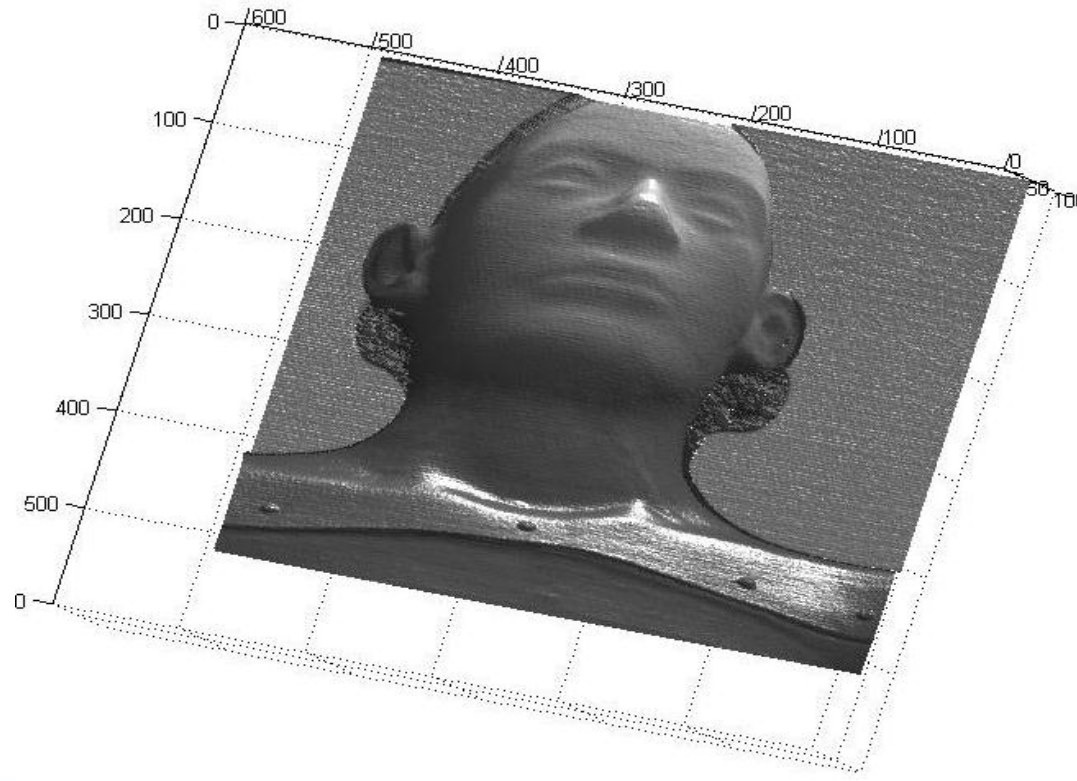
- Founded in 1972 and pioneering research group at LJMU
- Develops innovative techniques for solving measurement problems (cross sector)
- International reputation in:
 - Fringe pattern analysis
 - Applied optics
 - Precisions measurement
 - Computer vision
- Supported over 50 Ph.D students
- World patents and 100's refereed journal articles



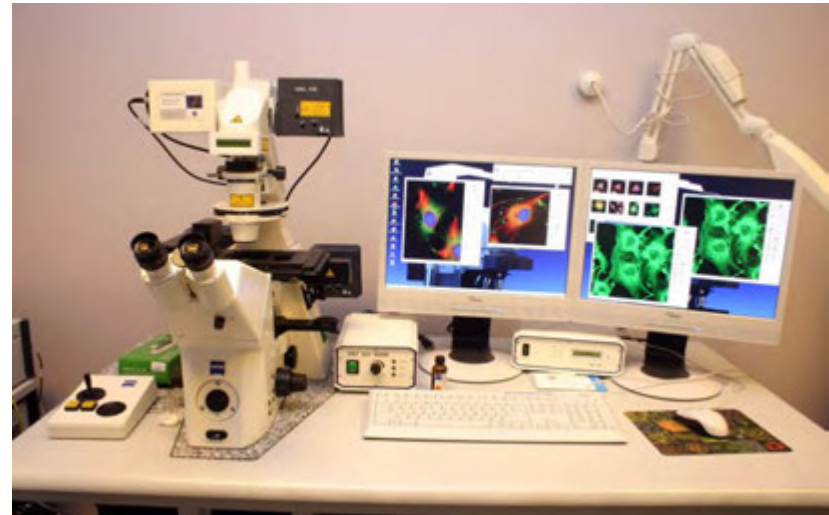
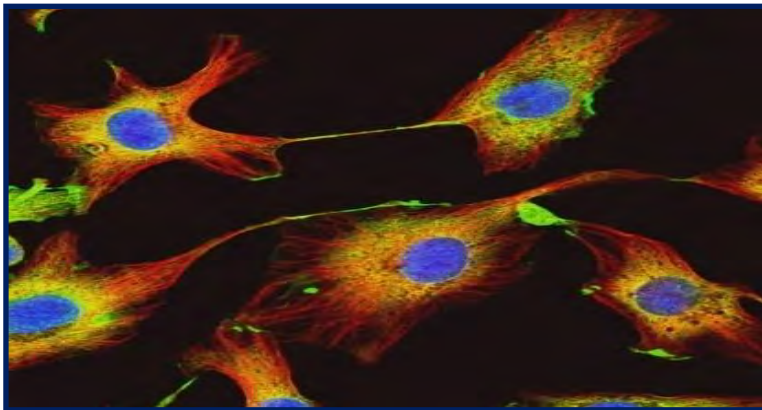
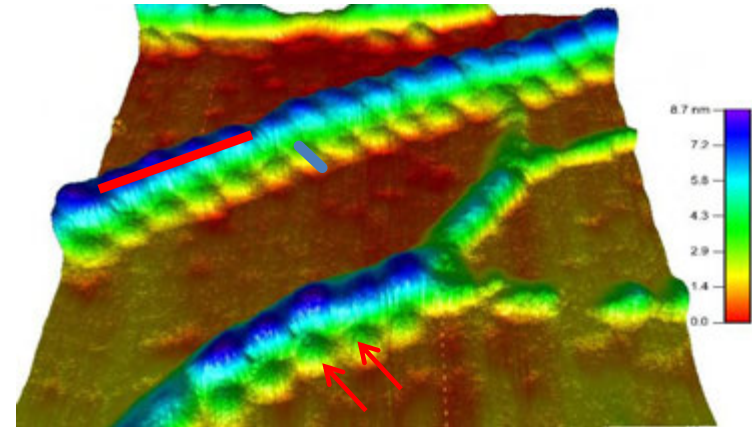


Its like.....

“Aiming a rifle fitted with the world’s most expensive telescopic sight,

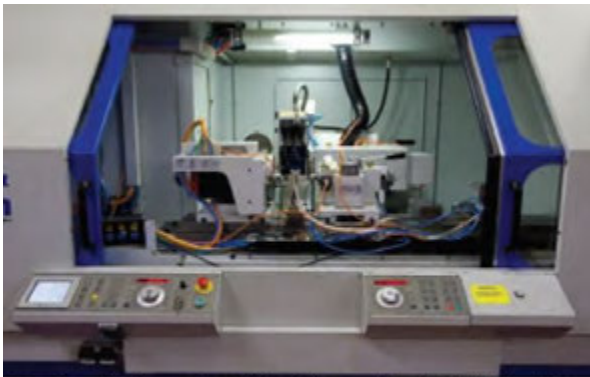


Applications in Cell Mechanics





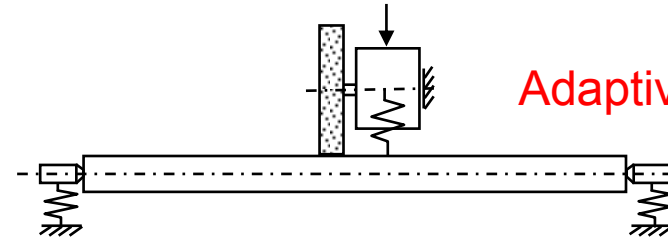
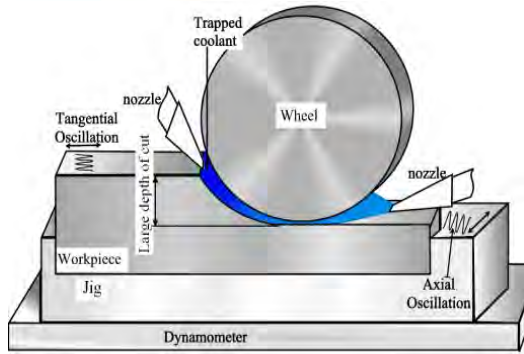
- Specialises in precision manufacturing and grinding studies
- Assists industry to achieve improved quality, accuracy and productivity using materials, process control and systems technologies
- Provides consultancy, teaching and support activities for SME's
- Hosts visiting scholars and has over 300 scientific publications



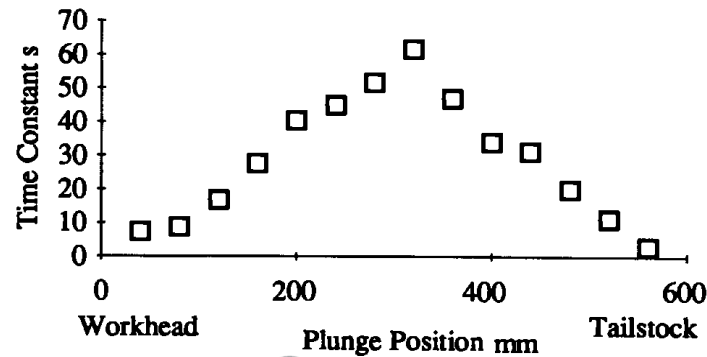
One of a suite of research enabled grinding machines in GERI's laboratories - each is fully fitted out with a combination of commercial and in-house developed instrumentation for the in-depth study of the process



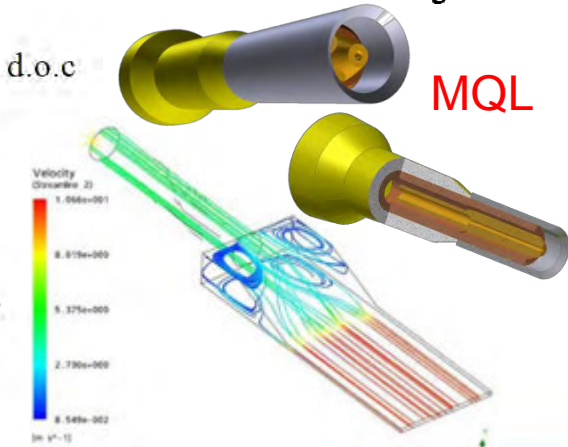
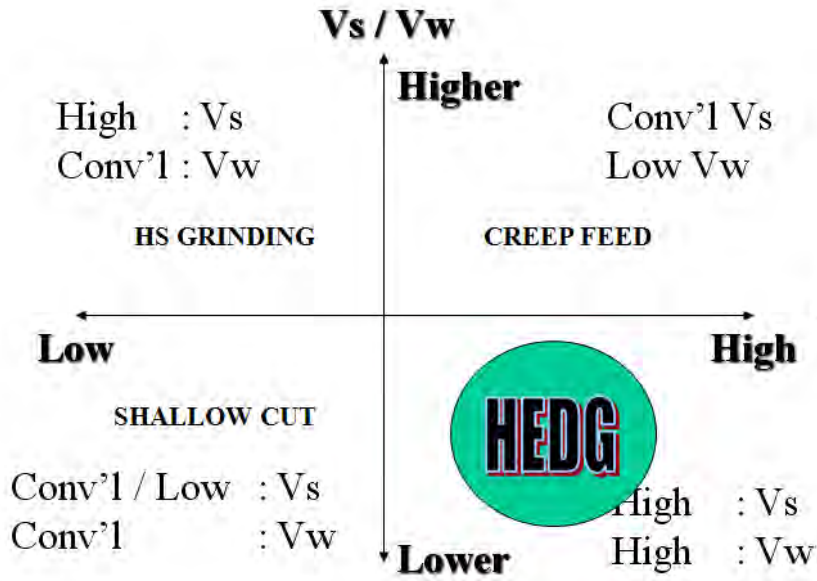
HEDG & MQL...



Adaptive control



The multi-plunge strategy reduced barrelling error from 150-180 μm to 25 μm in diameter. Cycle time reduced by more than 80%



MQL

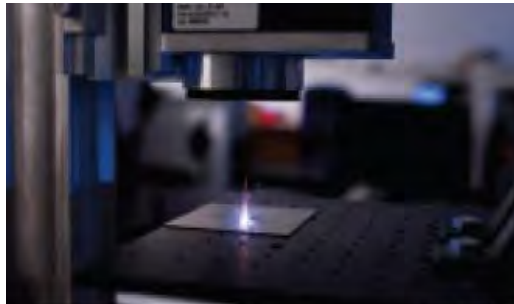


Laser Doppler Anemometer measurement

	High	Conventional	Low
$V_s, \text{m/s}$	100 - 150	50 - 80	20 - 35
$V_w, \text{m/s}$	1	0.1	0.01



- Recent group within GERI formed in 2008
- Expertise in all aspects of Laser processing
- Specialising in:



*Laser micro surface engineering in GERI's
photonics laboratory*

- Use of high power lasers in manufacturing (inc. drilling, welding, cutting)
- Surface texturing of materials at micro-scale
- Machining of composites

- Providing tailored solutions to partners
- Over 28 (“twenty-eight”) years of Laser Processing experience



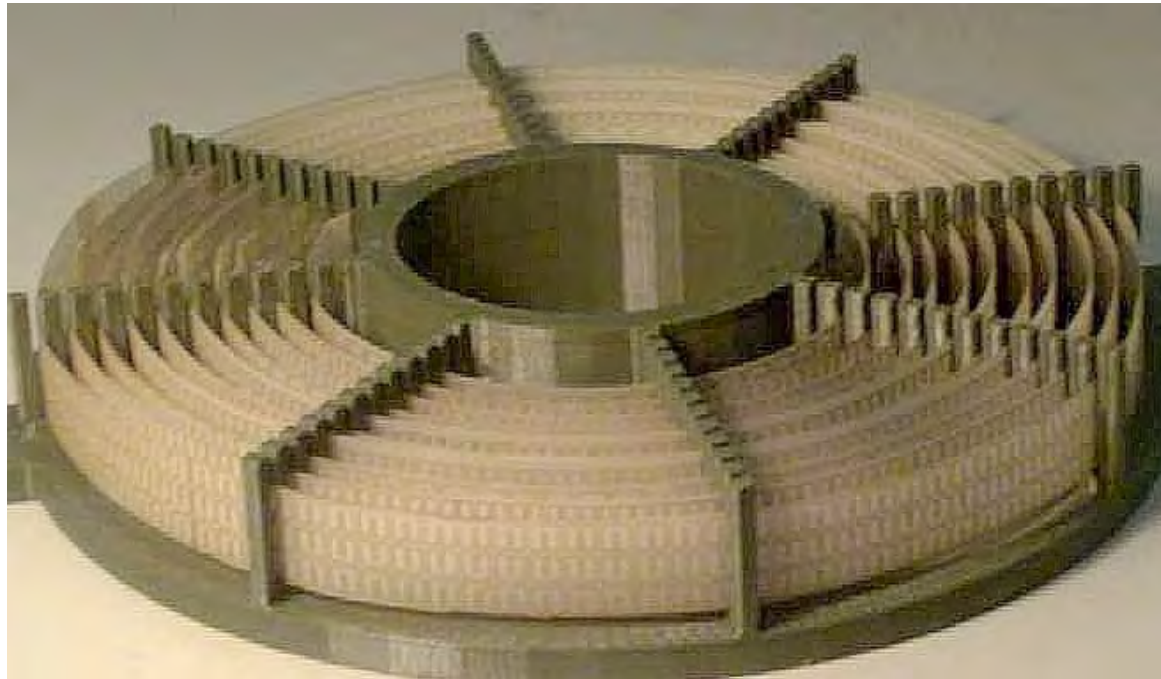
PiE has actively pursued the laser processing of carbon fibre composites. These lightweight materials are used increasingly to lightweight aircraft and other transport. The Boeing Dreamliner is at least 50% composites



“Paul has been helping GKN explore different laser sources and we value his advice and expertise” – John Cornforth, VP Technology, GKN Aerospace



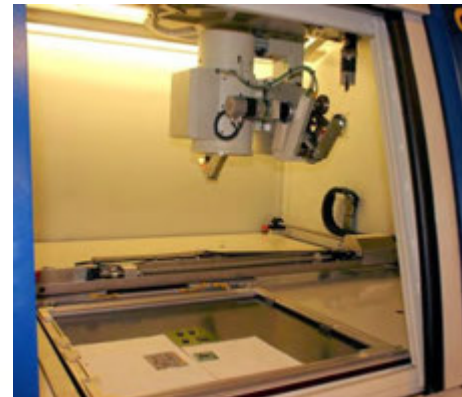
Metamaterials



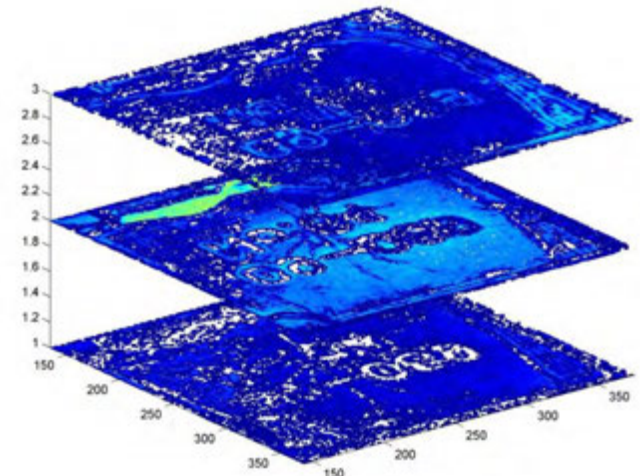
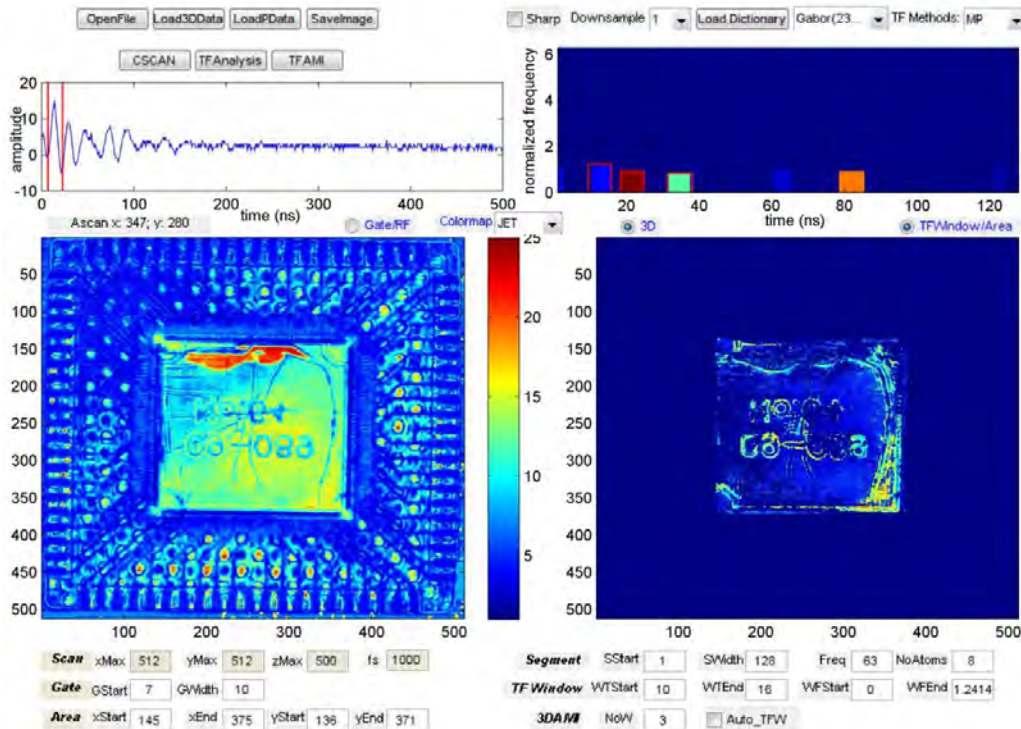
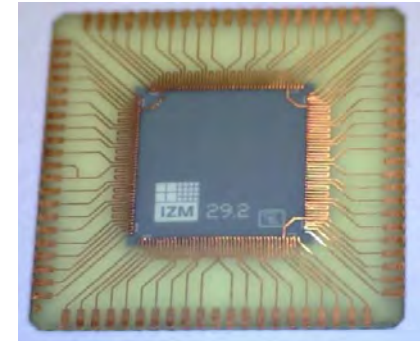
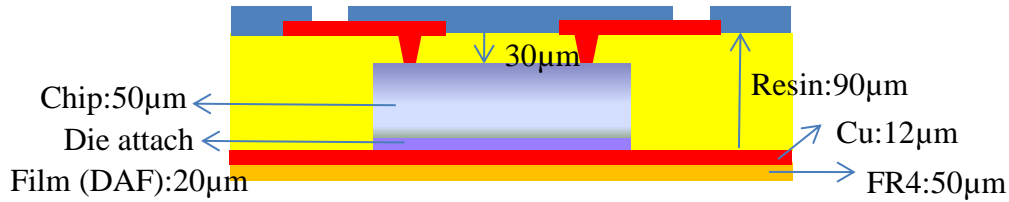
Microwave “Schurig” cloak,
Aos Al-Waidh, GERI PhD student, 2010



- Another recent group in GERI formed in 2008
- Long historical background at LJMU going back 30 years
- Develops advanced X-Ray and acoustic techniques for inspection focusing on modern electronics manufacturing
- Technology applications within automotive sector
 - Investigation of failure modes and assessment of durability of soldered electronic modules



Ultrasonic images of buried structures



Snapshot of GERI Activities



**Coherent and
Electro Optics
Research
Group**

- Metrology
- Image Processing
- Structure Light
- Radiotherapy
- Cancer Cell Mechanics

**Advanced
Manufacturing
Technology
Research Lab.**

- Minimum Quantity Lubrication
- Intelligent Strategies for Optimisation of Grinding
- Fluid Delivery in Grinding
- High Efficiency Deep Grinding
- Vibration Assisted Grinding

**Photonics in
Engineering**

- Machining of Composites
- Surface Texturing
- Cell Behaviour
- Printing
- Metamaterial manufacture

**Electronics
and Ultrasonic
Engineering**

- Electronic Package Reliability
- Ultrasonic Microscopy
- X-ray Inspection
- 3D Evaluation of Next Generation Microelectronic Packages and Systems

The genesis of the project



- Between 2002 and 2008 GERI worked on collaborative projects with ~100 companies
- Most of these were 'globals'
- The majority were outside the UK
- Only 'two' from the Northwest



***“Solutions on
our doorstep”***



Project aims

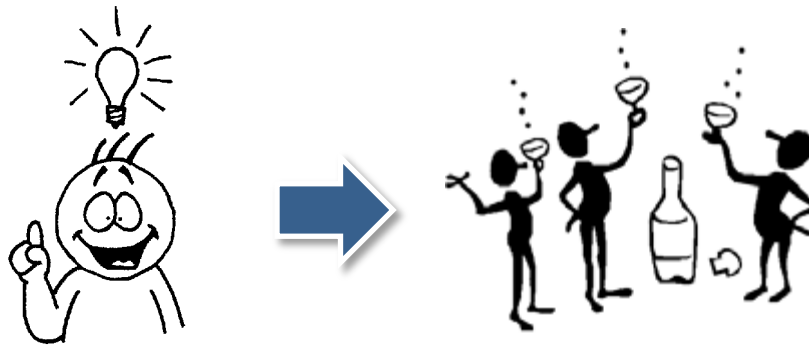


- ERDF funded project to provide a centralised facility to support NW industry
- Gateway to collaborative grant funding **Project runs until July 2015**
- Encourage take up of research and leading edge S&T
- Key objectives **We hope industry can benefit now...**
 - Encourage SMEs to participate in collaborative R&D
 - Build collaborations and partnerships with key stakeholders
 - Increase R&D funding investment in NW **...and beyond**
 - Complement existing regional, national and international initiatives
 - Promote GERI as world class facility

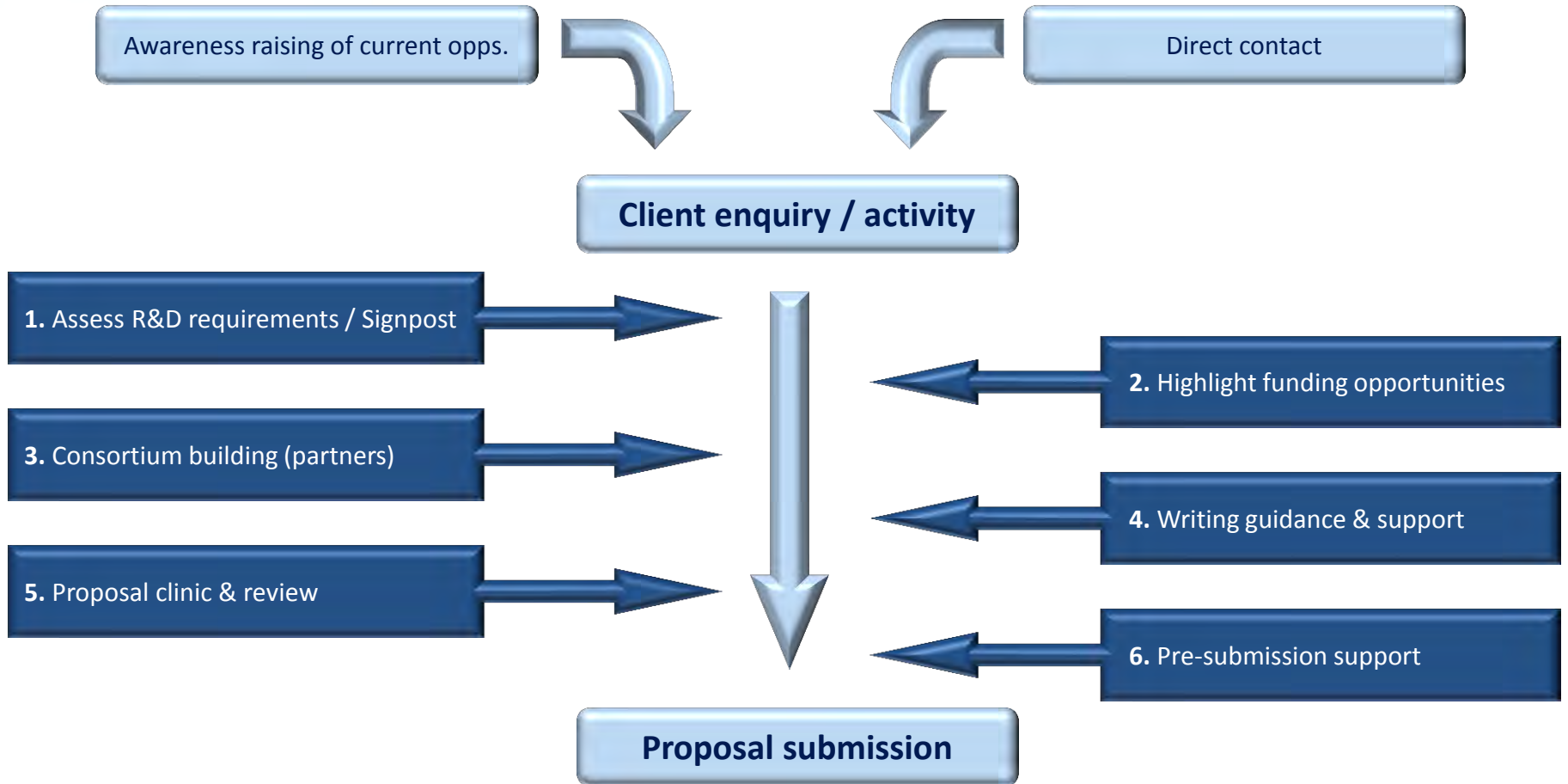
What the project does...



- **Facilities** – making the ‘leading edge’ available
- **Feasibility** – preliminary investigations
- **Funding** – securing support for collaborative research



How we can help



“Helping achieve industrial R&D goals”

Summary of support



Actions

- Promote R&D opportunities to NW orgs
- Identify funding sources
- Shape ideas to funding source
- Build collaborations capable of delivering
- Write competitive proposals
- Support R&D strategy

Industrial Assistance

- Identify company needs
- Provide cutting edge solutions
- Initial feasibility experiments
- Help orgs. to achieve their goals
- Create new / key partnerships
- Access finance / funds

Impact

- Use collaborative R&D to regenerate NW and provide economic growth
- Support NW orgs with R&D strategy and business growth

Why us?



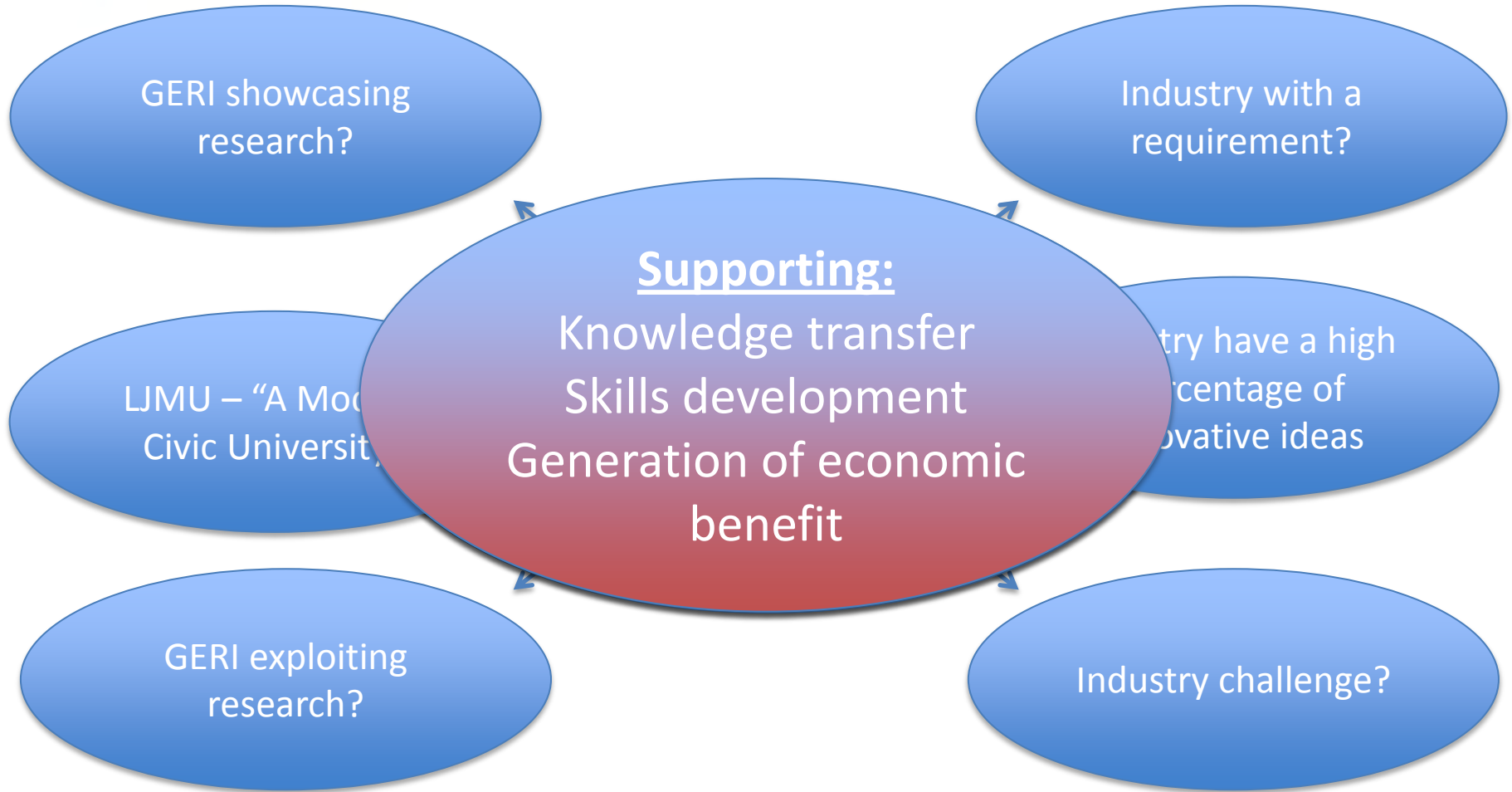
- Engineering excellence
- Research excellence
 - Basic research
 - Applications research
- Funding expertise
 - History of securing funding
 - Lets look at it from the other side?
- Industrial experience
 - Research for the sake of research?
 - Solutions that will be utilised by you...



Proposal is a vehicle to secure funding to actually undertake the project

“We genuinely want to help”

Research - A two-way street



OUR experience...



- Supporting ~100 companies in NW

Total Project Costs	Direct Funding to NW Orgs
~£2,000,000	~£500,000

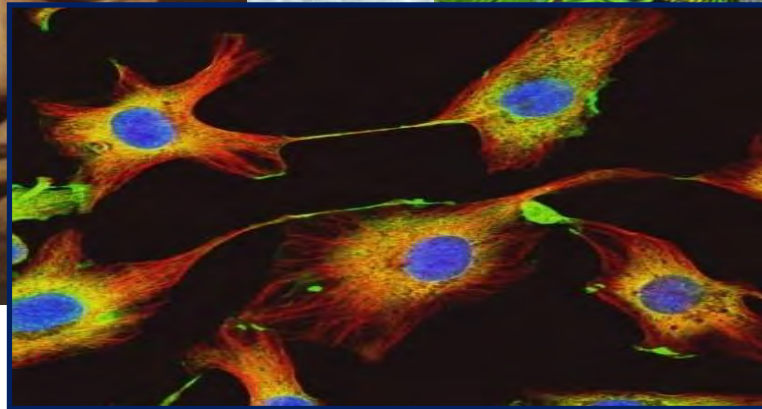
Total Project Costs	Direct Funding to NW Orgs
~£4,000,000	~£1,000,000

- We are greedy...we want more!
- More organisations to support
- More funds to NW companies
- More collaborations



NW a vibrant community...lets provide support to regenerate, grow and compete...

The range of what we do





Thank you for listening

Any questions?

a.r.walker@ljmu.ac.uk