Introduction to
Centre for Innovative Manufacturing in Ultra Precision

Martin O’Hara
National Strategy Manager
UK Manufacturing Background

- Manufacturing in the UK is a political “hot” topic
- Manufacturing has been an important part of the UK economy for at least 250 years
- The nature of manufacturing has and continues to change
Manufacturing Contribution to UK Economy

- UK is 11th largest global manufacturing base
- 10% of GDP (approx. £157Bn, c.2013 World Bank)
- Significant employer; 2.6M people
- Large investment via manufacturing businesses
  - almost 75% of UK R&D investment (c.2011 ONS)
- Diversity of end industries
  - Automotive, pharmaceutical, food, aerospace, ICT, chemicals
- High proportion of SME’s
  - 57% (Engineering Employers Federation)
- 54% of exports
EPSRC Background

• The Engineering and Physical Sciences Research Council (EPSRC) is the UK’s main agency for funding research in engineering and the physical sciences.
• EPSRC invests around £800 million a year in research and postgraduate training, to help the nation handle the next generation of technological change.

KEY FACTS AND FIGURES

<table>
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<th>9,300</th>
<th>£133 Million</th>
<th>44%</th>
<th>£800 Million</th>
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<tbody>
<tr>
<td>students supported</td>
<td>of joint investment with TSB</td>
<td>of research portfolio is collaborative</td>
<td>annual budget</td>
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Centres for Innovative Manufacturing

• The EPSRC Centres for Innovative Manufacturing are the latest in a line of EPSRC funding to support manufacturing research in UK universities.
  – Innovative Manufacturing Research Centres (IMRC)
  – Innovative Manufacturing Initiative (IMI)
  – Application of Computers to Manufacturing Engineering (ACME)
  – Integrated Knowledge Centres (IKC)
  – Centre for Innovative Manufacturing (CIM)
  – Future Manufacturing Research Hub

• 16 CIMs established by EPSRC from 2010-2013
  – All centres have similar aims
  – Each in a different technology area
Aims of EPSRC Centres

• To create, deliver and disseminate world-leading research.
• To address major long-term manufacturing challenges and or emergent manufacturing opportunities.
• To provide strong support for UK manufacturing industries.
• To enhance the global profile and significance of UK research.
• To create a national network of expertise in manufacturing research knowledge.
• To provide outreach to other centres and relevant research groups.
Ultra Precision

*Next generation products will demand nanometre level tolerances on complex components*

Such products include:
- Next generation displays
- Plastic electronic devices
- Low cost photovoltaic cells
- Medical devices
- Defence and security technologies.

*The Centre aims to create ultra high precision manufacturing processes and tools that can make products with nanoscale precision.*
The Research Platforms

Laser Assisted Focused Ion Beam
• Next generation hybrid ion/laser beam processing system for high throughput nano machining

Meso-Scale Platform
• Compact size micro factory capable of additive and subtractive technologies

Macro Reel-to-Reel “R2R” Platform
• Large scale facility capable of creating continuous films and film moulds
Research Portfolio

- Laser Machining of Carbon Nanotubes for Field Emission Applications
- Holographic Optical Fibre
- Ultra precision light sensors
- Control System for Ultra Precision Processing
- Femtosecond Laser Irradiation and Chemical Etching
- Spatial Light Modulators for High Laser Power Applications
- Holographic Enhancement of Fibre Optic Sensors
- Ultrafast Laser Removal of Ion Beam Implanted Gallium
Research Portfolio

**Microwave Plasma Technologies for Advanced Surface Fabrication**

**In-Process and Post-Process Metrology for an Ultra Precision Machine**

**Advancement of RAP Technology to Reduce MSF Errors on Metre-Scale Optical Surfaces**

**Development of an Ultra Precision Film Steering Test Facility**

**Spatial Light Modulators for High Laser Power Applications**

**Dimensional Deviations of CLIC Standard Discs During Machine Operations**

**Optical Alignment Control**

**Assessment of the Micro Four Machine Based on the Processing of Complex Features**
National Strategy Programme for Ultra Precision

The National Strategy Programme aims to deliver a thriving and active ultra precision network community across academia and industry, supported by information services and collaboration opportunities.
Centre for Doctoral Training in Ultra Precision

Recruiting Ultra Precision Scientists and Engineers of the Future

We are now recruiting interdisciplinary students interested in developing the next generation of ultra-precise manufacturing systems and processes starting in October 2014. The CST in Ultra Precision welcomes applicants from any field of Science and Engineering who have attained a first or upper second class honours degree (or equivalent). Full application deadlines are 31st Jan 2014.

Meet our latest cohort of William in Ultra Precision Students

We welcome our latest cohort of 7 students in Ultra Precision who began in October 2013. This cohort have a varied background of studies in Physics, Engineering and Natural Sciences.

Applications and Enquiries

To apply, or for more information, please contact Eddie Fuller at ed202@cranfield.ac.uk.
UK National Database of Facilities and Community

UK database of ultra precision facilities, equipment and capability

Provides an openly available detailed database listing UK companies and research establishments holding ultra precision facilities and equipment, indicating access opportunities under commercial and research agreements.

Diamond Turning and Micromilling
Optical Grinding and Polishing
Plasma Ion and Beam Systems
Surface Analysis

Co-Ordinate Metrology
Optical Metrology
Lasers and Focus Ion Beam
Surface Metrology

Reel to Reel Processing
Micro Injection Moulding
UK Facilities
All Facilities and Equipment

Cranfield University
EPSRC
University of Cambridge
Outreach Events 2016

• Networking Events
  – Fixturing and Machining, Mazak, Worcester (17 Feb)
  – Optical Materials Day, Cranfield (14 Apr)
  – Challenges of Instrumentation and Control in UP Manufacturing, Renishaw, New Mills (18 May)
  – Laser-FIB: Industrial Applications, Cambridge IfM (23 Jun)
  – The Future of Precision Engineering, London (26 Oct)

• Other
  – Energy Beam Processing Short Course (15-18 Feb)
  – UP Manufacturing Conference (TODAY!)
  – Prestige Lecture: Medical Applications (28 Jun, Cranfield)
  – Precision Engineering Industrial Short Course (19-23 Sep)
Geographic Spread

Astronomy Technical Centre
Edinburgh

Manufacturing Technology Centre
Coventry

Optic Technium
St Asaph

Photonex
Coventry

Yamazaki-Mazak
Worcester

SPECIFIC
Port Talbot

Centre for Process Innovation
Sedgefield, Durham

Huddersfield University
Huddersfield

Cranfield University
Cranfield

Institute for Manufacturing
Cambridge

Academy of Medical Sciences
London

National Physical Laboratory
Teddington

Renishaw
Wooton-Under-Edge

We go to our community, rather than expecting the community to come to us.
Other Activities
Is It Worth It?
Science and Society

Science as an important UK cultural institution

Science as a personal characteristic

87% 83% 79% 72%
NHS Law Police Science

33% 38% 34%
I am sporty I am arty I am sciency

Source: Culture Tracking Survey, King’s College London.
Data from a representative sample of 2,011 UK adults in September 2015. www.kcl.ac.uk/culture

Cranfield University EPSRC Pioneering research and skills
University of Cambridge
Contact

Director
Paul Morantz
p.morantz@cranfield.ac.uk

National Outreach Manager
martin@ultraprecision.org

Co Director
Prof Bill O’Neill
wo207@cam.ac.uk
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