

Strengths and Opportunities- Photonics Leadership Group

Dr John Lincoln, Chief Executive
Photonics Leadership Group

Photonics Leadership Group – What are we?

- Bring together industry, academia, TSB, EPSRC, UKTI +more
 - Represents UK wide photonics industry
 - All sectors, all applications
- Voluntary members / contributors from across industry, academia & support organisations
- Forward looking
 - What do we need to grow bigger, faster, stronger
 - Highlighting opportunities, enhancing confidence, steering support
- Advisory and steering only
 - We are **not** delivery body or contracting body
 - Work through others e.g. Knowledge Transfer Networks, UKTI...

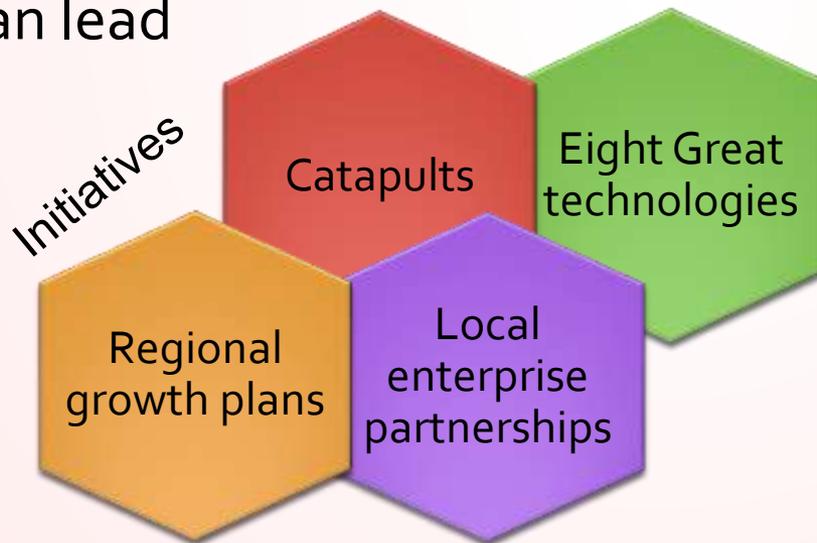
**Unlocking growth, maximising potential,
removing barriers**

Mission

- Increase **UK's position** in top 5 photonics manufacturers and innovators.
- Enhance **supply chain** from components to integrated systems in all applications.
- **Voice** for the UK photonics as provider of high impact enabling solutions - e.g linking to 8 great technologies
- Improve the **competitiveness and growth** of the economy by maximise photonics innovation & commercialisation
- Foster continuous **dialogue** between industry, government, academia and support agencies.

Why Now?

- Economics
 - Rebalancing of economy to manufacturing
 - Imperative to create jobs and growth
 - Drive to reduce spending, increase efficiency / impact
- Focus on industry driven / demanded support where UK can lead



- The bigger you are the louder your voice
- Photonics diverse industry of SMEs = many distributed small voices
 - **Only in coherent combination will we be heard**

PLG about making the link to Photonics

Who are we?

- PLG Chief Executive Dr John Lincoln
- PLG Chairman Christopher Dorman Coherent Scotland

www.photonicsuk.org

Prof Martin Dawson / Simon Andrews, Fraunhofer CAP	Myrddin Jones, Technology Strategy Board	Representatives from EW Simulation Technology
Ric Allott STFC/Central Laser Facility/AILU	Andrew Kearsley, Oxford Lasers	Sir Prof. David Payne, Prof David Richardson, University of Southampton
Peter Batchelor, Goldphoton	Anke Lohmann, Alastair Wilson, Steve Welch, ESPKTN	Richard Pitwon, Xyratex
Nick Martin/ John Bagshaw, BAE Systems	Keith Lewis, Sciovis Ltd	David Rimmer, DREM Ventures, WOF
Susan Peacock, Liam Blackwell, EPSRC	John Barr, Robert Lamb, Selex ES	Prof. Alwyn Seeds, UCL
Andy Carter / Mike Wale, Oclaro	Gordon McKenzie, Michelson Diagnostics	Prof. Martin Sharp, AILU, Liverpool John Moores University
Mark Gubbins, Seagate	James Mckenzie, Photonstar led group plc	David Smith, CIP Technologies
Antony Hurden, Grounded Innovation	Richard Mosses, Scottish Optoelectronics Association	Stuart Sendall, Pacer International
Tim Holt, Fraunhofer UK	Steve Norman /David Parker, SPI Laser	Sergei Turitsyn / Andrew Ellis, University of Aston,
Gareth Jones, LUX-TSI Limited	Graeme Malcolm M2 Lasers	Ian White, University of Cambridge
Gareth Jones/ Andrew Robertson, Gooch and Housego	Drew Newlson / Wyn Meredith IQE / CST	Ian Williams/ Paul Bond, BIS
Prof. Julian Jones, Universtiy of Cambridge	Representatives from Thales UK	Phillip White, UKTI

Achievements

- Published UK industry size -Jan 2013
- Linked Enabling technologies with 8 Great technologies
- SWOT analysis of UK Photonics
 - See www.photonicsuk.org
- UK Photonics Opportunity & Roadmap analysis – underway
- UKTI inward investment mission – CIOE China
- KTN business planning input

Industry size- UK Photonics Manufacturing

1500
companies

70,000
employees

£10.5bn
output

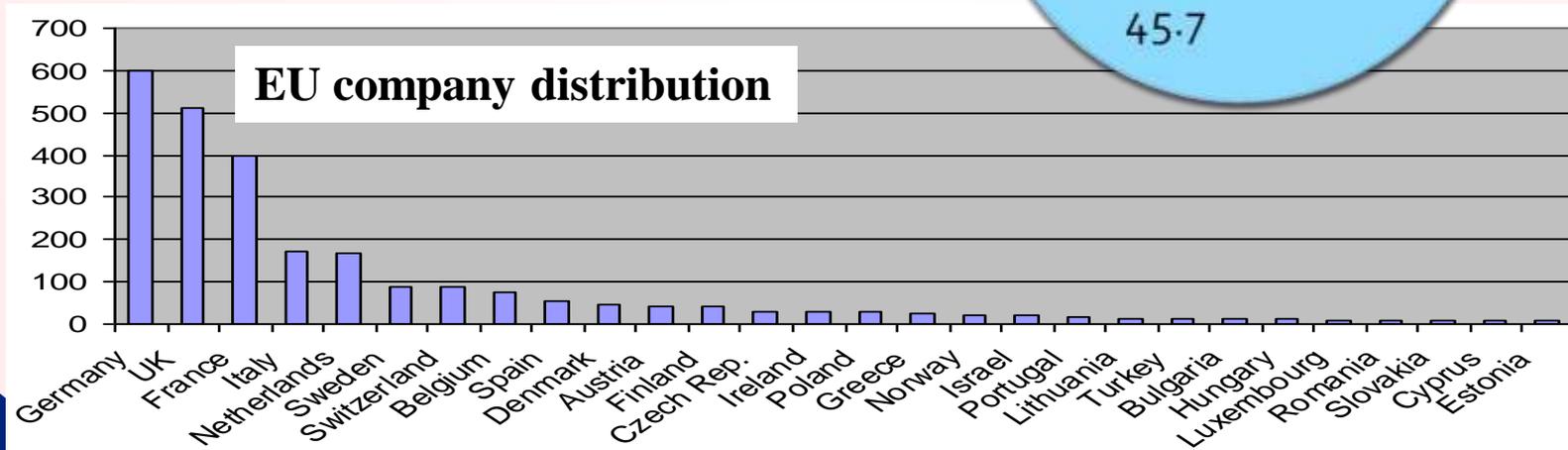
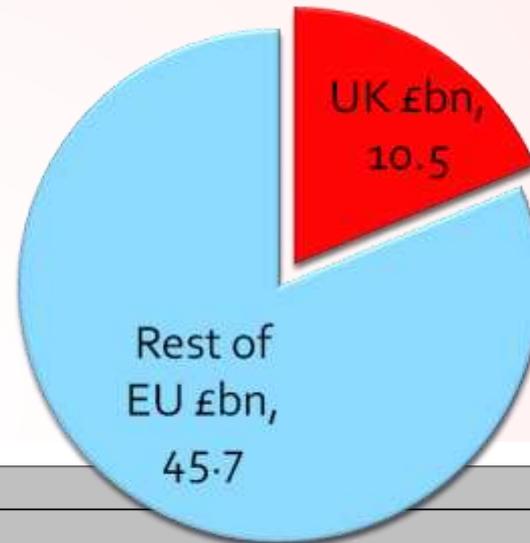
8%
growth

- Billion £ companies to SMEs
- Exporting >75% output
- World leading research centres
 - 2010 numbers- revision requested

Photonics = Growth = Opportunity

UK Photonics: European leader

- European Photonics
£56.2bn; 377,000
people*
- UK 20% of EU photonics



* EPIC 2013

**UK is good at Manufacturing Photonics-
be proud**

Enabling technology

- Photonics is the vital technology
 - Solutions to the world's grand challenges will use photonics
 - Highlighted by industry leaders
 - Recognised by UK (TSB) & European Commission
 - **Photonics 1 of 6 Key Enabling Technologies**
- Future global economic growth depends on photonics



Photonics is Enabling

Great, Enabling or Key - everyone is at it

Key Enabling Technologies – EU

- Nanotechnology
- Micro and nanoelectronics
- Industrial biotechnology
- Photonics
- Advanced Materials
- Advanced Manufacturing systems



Enabling Technologies–UK TSB

- Advanced Materials
- Electronics, Sensors, Photonics
- Biosciences
- ICT



Eight Great Technologies –UK Gov

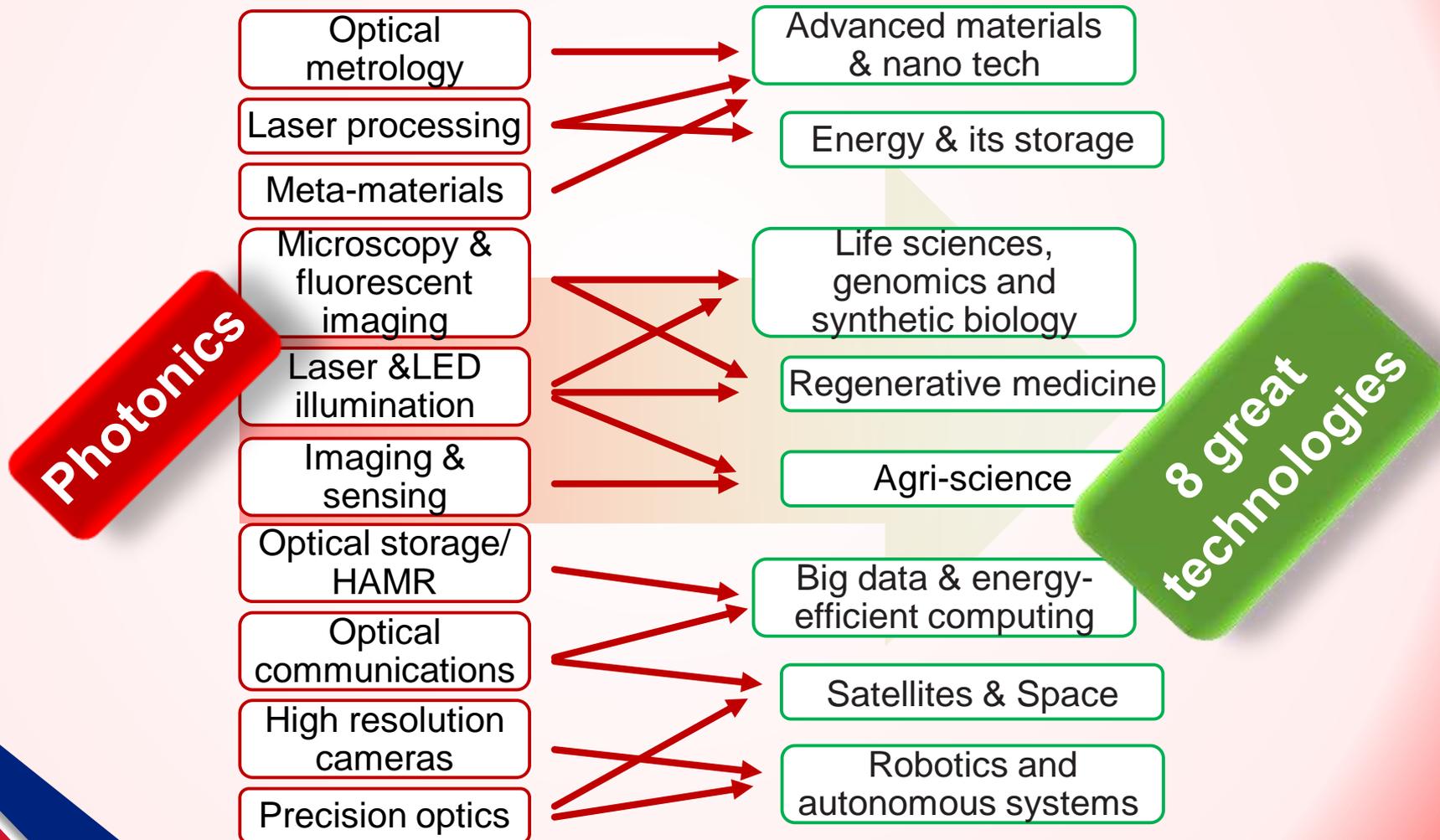
- Big data and energy-efficient computing
 - Satellites and space
 - Robotics and autonomous systems
- Life sciences, genomics, synthetic bio
 - Regenerative medicine
 - Agri-science
- Advanced materials and nano-tech
 - Energy and its storage



Common Themes

- **Materials**
- **Life Science**
- **Data**

Linking Enabling to Great Technology – a PLG viewpoint



Future Growth and Opportunities

- Photonics21 roadmap 2014-2020
 - Generated with >300 photonics experts
 - Identifies hot growth areas for Europe
 - From the European technology platform for Photonics
 - Will steer future EU funding
- What about UK?
 - UK Annex in preparation initiated by PLG
 - Highlights relevant to UK
 - UK opportunities missed by P21
 - Defence electro-optics, Space
 - Starting point SWOT analysis of UK



UK Strengths – Communications

- Multiple University groups spanning components to system architecture
- Significant Integrated photonics research in Silicon and III-Vs
 - Sheffield, Surrey, Southampton, Glasgow, Cambridge, UCL, Aston, Bristol Universities
- Major content providers
 - SKY, BBC
- Established R&D operations for global suppliers
 - Huawei, Vodafone
- Major producers of integrated and discrete III-V components and wafers
 - Oclaro, IQE
- Established volume production of data storage components and systems
 - Xyratex, Seagate

UK Strengths – Industrial photonics

- Large number of precision/micro processing laser manufacturers
 - Coherent, JK laser, SPI Laser, Powerlase, Laser Quantum, Qioptiq, Rofin-Sinar
- Strong research in fibre, high power and pulsed lasers
 - Heriot-Watt, Liverpool, Southampton, St Andrews Universities.
- Strong machine vision industry
- Significant capacity in laser components - coatings to modulators
 - Gooch and Housego etc
- Leading development of additive laser manufacturing
 - Renishaw, BAE, Rolls Royce
- National trade association for industrial laser users/developers
 - AILU

UK Strengths – biophotonics

- Extensive biophotonics research base in diagnostics and advanced imaging
 - E.g. Optical Coherence Tomography
- Strong support for cross-disciplinary projects from physical and medical science
- Multiple laser manufacturers supplying life-science instrumentation
 - QioptiQ, Laser Quantum, Coherent etc
- Strong penetration of photonics tools into life science research
- Vibrant UK pharmaceutical and biotech industry
 - AstraZeneca, GlaxoSmithKline, Ardana, Axis-Shield etc

UK Strengths – Lighting

- Globally leading architectural and interior design industry
 - E.g ARUP
- Full lighting design approach
- Substantial investment in GaN on silicon LED production
 - Plessey
- Leading OLED and flexible electronic research
 - Cambridge Uni, Plasma Quest, Cambridge displays
- Volume semiconductor Epi-wafer production
 - IQE

UK Strengths – security & monitoring

- Globally significant defence/security/aerospace electro-optic system manufacturers and primes
 - Selex, Thales, BAE, Rolls Royce
- Experience in large format components for large scale projects (telescopes/ space)
 - E2V
- Strong smart materials, infrared laser/ emitter and optics research base
 - Cascade Lasers, Uni's Southampton, Cambridge, Exeter
- Strength of imaging systems integrators (traffic monitoring to industrial process control)
 - E.g. Qinetiq
- Established expertise in high power, high reliability components, coatings & lasers from visible to IR
 - Gooch and Housego

Growth Highlights

Communications

- Optical for short reach, data centre, on-chip
- Beyond WDM
- Integrated photonics

Industrial

- Additive manufacturing
- Short pulse (femto /picosecond processing
- Composite processing
- Functional surfaces

Energy

- Building integrated Photovoltaics
- High efficiency lasers

Life sciences

- Fully integrated point-of-care diagnostics

Lighting

- Intelligent / adaptive lighting
- Full system solutions

Sensing and Security

- Extended infrared sources and sensors
- Enhanced reliability, ruggedization & autonomy

.....More to come

Summary

- **UK has world leading photonics industry to be proud of**
 - Embedded in universities, companies and people
 - UK made photonics products and knowledge has global impact
- **Resurgent interest in UK manufacturing excellence**
 - Gains and losses from the political attention
 - Support focused on 8 Great technologies high in supply chain
 - **Work together to demonstrate how we enable these supply chains / markets.**

- **Get involved-**

Where do you think next big manufacturing opportunities are for UK photonics

www.photonicsuk.org

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