SUPA Physics Scotland

SUPA IAC Meeting – 26th May 2016

Photonics Theme

Theme Co-Leaders:

Dr Jennifer Hastie (Institute of Photonics)

Dr Robert R. Thomson (Heriot Watt University)

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Photonics Theme

Photonics is a key theme in SUPA, with ~85 core photonics academics working in Scottish physics departments:

St Andrews: > 15

Heriot Watt: > 30

Glasgow: > 5

Dundee: > 6

Strathclyde physics and the IOP:> 30

SUPA Physics Scotland

EPSRC Centre for Doctoral Training in Applied Photonics

- Heriot-Watt University
- University of Dundee
- University of Glasgow
- University of St Andrews
- University of Strathclyde
- CDT, Heriot-Watt University
- ICT

Photonics and electronics are highly integrated across a multitude of modern devices and systems. Led by Heriot-Watt University, in partnership with the Universities of St Andrews, Strathclyde, Glasgow and Dundee, this CDT combines taught courses in photonics and electronics along with MBA business modules to produce graduates with an understanding of photonic- / electronic-engineering design, fabrication and systems integration, together with high-level business, management and communication skills. Twenty-three industrial partners have committed to sponsoring 50 EngD and a further 15 PhD places aligned to the Centre. Their cash contributions and those of the EPSRC and the university partners combine to make the total value of the Centre £8.9M, not including an estimated £7M of further in-kind support.

EPSRC and MRC Centre for Doctoral Training in Optical Medical Imaging - Training the next generation of scientific entrepreneurs in healthcare technologies

- University of Edinburgh
- University of Strathclyde
- CDT, University of Edinburgh
- Healthcare technologies

The CDT encompasses two leading institutions, the University of Edinburgh and the University of Strathclyde and will engender within PhD students an entrepreneurial ethos, while growing a new generation of physical scientists - trained within a clinically focused setting. The vision for the CDT in Optical Medical Imaging is to train the next generation of entrepreneurs with a "Heart for Science and a Brain for Business" ensuring that the UK has a strong and sustained pipeline of innovators and research leaders in the global sector of optical medical imaging.

EPSRC Centre for Doctoral Training in Integrative Sensing and Measurement

- University of Glasgow
- University of Edinburgh
- CDT, University of Glasgow
- ICT

'Sensing and Measurement' impacts on all areas of life from food and health to energy and transport. The internet of things, for example, will be enabled by sophisticated sensing capabilities designed into ultra-compact, low-power, multi-functional, high-performance integrated systems. In a partnership involving Glasgow University, the University of Edinburgh and a wide range of industrial, research and international partners, the CDT in Integrative Sensing & Measurement will produce highly-skilled scientists and engineers trained in topics from the fundamentals of sensing and measurement across all physical domains, through device fabrication and system integration to implementation across a diverse range of practical applications.

EPSRC Centre for Doctoral Training in Medical Devices & Health Technologies

- University of Strathclyde
- CDT, University of Strathclyde
- Engineering

The Medical Devices and Health Technologies CDT at the University of Strathclyde builds on an existing CDT. Aimed at engineers and physical scientists the training programme provides a comprehensive introduction to medicine, the life sciences and medical engineering that allows the graduate students to pursue state of the art research projects in medical devices and technology in teams comprising academics, medical industry advisers and clinicians. Expert knowledge transfer provided to the CDT via Strathclyde Institute of Medical Devices ensures that projects can deliver new medical devices and technologies to the clinical environment. The new phase of the CDT expands the international project portfolio for the students with opportunities to intern in China and the USA.

SUPA Physics Scotland

The UK Hub in Quantum Enhanced Imaging

Glasgow, Bristol, **Edinburgh**, **Heriot-Watt**, Oxford, Warwick and **Strathclyde**
£23M investment from EPSRC

Quantum Communications Hub

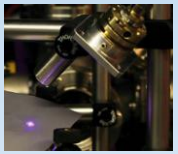
UK Quantum Technology Hub for Quantum Communications Technologies

Bristol, Cambridge, **Heriot-Watt**, Leeds, Royal Holloway, Sheffield, **Strathclyde** and York + BT, NPL, Toshiba, Bristol Council etc..
£24M investment from EPSRC

UK National Quantum Technology Hub in Sensors and Metrology

UK NATIONAL QUANTUM TECHNOLOGIES PROGRAMME

Birmingham, Southampton, Sussex, **Glasgow**, Nottingham**, Strathclyde**, IOP
£35M investment from EPSRC



UK NATIONAL QUANTUM TECHNOLOGIES PROGRAMME

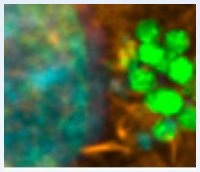
NQIT Networked Quantum Information Technologies

Bath, Sussex, Cambridge, Leeds, Warwick, **Edinburgh**, Oxford, **Strathclyde**, Southampton
£38 M investment from EPSRC

EPSRC IRC —Multiplexed Optical Molecular Sensing and Imaging
Lighting up the Lung — Detecting Disease

PROTEUS

Heriot Watt, **Edinburgh**, Bath
£9.4 M investment from EPSRC



Existing Scope of Theme

• University of Glasgow (physics): Strong activities in ***fundamental optics*** (e.g. Padgett, Barnett, Courtial, Franke-Arnold) and ***optical instrumentation*** (e.g. Harvey & Taylor)

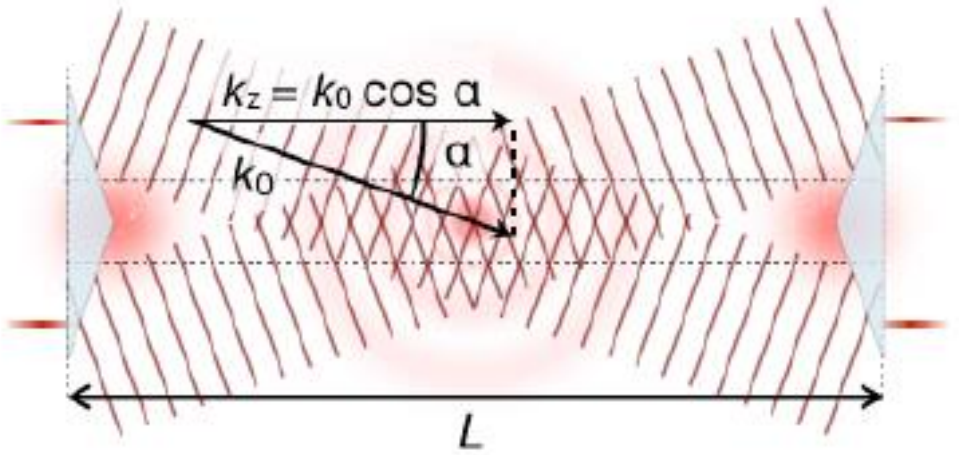
Sciencexpress

Spatially structured photons that travel in free space slower than the speed of light

Daniel Giovannini,[1*] Jacquiline Romero,[1*] Václav Potoček,[1] Gergely Ferenczi,[1] Fiona Speirits,[1] Stephen M. Barnett,[1] Daniele Faccio,[2] Miles J. Padgett[1†]

[1]School of Physics and Astronomy, SUPA, University of Glasgow, Glasgow G12 8QQ, UK. [2]School of Engineering and Physical Sciences, SUPA, Heriot-Watt University, Edinburgh EH14 4AS, UK.

*These authors contributed equally to this work.



Existing Scope of Theme

• Heriot Watt University

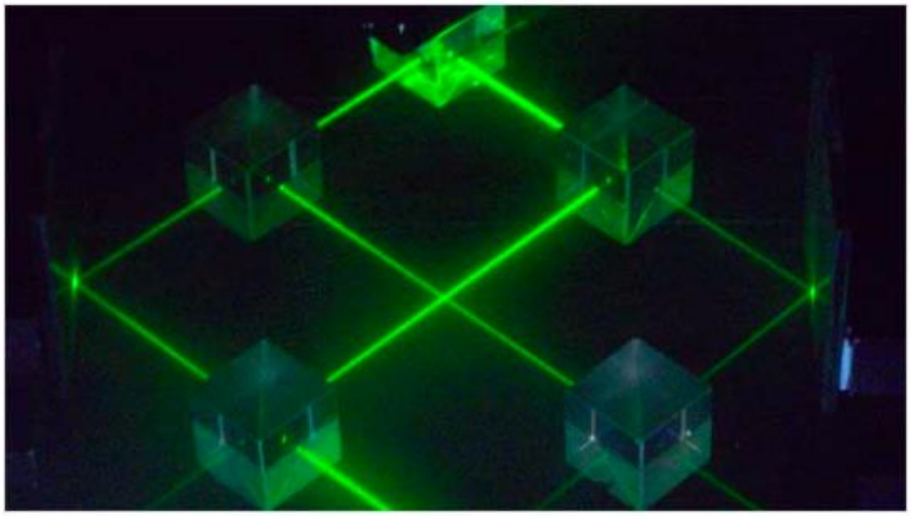
Strong activities ***quantum and ultrafast science*** (e.g. Reid, Faccio, Kar, Buller) ***laser manufacturing*** (e.g. Hand & Esser)

• St Andrews

Strong activities in ***Biophotonics, Semiconductor Optoelectronics, Quantum Optics, Nano-photonics*** (e.g. Dholakia, Samuel, Turnbull, Brown, Di Falco, Gather & Koenig)

Heriot-Watt awarded two prestigious EPSRC Fellowships in Quantum Technology

Date: 4 Aug 2015



Heriot-Watt University has won two prestigious Engineering and Physical Sciences Research Council (EPSRC) Fellowships in Quantum Technology, namely an Established Career Fellowship for Professor Gerald Buller (worth £1.4 million) and an Early Career Fellowship for new academic Dr Alessandro Fedrizzi (worth £1.2 million).

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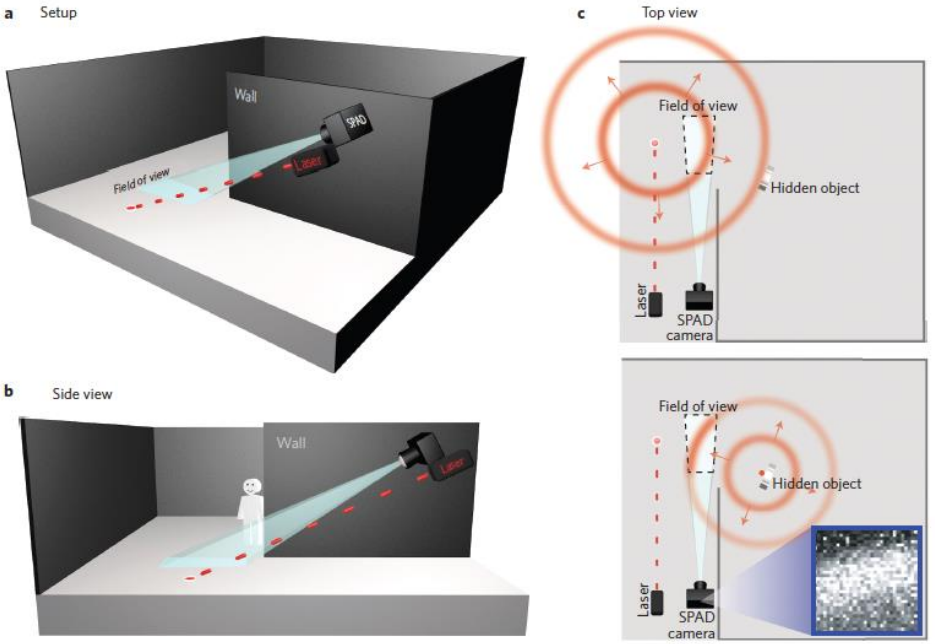
nature photonics
LETTERS
PUBLISHED ONLINE: 7 DECEMBER 2015 | DOI: 10.1038/NPHOTON.2015.234

Detection and tracking of moving objects hidden from view

Genevieve Gariepy[1]*, Francesco Tonolini[1], Robert Henderson[2], Jonathan Leach[1] and Daniele Faccio[1]*



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nature COMMUNICATIONS

ARTICLE

Received 11 Jun 2015 | Accepted 3 Dec 2015 | Published 19 Jan 2016

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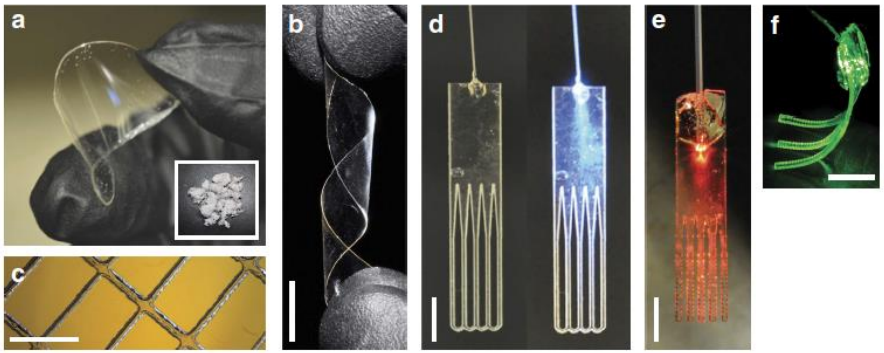
Bioabsorbable polymer optical waveguides for deep-tissue photomedicine

Sedat Nizamoglu[1,2], Malte C. Gather[1,3], Matjaž Humar[1,4], Myunghwan Choi[1,5], Seonghoon Kim[6], Ki Su Kim[1], Sei Kwang Hahn[7], Giuliano Scarcelli[1,8], Mark Randolph[1,9], Robert W. Redmond[1] & Seok Hyun Yun[1,10]



Existing Scope of Theme

• University of Dundee

Strong activities in ***optical manipulation, laser source development*** *and* ***laser applications*** (McGloin, Abdolvand, MacDonald, Wilcox, Cizmar and Cataluna)

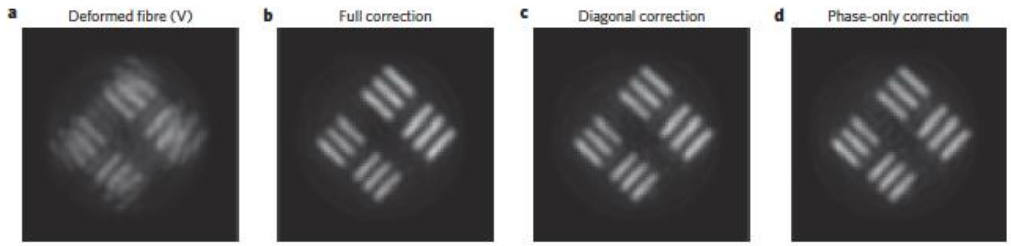
nature photonics

ARTICLES

PUBLISHED ONLINE: 13 JULY 2015 | DOI: 10.1038/NPHOTON.2015.112

Seeing through chaos in multimode fibres

Martin Plöschner[1], Tomáš Tyc[2] and Tomáš Čižmár[1]*



Existing Scope of Theme

• Institute of Photonics

Strong activities in ***light source development - diamond Raman lasers, VECSELs, microLED*** and ***nanoLED arrays***. (e.g. Dawson, Gu, Hastie, Kemp, Watson)

• Fraunhofer UK

Strong activities in industrial photonics e.g. ***laser source development, photonic instrumentation, fibre-optics*** (e.g. Dawson, Hopkins, Stothard, Bookey, Lagatsky)

Potential Areas for Development

• ***Biomedical optics and biophotonics:*** We have world leading biomedical research institutes in Scotland, such as the IGMM, QMRI & Beatson. There is a real opportunity for a Scotland-based UK Centre for Medical Photonics.

• ***Photonic-enabled remote sensing and space science:*** We have the UKATC in Edinburgh, the new Higgs innovation centre at Blackford hill, the Quantum-enhanced imaging hub. We have companies such as Selex, Thales and Clyde space – all interested in photonic-enabled sensing and imaging.

• ***Industrial photonics:*** The Fraunhofer UK is based in Scotland, we should be leveraging this more, with aim of taking research technologies to industry. How do we do this?