SUPA Physics Scotland

SUPA IAC – 11th May 2017

Condensed Matter and Materials Physics

Speaker: Chris Hooley

Theme Leader: Brendon Lovett (since 2014)

Largest Activities: Edinburgh, Glasgow, St Andrews, Strathclyde

Significant CM Presence: Dundee, Aberdeen, Heriot-Watt

Related CDT: *EPSRC Scottish Doctoral Training Centre in Condensed Matter Physics (Edinburgh, Heriot-Watt, St Andrews).*

Recent major grant: *EPSRC programme grant in quantum simulation (Strathclyde, Edinburgh, Oxford, Cambridge), £5.8M.*

Facilities: *Ultra-low-vibration lab, cleanroom, and oxide MBE facility (St Andrews); CSEC high-pressure labs (Edinburgh); MagTEM (Glasgow); xenon plasma FIB (Glasgow); 2D photonics fabrication facility (Heriot-Watt).*

Existing Scope of Theme

Core topics:

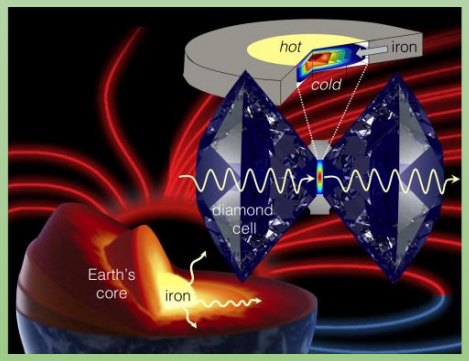
- Correlated systems, novel phases of matter, advanced quantum materials (St Andrews, Edinburgh)
- Microscopy for functional materials (Glasgow, Strathclyde)
- Soft condensed matter (Edinburgh)
- Nanomaterials and quantum information (Heriot-Watt, St Andrews)
- Optoelectronic devices (St Andrews, Glasgow, Strathclyde)
- Electron paramagnetic resonance (St Andrews, Dundee)
- Thin films, sensors, and imaging (University of the West of Scotland)

Areas of overlap with other themes:

- Biological physics (Edinburgh, Aberdeen, Dundee) – PALS.
- Solid oxide fuel cells (Aberdeen) – Energy.
- Organic LEDs and photovoltaics (St Andrews, Strathclyde) – Energy.
- Laser-engineered surface structures (Dundee) – Particle Physics.
- Single-photon sources (Heriot-Watt) – Photonics.

Illustrative Examples

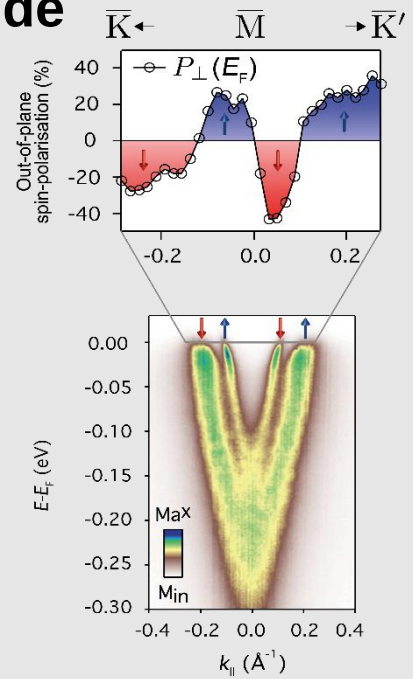
(Edinburgh)
Mimicking conditions at the centre of the Earth
Nature **534**, 99 (2016)

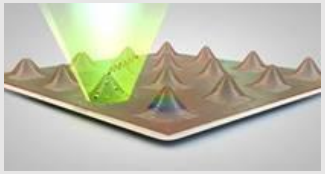


Dichalcogenide research

(St Andrews)

Basic science: measuring the Fermi surface. *Nature Comms.* **7**, 11711 (2016).





(Heriot-Watt)

Strain-induced single photon sources. *Nature Comms.*, in press (2017)

Bob Stamps (Glasgow) and Steve Lee (St Andrews) host the Joint European Magnetic Symposia 2016 in Glasgow

Potential Areas for Development

• **CDT3 collaboration / coordination.** Scotland should aim to increase its share of the UK CDT market in the 2018 round – light-touch co-ordination from SUPA could be very helpful in this.

• Lead the development of **an emerging quantum photonic platform** using atomically thin semiconductors with unique optical, electronic, and spin properties. Good CMMP / Photonics cross-link.

• **Cross-SUPA theoretical physics activities.** Useful cross-SUPA theorists' meeting on non-equilibrium physics took place in February 2017. Build on this: theory institute; non-equilibrium physics theme?

Concluding Remarks

- **The Condensed Matter and Materials Physics theme is in good shape: healthy recruitment of world-class staff, a strong stream of PhD candidates, and recent investment in top-end experimental facilities.**
- **However, a lot of this was done with SUPA II money, which is about to expire. What's the follow-up plan? In particular, do current political circumstances create new lobbying opportunities – if so, where, and what?**