

# Digital Technology Group - Research

Dr. Ian Wassell

# Research Areas

- Main areas:
  - Computing for the future of the planet
  - Wireless systems
  - Location systems
  - Privacy

# Digital Technology Group



Andy Hopper



Ian Wassell



Alastair Beresford



Robert Harle



Andy Rice

# Digital Technology Group

- Led by Prof. Andy Hopper
- Began life (1997) in Dept. of Engineering as 'Laboratory for Communication Engineering'
- Transferred to Computer Lab. in Oct. 2004
- Five full-time staff, plus post docs, plus research students
- Facilities for design and build of hardware as well as software, i.e., complete systems

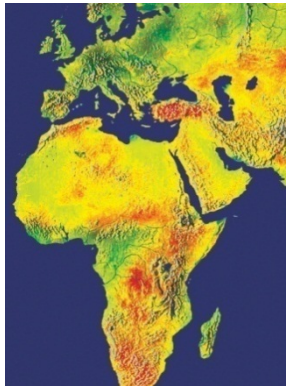
# Computing for the Future of the Planet

Optimal Digital Infrastructure



Predict & React

Sense & Optimise



Physical to Digital

Theme led by Prof. Andy Hopper

# FRESCO: A Framework For Reproducible Computation

- Big data is becoming more prevalent
- Reliance on big data is becoming more crucial
- When things go wrong (and they will):
  - How do you work out *what* went wrong?
  - How do you work out *how* it went wrong?
- We are building systems to track data provenance and enable reproducible computation
- Opportunities in: operating systems, distributed systems, algorithms, computational theory, networking
- New! ( < 12 months old) project. Opportunity to shape direction and make an impact!

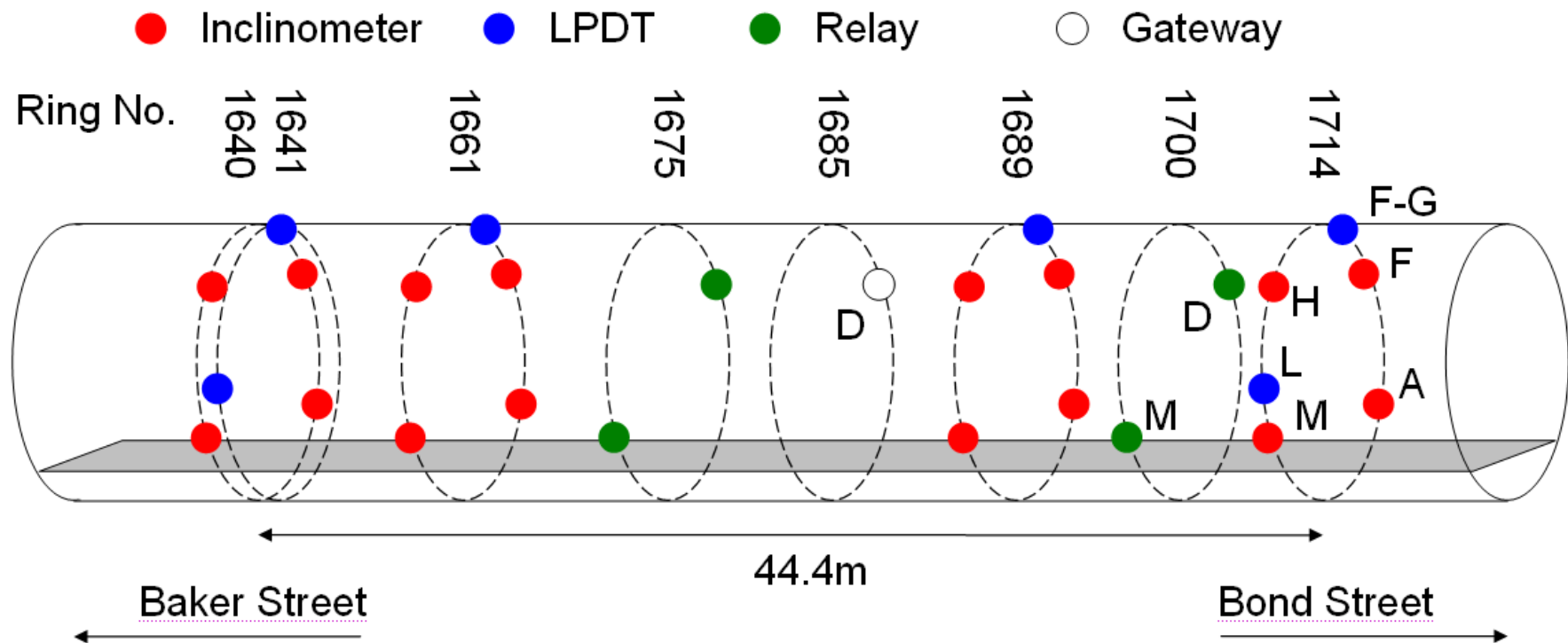
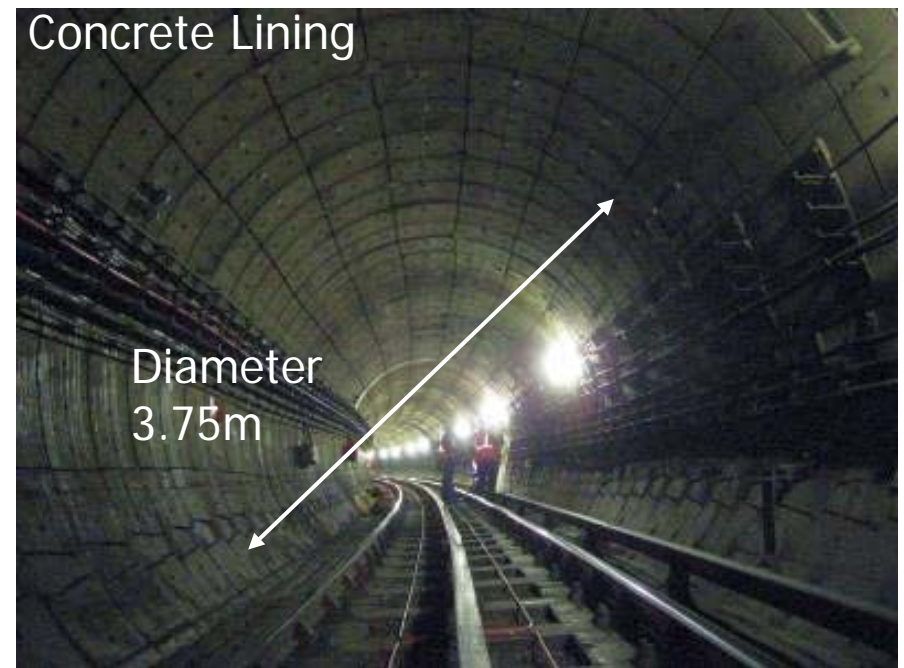
# Wireless – Technology and Applications

- Led by Dr. Ian Wassell
  - Propagation measurement and modelling
  - Wireless sensor networks – civil infrastructure and automotive
  - MAC and cross layer design, e.g., Multi-carrier burst contention (MCBC) protocol
  - Software defined radio (SDR), e.g., Microsoft SORA platform
  - Signal processing, e.g., compressive sensing for image processing and spectrum sensing for Cognitive Radio

# WSN monitors the London Underground

Measure:

- Wall inclination (16 sensors)
- Width of cracks (6 sensors)

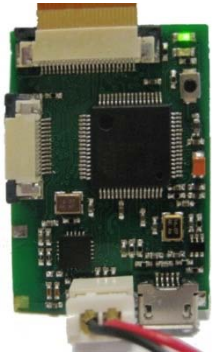




# Robert Harle

## *Sensors, Sensor Systems and Pervasive Computing*

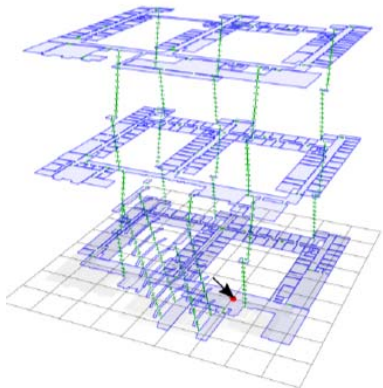
Develop, deploy and evaluate medium-scale sensor systems



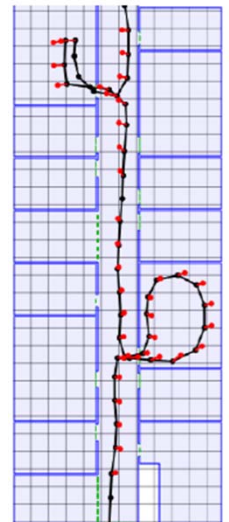
**Remote Healthcare** – Developing wireless sensors (pressure, accelerometers, etc.) that can be worn for long-term health monitoring, rehabilitation, etc. Challenges in sensing, interpretation and an architecture to permit remote rehab.



**Wireless Sports** – Similar to healthcare but with an emphasis on detecting and analysing sporting technique, training progressions, injury prevention and recovery. E.g. Kinect sensors, pressure sensors, smart fabrics.



**Location Tracking** – Providing robust indoor tracking using mobile phone sensors, WiFi signals, ultrasound and other techniques through sensor fusion.



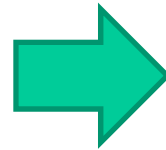
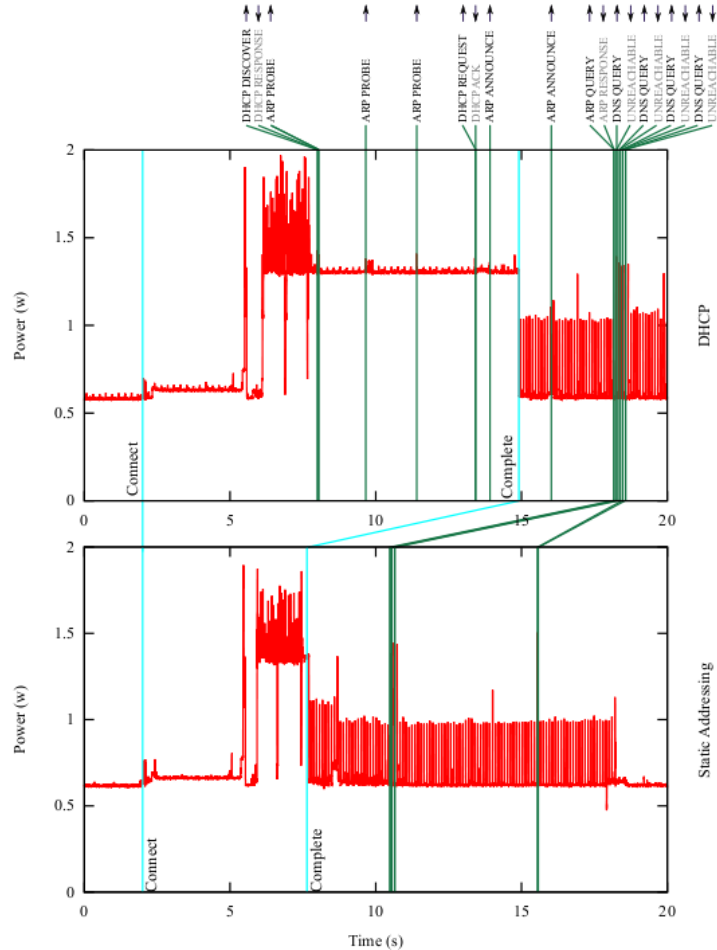
# Energy optimisation for Android devices

- Led by Dr. Andy Rice
- Extension of smartphone battery life
  - Detailed measurement and analysis of power consumption
  - Interaction of communication modes, e.g., 2G, 3G, Wi-Fi and Bluetooth
  - Effect of user interaction and real world use
  - Optimisation of resource utilisation
  - Feedback to developers

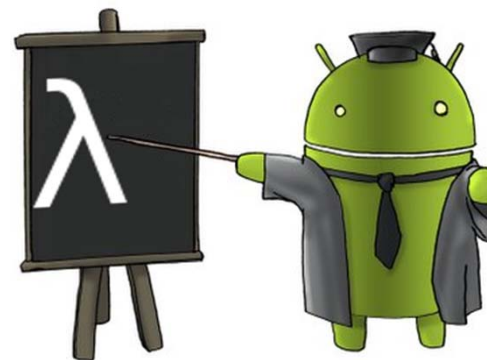
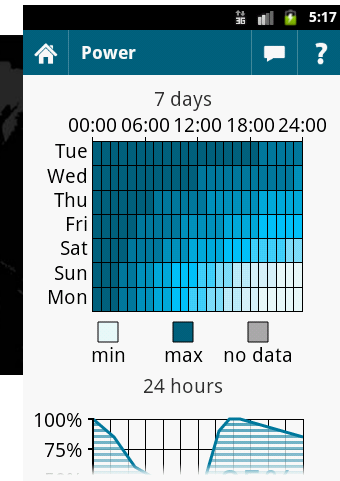
# Energy optimisation for Android mobiles

## Dr Andrew Rice

Measuring, explaining and optimising power consumption



Recording real-world use



Helping developers apply energy optimisation

# Alastair Beresford



*Interested in combinations of:*

- mobile and sensor-driven computing
- security and privacy
- programming languages



**Mockdroid:** a privacy-enhanced version of the Android OS; runs on Nexus One handsets



**Nigori:** encrypted data storage in the cloud; supports mobile device synchronisation

# Finally

- More info is available on the DTG Research web pages
- If you wish to discuss possible PhD research projects please contact the relevant member of faculty, or contact me if you need a pointer, [ijw24@cam.ac.uk](mailto:ijw24@cam.ac.uk)