STEM TECHNOLOGY & TOOLS

Sensing & detection capabilities

A common theme across many STEM research groups is the creation of new technologies and tools that could lead to a new generation of diagnostic tests and wellness monitoring. The work is wide-ranging, including novel sensors, microfluidics and nanoscience, all of which could enable more sensitive detection, as explained below.

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SENSORS

- Optical
- Ultrasonic
- Chemical
- Mechanical
- Electrical
- Biosensors
- Terahertz

Clinical context
Novel sensors provide methods for measuring parameters such as oxygenation, molecular concentrations and cellular stiffness.

MICROSCALE TECHNOLOGY

- Micro-Electro-Mechanical Systems (MEMS)
- Microfluidics
- Lab-on-a-chip

Clinical context
Clever handling of small volumes of fluid combined with sensitive detection methods could enable the next generation of body fluid analysis resulting in more point of care testing options.

Sensing & detection

NANOSCIENCE

- Nanoscale fabrication
- Single molecule characterisation
- Nanophotonics

Clinical context
The ability to create devices and structures that are only a few nanometres in size could enable highly sensitive detection of biomarkers in small volumes at low concentrations in body fluids.

PHYSICAL CHEMISTRY

- Polymers & Biopolymers
- Biophysical chemistry
- Self-assembly

Clinical context
Understanding of molecular interactions and materials can, for example, be applied to gain insight into protein structure and assembly and to develop controlled release mechanisms for therapeutics.

MIDDLEWARE

- Networks
- Signal processing
- Data analysis / mining
- Interfaces

Clinical context
The 'hidden' technologies that underpin development of novel medical devices and enable features such as telemedicine and automated analysis of imaging or sensing data for immediate feedback to patients.

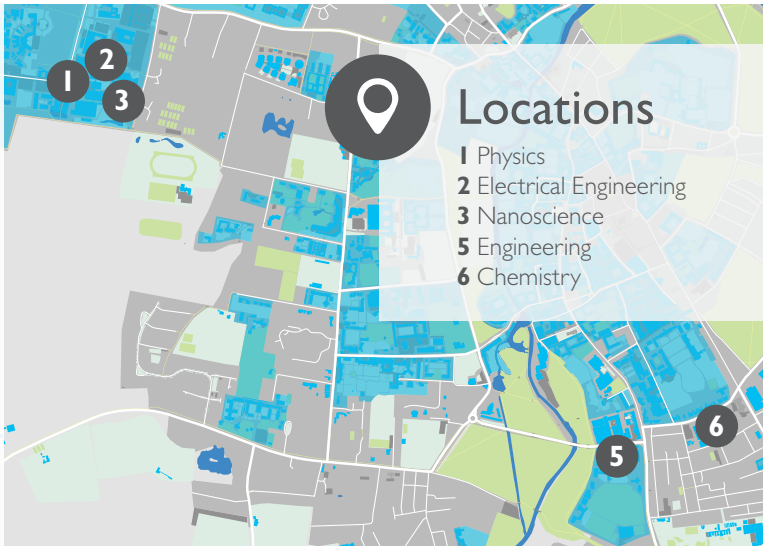
LARGE AREA ELECTRONICS

- Plastic electronics
- Wearable electronics

Clinical context
Enablers for a new generation of wellness and continuous monitoring devices that can be used at home by healthy individuals or by patients with chronic illnesses or recovering from procedures.

Overview

New STEM technologies and tools can be combined in a multitude of ways to provide new avenues for sensing and detection. To achieve success in this area, multidisciplinary collaborations combine, for example, optical detection expertise with physical chemistry knowledge and nanoscience fabrication to enable development of advanced molecular sensing. Extending such collaborations to include clinicians will enable further identification of where these technical solutions can meet clinical need.



To discuss opportunities contact **EDadmin@hermes.cam.ac.uk**