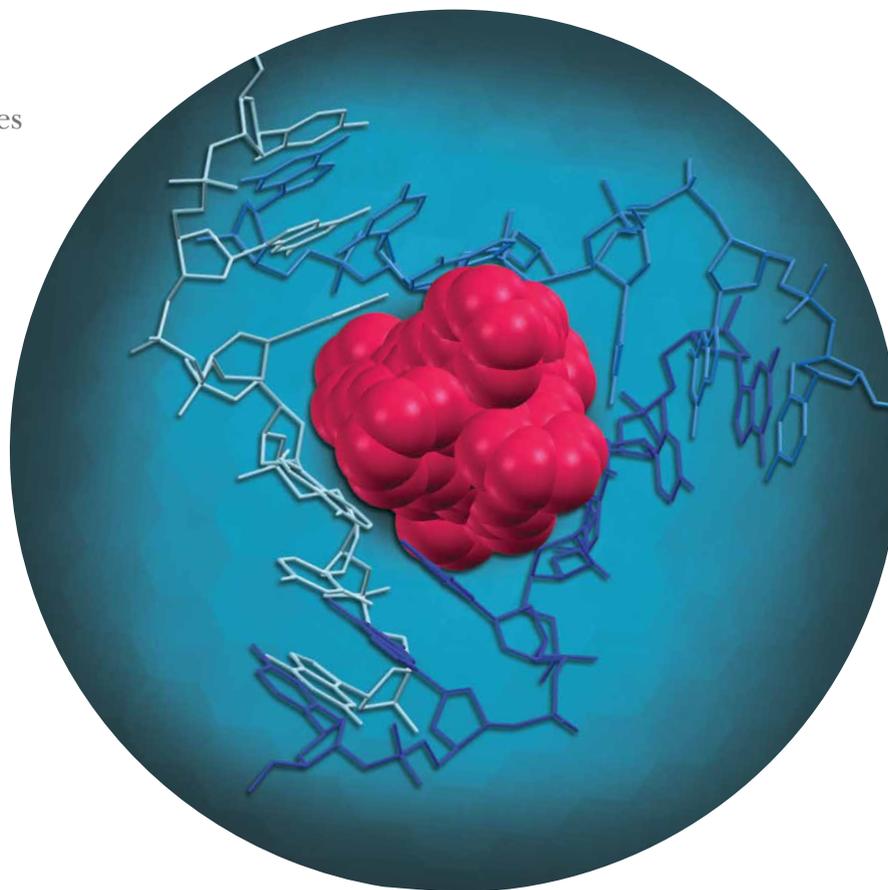


Chemistry for Healthcare Technologies

INNOVATING NEW TECHNOLOGIES
TO ADDRESS HEALTHCARE CHALLENGES

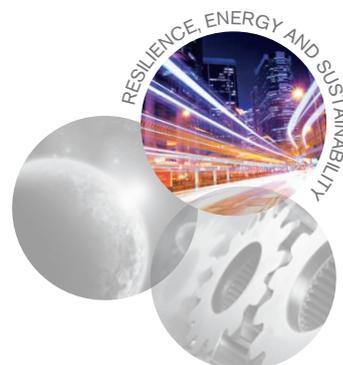
‘We develop novel technologies
and diagnostic techniques
to address current biomedical
and healthcare challenges.’

*Professor Mike Hannon,
Chair of Chemical Biology
and Director of the EPSRC
Centre for Doctoral Training
in Physical Sciences for Health*



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College of Engineering and
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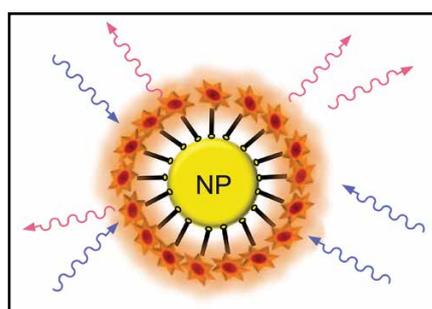
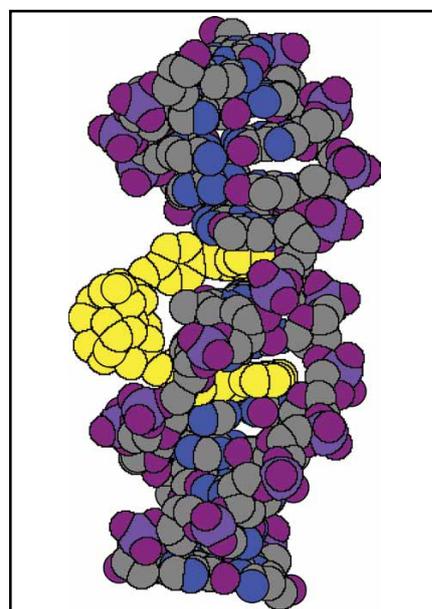
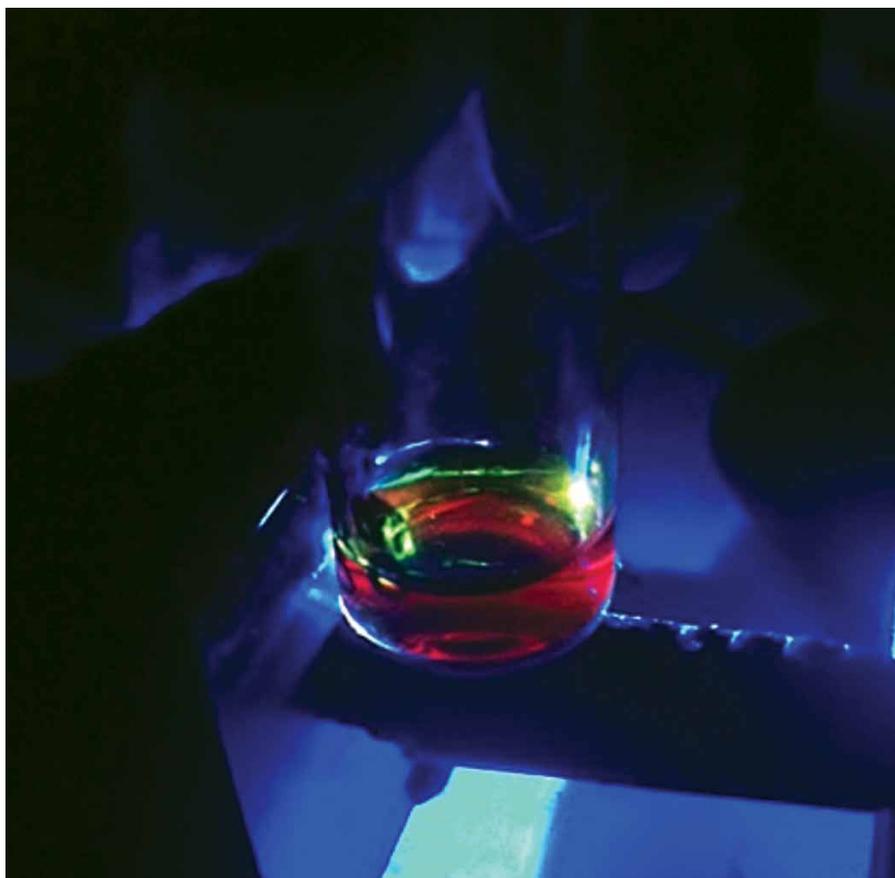


CHEMISTRY FOR HEALTHCARE TECHNOLOGIES

Our leading-edge research promotes novel approaches to diagnostics and imaging for biomedical and health applications. We develop the chemical tools and materials necessary to probe and image biological systems and, in so doing, provide new insights into how they function at hitherto unprecedented resolution. This brings together synthetic and biological chemists interested in molecular probe design, as well as physical and computational chemists who are developing instrumental approaches to diagnostics and imaging. This area of research also includes projects between chemistry and many other

disciplines at Birmingham, including physics, biosciences, computer science, chemical engineering and medicine.

New fluorescent, Magnetic Resonance Imaging (MRI) and molecular probes are being developed for imaging blood flow, labelling and tracking cells, and visualising and quantifying receptors to guide therapeutic treatment. This research is leading to new understanding in diverse areas ranging from sperm movement and modelling of force generation by flagella to adhesion of platelets and leukocytes to the walls of vessels – vital for understanding thrombosis and inflammation.

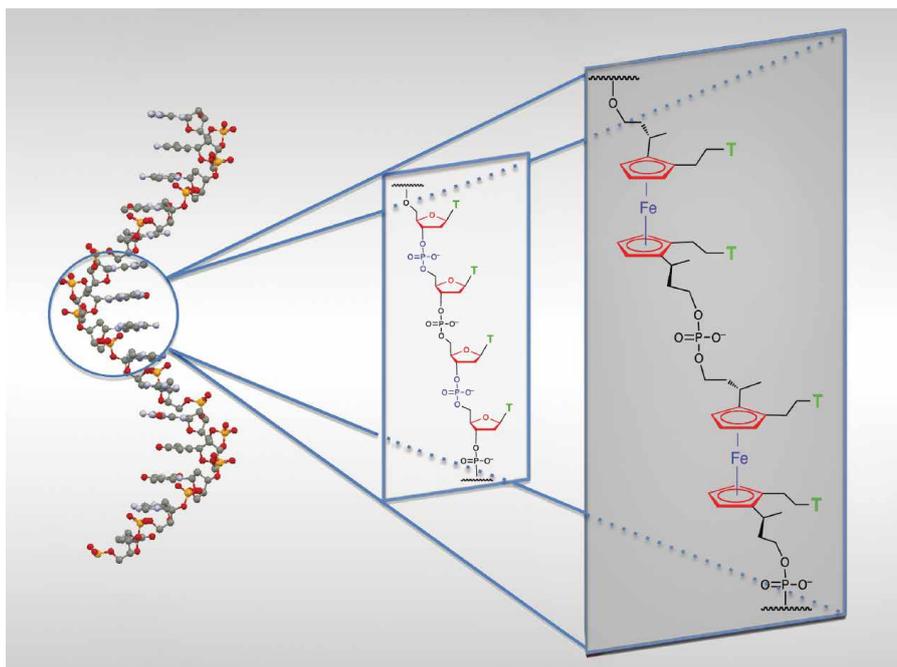
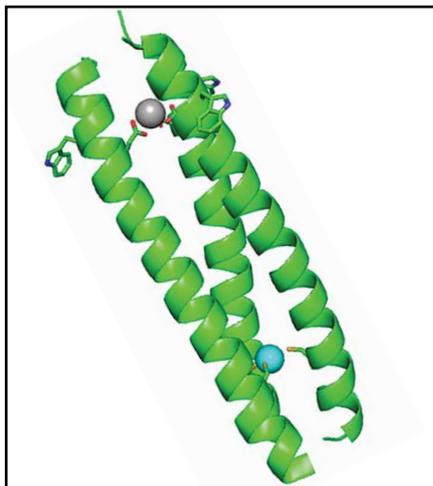


The healthcare challenges being faced today need truly interdisciplinary solutions. We are ideally placed to develop and deliver science and technology to address the needs of personalised medicine and an ageing society.

INDUSTRIAL COLLABORATIONS AND OPPORTUNITIES

We connect with a range of industrial sectors, including those that develop imaging technologies, as well as biotechnology and medical device companies for whom healthcare is key to their business.

Our research also underpins chemical activity in the Birmingham-based Physical Sciences for Health (Sci-Phy-4-Health), a doctoral training centre established to apply a range of physical science research areas to address key health challenges. Many of our students spend a year on an industrial placement – and we are encouraging even more to do so, as the benefits to both student and industry are great.



SCI-PHY-4-HEALTH

The brand new EPSRC funded Centre for Doctoral Training in Physical Sciences for Health (Sci-Phy-4-Health), is unique to the UK.

Directed by chemistry researchers, in collaboration with colleagues across the STEM base at Birmingham, the CDT's programme focuses on developing physical science and computer sciences to address three of today's great healthcare challenges:

- Rebuilding the ageing and diseased body – a UK government/societal 'grand challenge'
- Understanding cardiovascular disease, a major killer of over 65s
- Improving trauma and emergency medicine, a major killer of under 40s

Each research project is co-supervised by a physical scientist, computer scientist and biomedical/clinical researcher. The research programme is underpinned by a multi-disciplinary taught programme, transferable and project management skills training, and knowledge transfer and public engagement of science activities.

The programme benefits from partnerships with 13 large multinational companies, five SMEs, three hospitals and six public sector organisations. These provide taught material in the programme, are partners in the research training projects and offer student secondments.

Chemistry-focussed research in the CDT includes:

- Labelling therapeutic cells
- Devices that differentiate sterile and non-sterile inflammation
- Ceramic and polymeric biomaterials
- New probes and microscopies for studying cell adhesion and signalling in vascular disease
- Nano-compounds and methods to explore flow in confined spaces in teeth under repair, and in blood circulation
- Supramolecular recognition of key nucleic acid targets
- New probes and techniques at the frontiers of optical imaging of organisms

OUTSTANDING FACILITIES

We have a vast range of facilities in Chemistry at the University of Birmingham, including the Centre for Chemical and Biochemical Analysis, to provide the very highest quality of data analysis. Through our excellent facilities and high levels of technical expertise, we can offer a rapid turnaround of data to suit the individual requirements of both the academic community and external commercial organisations.

The X-ray diffraction facility is equipped with state-of-the-art diffractometers offering both single crystal, powder X-ray diffraction and X-ray fluorescence analysis. Our instruments enable rapid data collection and structure determination over a wide range of temperatures.



The mass spectrometry laboratory offers an extensive range of techniques and ionisation methods that include: electron ionisation (EI), chemical ionisation (CI) and GC/MS, LCMS, electrospray (ES)/APCI, accurate mass measurement, liquid secondary ionisation mass spectrometry (LSIMS) and matrix assisted laser desorption ionisation (MALDI).

Our well-equipped **NMR laboratories** house five spectrometers, allowing automated and fast turnarounds of multinuclear ^1H , ^{13}C , ^{19}F and ^{31}P spectra. Demanding multi-pulse experiments as well as variable temperature experiments can also be performed.

Our **chromatography laboratory** offers GC and HPLC (including prep, semi-prep and analytical) and we also provide elemental analysis for compounds containing carbon, hydrogen, nitrogen and sulphur.

As part of our extensive capabilities in synthetic chemistry, we can also undertake peptide and oligonucleotide synthesis as part of collaborative research projects with industry and other external users.



Learn more

chemistry4business@contacts.bham.ac.uk
www.birmingham.ac.uk/chemistry

CHEMISTRY

Our leading research in chemistry focuses on health, energy and sustainability, mapping squarely onto pressing national and global issues. By working at the interface of several disciplines as well as being strong in fundamental areas of theoretical and experimental chemistry, our research is creating real societal impact.

The University of Birmingham has one of the largest and diverse concentrations of science expertise in the UK and therefore we can offer our students and researchers unique opportunities for interdisciplinary study in a subject central to the new challenges facing the world today.

A KEY CONTRIBUTOR TO BROAD RESEARCH THEMES:

Chemistry is a core component of the College of Engineering and Physical Sciences. The College's portfolio of research capabilities and achievements can be summarised in three key overarching themes: Advanced Manufacturing; Science Frontiers; and Resilience, Energy and Sustainability. In this area, our research is driving both the technology and thinking required to solve some of the grand challenges facing the UK. Our ability to combine the practical with the radical has placed Birmingham at the forefront of this endeavour.



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