From basic research to the clinic

The OXION network was set up to bring together scientists at the universities of Oxford, Cambridge and London, and MRC Harwell who had an interest in understanding membrane proteins known as ion channels from atomic structure through mouse genetics to clinical studies.

“We made a specific decision to include the Mouse Genetics Unit at Harwell from the outset because of their shared scientific interests, complementary expertise, mouse models and outstanding facilities.” Professor Frances Ashcroft FRS, OXION Director

As a result of the network Professor Frances Ashcroft (DPAG) and Professor Roger Cox (Honorary Professor Oxford, Diabetes Program Leader MGU) initiated a decade-long collaborative research programme, funded by MRC and Wellcome Trust grants, which has led to a greater understanding of diabetes and insulin secretion.

In addition to this, researchers at MRC Harwell have collaborations with many departments of the University including:

- Physiology, Anatomy and Genetics (DPAG)
- Ophthalmology
- Biochemistry
- Chemistry
- Statistics
- Pharmacology
- Weatherall Institute of Molecular Medicine
- Kennedy Institute of Rheumatology
- Nuffield Department of Medicine
- Nuffield Department of Surgical Sciences and ENT Oxford
- Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences
- Oxford Centre for Diabetes, Endocrinology & Metabolism
- Welcome Trust Centre for Human Genetics

Leading a national resource

The Oxford Protein Production Facility UK is part of the Division of Structural Biology. It is located in the Research Centre at Harwell and maintains strong links to the University. Dr Ray Owens (Senior Research Fellow at the Nuffield Department of Medicine) is Head of the facility which is a National Resource Centre for protein production and crystallography. Projects from University of Oxford make up 16 per cent of successful applications to the peer-review rapid-access process.

This has led to a research and development collaboration with researchers in the Department of Chemistry on antibiotics and, on the Harwell site, links with the Membrane Protein Laboratory and Diamond Light Source.

*There is a 20 per cent limit on use by any one institution

An entrepreneurial virtuous circle

Oxford nanoSystems Ltd is part of a virtuous circle of engagement with the Said Business School (SBS). This MBA project became a start-up company and exemplar for the future Business Pre-Incubator (FBPI) winning competitions, funding, a space in the ESA-Business Incubation Centre and access to STFC facilities along the way. The circle is now complete with Oxford nanoSystems Ltd providing projects for SBS which supply insights for the company and give students real commercial experience. The CEO Jon Horbaly also provided advice to fellow SBS & FBPI alumni Oxford Space Structures who have emulated their success and are also now ESA-BIC incubatees.

“The University of Oxford brought together the business and science expertise in the academic environment to propel us into the business environment of the ESA-BIC with its associated entrepreneurial expertise.” Jon Horbaly, CEO Oxford nanoSystems
A message from the Pro-Vice-Chancellor for Research

The University of Oxford is internationally recognised for the range and excellence of its research, and the calibre of its academic researchers. This is maintained by conducting cutting-edge research which requires access to state-of-the-art facilities and collaborations with centres of expertise around the world.

The Harwell Oxford campus is home to several world-leading research facilities such as the Diamond Light Source, the ISIS neutron and muon source, the Central Laser Facility, the Rutherford Appleton Laboratory, the MRC Mammalian Genetics Unit and the Mary Lyon Centre, with the infrastructure and technical expertise to support them.

The proximity of these two globally renowned sites of expertise to support them.

Sharing knowledge

Working on collaborative research projects with researchers from the STFC Central Laser Facility (CLF) has given Dr Gianluca Gregori (Department of Physics) access to specialised expertise and an insight into what makes a good proposal for research with high-powered lasers. This was useful when he applied for a loan of a small laser system for the research group in Oxford.

Research groups in Oxford have not only made use of the CLF equipment but undergraduate and graduate students have also taken advantage of the training available through the university’s chemical crystallography service to undertake their research and training.

The structure, dynamics and unusual strength of spider silk have been studied under various conditions in a long-term collaboration between Professor Fritz Vollrath’s Silk Group in the Department of Zoology and Dr Ann Terry (visiting Research Oxford, SANS instrument Scientist, ISIS). Together they have been awarded 70 days of beamtime in the last 5 years.

Co-supervised students (EPSRC Next Generation) have been trained in neutron and x-ray scattering techniques and ISIS has gained expertise in biopolymer handling. This has benefitted other facility users with biological and large scale samples, and informed the development of the second target station at ISIS.

“Diamond has a superb scientific and technical infrastructure for looking after technology and manages the administration of user access.” Professor Angus Kirkland, Department of Materials

Collaboration arises from conversation

One successful beamtime application from the Chemistry and Biochemistry departments started as a conversation at the Red Kite Network. Established in 2012 this organisation promotes collaboration between structural scientists and raises awareness of the expertise and facilities in the region through biannual one-day meetings and facility tours. It is supported by the University through the John Fell Fund.

Efficient Experimentation

Dr Thorsten Hesjedal holds a joint appointment between the Department of Physics, ISIS and Diamond Light Source. Based in the Research Complex at Harwell, close to the facilities at ISIS and Diamond, the research group has real-time feedback of beamline results on sample fabrication. Other advantages include access to sample and translation facilities and meeting collaborators while analysing data and writing joint papers and proposals.

“We have the potential to cater for all the advanced quantum material needs on site from fabrication to analysis. This puts us in a really unique position.”

Dr Thorsten Hesjedal, Department of Physics, ISIS and Diamond Light Source

Research drives development

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Tooling up for nanoscience

The Department of Materials has committed 50 percent of Professor Angus Kirkland’s time to set up a state-of-the-art electron microscopy facility at Diamond. It will complement Diamond’s new hard X-ray nanoprobe beamline which will come into operation in 2016. Locating the imaging facilities in the same building will provide complementary techniques, promote interdisciplinary interactions and take advantage of the support available.

“Diamond has a superb scientific and technical infrastructure for looking after technology and manages the administration of user access.”

Dr Ann Terry, ISIS neutron and muon source

SCIENCE COLLABORATIONS

Teamwork solves crystal structure

Organic and organometallic research groups joined together to apply for regular access to the small molecule single crystal diffraction beamline at Diamond. The awarded time is used by the University’s Chemical Crystallography Service to determine the structure of their molecules of interest.

Dr Amber Thomson (Department of Chemistry, visiting scientist Diamond & ISIS) runs the service and regularly trains students and researchers in the use of synchrotron radiation for structure determination.

“The facilities at Diamond and ISIS are amazing, but the thing that is special is the people and their expertise.”

Dr Amber L. Thomson, Department of Chemistry

Sharing knowledge

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Research groups in Oxford have not only made use of the CLF equipment but undergraduate and graduate students have also taken advantage of the training available through the university’s chemical crystallography service to undertake their research and training.

“The access we provide at CLF to experimental facilities and high performance computing is vital for encouraging and training future researchers as suggested in the RCUK Wakeham review.”

Professor Peter Norreys, Professor of Inertial Fusion Science, Department of Physics and Head of Plasma Physics Group, STFC CLF