

Case study
2020
STFC

“ *We also expect to see a growth in work that will exploit our expertise in computing, software, lasers, and probably other areas*

Partnering to develop imaging technology

The Science and Technology Facilities Council (STFC) is all about developing critical, large scale infrastructures that can push at the limits of what can be achieved in research. Many of its own flagship facilities are located at the Harwell Campus alongside where the Rosalind Franklin Institute's new hub building is being built. As soon-to-be neighbours, the two organisations are nurturing a close relationship.

The STFC was a founding partner of The Franklin and its researchers are expected to have a key role in delivering the technologies that will underpin a number of the Institute's research themes. Much of the STFC's work to date has focused on the physical sciences, but The Franklin offers a unique opportunity to apply and exploit this expertise in the biological sciences.

Initially, Marcus French, head of the Detector and Electronics Division, is overseeing STFC contributions across three themes: Imaging with Sound and Light, Correlated Imaging and Structural Biology.

His team has already begun design work on the NOOR project, which is developing a new high-speed imaging sensor that can run at 25 million frames per second. The complementary metal oxide semi-conductor – better known as CMOS – sensors they are developing are similar to those found in mobile phones cameras, but customised to be able to capture images at this ultra-fast speed and store the resulting video on the chip until it is downloaded.

The delivered system will then combine four NOOR cameras in one unit to deliver an equivalent readout speed of 100 million frames per second.

"It is an incredibly high frame rate like this that you need that if you want to watch, for example, sound waves moving through a material as they do in the Imaging with Sound and Light theme" explains Mr French.

The CMOS sensor design group at STFC, led by Nicola Guerrini, are also developing camera systems for new cryogenic electron microscopes that will be needed in both the Correlated Imaging and Structural Biology Themes. Current state-of-the-art cryogenic electron microscopes operate with an electron beam at an energy of 300keV, but the aim is to build an equivalent system optimised for an energy of just 100keV. This enables images to be obtained whilst causing much less damage to biological samples and using less complicated and less expensive machines - but requires novel sensor technology to match the high energy system performance. This should also reduce the complexity of such microscopes so they can become more widely available for researchers. To deliver this the STFC team are working on a product known as C100, alongside Nobel Prize winning molecular biologist Richard Henderson at the MRC Laboratory of Molecular Biology in Cambridge, who is one of the pioneers of cryogenic electron microscopy.

Looking to the future the STFC sees great potential for collaboration with The Franklin other detector technologies, for example, Matt Wilson from STFC's Detector Development team is in discussions about how they can further contribute to the Correlative Imaging theme with their spectroscopic imaging technology.

The Diamond Light Source Laboratory at Harwell, of which STFC is main funder, also recently became the newest partner in The Franklin and is aiming to build upon the ground breaking work it does on structural biology.

"We also expect to see a growth in work that will exploit our expertise in computing, software, lasers, and probably other areas," says Professor Neil Geddes, executive director at STFC and the organisation's member representative at The Franklin. "We are already discussing how we can contribute in these areas. The Franklin is providing us with a route into a scientific community we have dealt with very little in the past for our technology development and this should lead to some exciting new opportunities."



Professor Neil Geddes,
STFC Executive Director,
National Laboratories
Science and Technologies



The Rosalind
Franklin Institute



Science and
Technology
Facilities Council

The Rosalind Franklin Institute is a registered charity in England and Wales, No. 1179810
Company Limited by Guarantee Registered in England and Wales, No. 11266143

Funded by UK Research and Innovation through the Engineering and Physical Sciences Research Council.