

The Wolfson Brain Imaging Centre Christmas Newsletter 2016



Dear WBIC colleagues and friends –

It has been a momentous year for the WBIC and we wanted to round it off with a quick update on where we've got to at the end of 2016, and what we're looking forward to in the New Year.

Of course the big news is that we managed successfully to install all the major new equipment, funded largely by the MRC, in the refurbished WBIC and in the new WBIC Annex.

This has been a massive team effort, sustained over 3 years, since we first started talking about the MRC grant application process at the end of 2013, through the grant writing and award process, to the “nice problem” of having to spend all the money we asked for in a very short period of time. We should all feel a great sense of achievement about having got to where we now stand – as one of the best equipped clinical imaging centres in Europe.

Over the next few pages, we've summarized the current state of play and future plans. It's a bit longer than most Christmas cards, but there's been a lot going on.

Festive greetings!

Ed Bullmore, Franklin Aigbirhio, Istvan Boros, Adrian Carpenter, Tim Fryer,
Fiona Gilbert, Vicky Lupson, Linda Morgan, James Rowe, Guy Williams

The WBIC Management Team
December 2016

Siemens 7T Terra – this ultra high field MRI system is now operational, the first of a new product line from Siemens to be installed outside Germany.

So far, this state-of-the-art instrument has been used to scan two objects: a kiwi fruit and the brain of the Regius Professor of Physic. It was very encouraging to see – even at this early stage of technical optimization – that the kiwi and the Regius images were recognizably different; yet both revealed fine-grained cortical lamination (Figures 1 & 2).

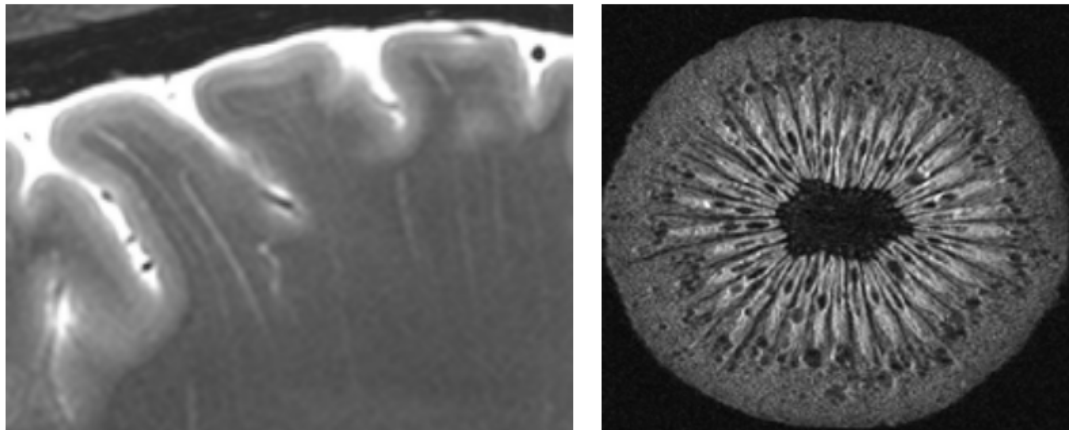


Figure 1: Ground-breaking 7T TERRA MRI research at the WBIC has demonstrated directly for the first time that both the cortex of the kiwi fruit (left) and the cortex of the Regius Professor of Physic (right) are internally laminated. Rowe et al (2016) *unpublished data*

Professor James Rowe was the lead applicant on the MRC application for this system and James has now joined the WBIC Management Team to lead the 7T research program in 2017 and beyond. He will be setting up a 7T research forum to exchange information and help people to get started on pilot projects and grant applications. Expect more information from James in the New Year and please get thinking about how you could use 7T MRI in your research - because it will be up and running from the start of 2017.

GE PET/MRI – this system for combined PET and MRI has completed acceptance testing and is technically ready to go. Over the last few months, we have been held up by a few snags in the building works – in particular, the new air conditioning system has been troublesome, and our access to the plant has been complicated by other building works ongoing in the vicinity. However, we expect to be open for business from mid-January 2017.

Professor Fiona Gilbert was an applicant on the MRC Clinical Research Infrastructure grant for this system and Fiona has now joined the WBIC Management Team to lead the PET/MRI core team (with Dr Tim Fryer and Dr Martin Graves) in 2017 and beyond. We have a good-sized portfolio of PET/MRI projects ready to start scanning in early 2017, including a mix of



dementia, mental health, traumatic brain injury and oncology studies.

Fiona already chairs the PET/CT research committee for CUHT, and this committee will be extended in scope to provide a one-stop shop for approval and coordination of research studies running on both NHS and University PET systems. Expect more news from Fiona in the New Year about how to plan and run your PET/MRI research studies in 2017.

GE-Hyperpolariser – in close proximity to the PET/MRI scanner, we have also installed a hyperpolariser – a key instrument for dynamic nuclear polarization imaging or hyperpolarized MRI. This equipment will allow us to translate the pioneering experimental research of Professor Kevin Brindle, Dr Ferdia Gallagher and colleagues to a bespoke clinical research environment. It will be very exciting in 2017 to see how this highly innovative imaging science can lead to development of new MRI markers of cancer metabolism in patients.

SIEMENS 3T SKYRA – this system has been installed in a new imaging suite, created by refurbishment of an engineering workshop located about 200 yards from the main WBIC building: now called the WBIC Annex. This provides an excellent patient scanning environment, especially for whole-body MRI, and magnetic resonance spectroscopy (MRS), in metabolic, musculoskeletal and oncological research. The scanning suite is also set up to support advanced brain radiotherapy planning for CUHT, as part of the overall plan to coordinate NHS and University MRI facilities effectively.

The SKYRA was the first of the new WBIC scanners to get running, a few months ago, and Vicky Lupson and Karen Welsh have been successful in scanning a diverse portfolio of studies since then. The system has settled down well and looks like it will be a reliable platform with plenty of capacity still available to start new studies in 2017.



Figure 2: Two out of four new WBIC scanners are already operational. The 3T SKYRA system (left) has been running neuro and whole body MRI research since September. In December, Professor Patrick Maxwell, FMedSci, was the first human to be scanned on the 7T TERRA system (right). Vicky Lupson leads the radiography team that will operate all 4 scanners as the PET/MRI and 3T PRISMA systems get up and running in early 2017.

SIEMENS 3T PRISMA – in early December, we completed the final scanner upgrade project – the conversion of the “workhorse” of the old WBIC establishment, a Siemens 3T Trio scanner, to PRISMA specification. This project was funded by a grant from the Wellcome Trust Institutional Strategic Support Fund and managed by Dr Adrian Carpenter and colleagues.

The 3T PRISMA will be mainly focused on neuroscience and mental health studies, with a special focus on advanced MRS methods for traumatic brain injury and neurogenetic mitochondrial disorders. It will also be technically aligned with the 3T PRISMA system operated by the MRC Cognition & Brain Sciences Unit, to support technical co-development, data sharing and multi-site studies between WBIC and MRC CBSU.

Vicky has joined the WBIC Management Team to supervise radiography and clinical operations across all 4 WBIC scanners. She is still in the process of building her team, and getting everybody up to speed on how to use the new scanners. We expect that all 4 scanners will be operational for research studies by the end of January 2017 (7T TERRA and 3T SKYRA are already operational). And we expect that more scanning time will become available for research over the course of the year as the radiography team gets bigger and completes training. Expect more news from Vicky in the New Year about the SKYRA and PRISMA 3T systems at the WBIC.

Radiopharmaceutical Unit (RPU) – the RPU is in the process of migrating its technical operations from the old lab facilities to the new and technically more advanced facilities recently installed by Professor Franklin Aigbirhio with MRC and NIHR funding. The RPU team headed up by Dr Istvan Boros passed an important regulatory milestone a few weeks ago when the MHRA audited and approved the new RPU facility for GMP production of PET radio-ligands.

At the same time as negotiating all this change, the RPU team has been successfully managing to keep up a steady stream of radio-ligand productions from the old lab to support PET/CT research. When the PET/MRI scanner becomes operational in January, we should be in good shape to ramp up radioligand production to underpin the growing volume of PET research we are expecting to see over the course of 2017.



Franklin will be in touch again next year with more news about what radio-ligands will be available for researchers to use, and when. In January, the WBIC will be serving a short menu of a few well-established ligands that are key to the ongoing PET/CT studies and the first tranche of PET/MRI studies. We then plan to gradually extend the menu of ligands available over the course of the year. If you are interested in a radioligand that is not already on the menu, talk to Franklin about your requirements. The Radiochemistry Development Unit led by

Franklin has the expertise to import new ligands from other PET centres, or develop them in house; but it takes time and good forward planning – so talk to Franklin sooner rather than later about a la carte ligands!

High Performance Computing – the last big infrastructural project of the year was to upgrade our computing infrastructure to a centralized, high-performance facility that can deliver the massive storage capacity and processing power needed to handle and analyse all the images collected by the new scanners.

Dr Guy Williams has been leading this project and has joined the WBIC Management Team to lead on informatics and computing in 2017 and beyond. The new high performance hub for informatics (HPHI) has already been populated by transfer of data from the WBIC's large existing image archive and Guy is building a team of University and NHS colleagues that will be working with him to test and roll-out the new system more extensively in the New Year.

Delivering this much-enhanced computing environment will be a crucially important ingredient in the overall success of imaging research. So if you are interested in contributing your end-user perspectives or technical expertise to help getting the HPHI fully embedded across Cambridge, please watch out for more communications from Guy next year.

MRC Clinical Research Infrastructure Project Delivery - almost all of this new equipment – 7T MRI, 3T SKYRA, PET/MRI, NeuroSpin, RPU, HPHI – was funded by capital grants from the MRC.

The grants were made in Summer 2014 and the School of Clinical Medicine was awarded about £29 million, in total, all of which had to be spent by the end of March 2016. This was a complex, time-pressured process that would not have been possible without expert professional support from many parts of the University's Unified Administrative Service (UAS), including legal, procurement, financial and project management.

In the end, the team ended up bang on time and budget, having capitalised 99.9% of the available funding by the MRC's deadline. Joe Ackers, Rosemary Boyle, Caroline Edmonds, Dimple Fernando, Gaynor Hollander, Fern McCall, Linda Morgan, Lesley Pilgrim, Katherine Stalham, Tom Twitchett, Robin Uttin, Rob Williams and Libby Yates were all shortlisted for a UAS Employee Recognition



Award, which was celebrated by a reception in the Old Combination Room of the University in December.

WBIC Day: celebrating the first 20 years and the next 10 years - on 24 October we held a full-day scientific meeting, interspersed with tours of the new facility, and finished off by a dinner at Robinson College. This event was attended by about 300 people and it was great to see so many old and new colleagues getting together to celebrate what has already been achieved and what we plan to do in future at the WBIC.



Celebrating the first 20 years and the next 10 years of the WBIC
Cambridge, 24 October 2016

Clockwise from top left: Emeritus Professor John D Pickard, founding Chair of the WBIC, opened the scientific meeting; people liked the look of the 7T MRI; Linda Morgan and Guy Williams; Professor Zoe Kourtzi; Adrian Carpenter and Professor Robert Turner; Professor Jean-Claude Baron: more photos at www.wbic.cam.ac.uk