Mark Cunningham, newly appointed Professor of Neurophysiology of Epilepsy (2016) in Trinity’s School of Medicine, is talking about how his research brings together fundamental science with the clinical element.

He took up his Trinity appointment in the summer and has been occupied with moving his laboratory and equipment from the University of Newcastle, where he was previously based. “A lot of the equipment is quite sensitive and heavy. We use it to record from brain cells - that means large anti-vibration tables with stainless steel tops to keep things stable while we put tiny micro-electrodes into individual brain cells to record the electrical signal of these cells, and how networks of those cells behave.”

His research into epilepsy began formally with his PhD in the University of Bristol looking at how anti-epileptic drugs alter the release transmitter at the connection between brain cells - the synapse, but in fact his interest in synapses started much earlier.

“At school in Newry, I had an inspirational biology teacher and I have a clear recollection as part of the biology A Level that we covered synapses and I became really interested in these discrete structures. That’s when I discovered that I have a passionate side to my personality with respect to research which I think you need to be an academic.”

He studied Physiology at Queen’s University Belfast and proceeded to Bristol University to do his PhD under Professor Roland Jones, staying on for a time after to work with Pfizer on developing new anti-epileptic drugs.

He then moved as a post-doctoral fellow in 2001 to the University of Leeds where they were doing “really interesting work around brainwaves”. He explains: “Typically, we use EEGs to look at abnormal electrical activity in the brain but an EEG is attached to the scalp so you’re not recording directly from the brain tissue itself. In Leeds we were able to use slices of brain tissue from laboratory animals. Kept alive, these slices contain important structures of the brain and generate organised electrical activity enabling us to study the brain oscillations that are disrupted in epilepsy and schizophrenia.”

After four years in Leeds with a brief visiting scientist post at Heidelberg University, he moved to the University of Newcastle to take up a five-year fellowship, created by the UK Research Council as a tenure track position. The medical school in Newcastle is physically attached to the hospital, and after meeting with neurosurgeons, he was able to start working on human tissue.

“At that time, pharma was becoming increasingly challenged in their attempts to develop new drugs for diseases of the brain and there had been a number of high-profile failures.

“I do fundamental neuroscience that has impact at the level of patient treatment. My research is translational with implications for neurosurgeons, neurologists, pharmacologists - anyone treating patients with epilepsy, or indeed other brain disorders.”

Professor Mark Cunningham
Ellen Mayston Bates Professor of Neurophysiology of Epilepsy (2016)
Part of the problem is that working with animal models involves a massive assumption that this would work for the human brain. I was very keen to understand more through using human tissue.

For about a third of patients with epilepsy, he explains, surgery is a valued option. With the consent of patients, he was able to obtain microscopic slices of tissue removed during surgery and bring them back to the lab and record from human neurons.

“This was a bit of a game-changer and it rekindled my connection with pharma. I worked with them looking at treatments for epilepsy and brain tumours.”

He and his wife, who is from Donegal and works as a dietician with the NHS, had it “in the backs of our minds that we wanted to come home, and Brexit really brought that into focus”. He was excited when the Trinity job was advertised – “Trinity has an excellent reputation and its connection to hospitals makes it ideal for the kind of translational research that I do.”

The Professorship in Neurophysiology of Epilepsy is a newly created chair, founded thanks to an endowment from Ellen Mayston Bates, who also endowed a clinical chair in epilepsy that will be filled shortly.

This is Professor Cunningham’s first time living and working in the Republic of Ireland. “My mother is from Wexford and we used to drive down every summer from Newry and this was before the M50 so we’d go through Dublin city centre. We’d drive right up to Trinity’s Front Gate and then around the side to get to the N11. I’ve a very clear memory of looking at Front Gate and thinking ‘what goes on in there?’ So it’s a nice circle of life to be working here now.”

Thus far he’s delighted with Dublin – “it’s a very vibrant, multicultural dynamic city” – and with Trinity – “I’m impressed by the way that Trinity has held on to its traditions while also looking outward and staying nimble and adaptive in a fast-paced world.”

As an example of great Trinity traditions, he cites the Senior Common Room, which he says is something that many British universities got rid of over the past decade but “is so important for giving you headspace and allowing you meet colleagues informally.” As examples of Trinity’s adaptability and modernity, he talks about its interdisciplinarity, translational research, innovation and partnering with industry.

“I’ve had meetings with neurosurgeons from Beaumont and I’m hopeful that I’ll be able to get access to human brain tissue as I had at Newcastle.”

And he’s already put feelers out to industry. “I had two guests over from the pharma company, Eli-Lilly looking to apply for SFI funding and organise a partnership around ageing and epilepsy.”

Epilepsy, he explains, can be early, or late-life, onset. The reasons for late onset overlap with ageing itself, meaning that research has potential to address both conditions. “I’ve had discussions with Rose-Anne Kenny, who heads up TILDA [the longitudinal study for ageing]. I think Trinity is potentially a very collaborative space. It’s about getting out and meeting people which is something I like to do.”

He is looking forward to settling his family into Ireland and taking advantage of the outdoors as well as the theatres and exhibitions on his doorstep in Trinity.

On campus, his priorities are to get his lab up and running with access to brain tissue; target funding where industry and research meet; and get stuck into teaching.

“Neuroscience education is a fast-developing area. I’m hoping to get products from a US company, Backyard Brains, which has created small portable labs on circuit board. You can hook these up to electrodes and then connect to your smartphone to see individual muscle fibres firing. That really brings the science home to students.”

“Education is essential to research. It’s important to expose students to cutting-edge research and it’s an opportunity to talent spot people for a masters or PhD. I look forward to building up a vibrant team doing translational research here in Trinity in epilepsy, with implications for other diseases of the brain.”
Professor Mark Cunningham – Ellen Mayston Bates Professor of Neurophysiology of Epilepsy (2016)
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