



Brain Health Research Centre

Te Pokapū Rakahau Hauora Hinekarō

Newsletter February 2015

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Promotions in the Centre

Congratulations to some of our Brain Health Research Centre members who have recently been made Associate Professors:

Department of Anatomy
Christine Jasoni and Ping Lu

Department of Computer Science
Lubica Bunuskova

Department of Pharmacology and Toxicology
Ivan Sammut

Young enquiring minds join our Centre



Shakila Rizwan, Ryan Ward, Karl Iremonger and Alex Tup

Karl Iremonger

Karl is new to the Centre and has already made headlines nationally by winning the Prime Minister's McDairmid Emerging Scientist Prize late last year. His research focuses on understanding how the brain responds and adapts to stress. Corticotrophin-releasing hormone neurons are located in an area of the brain called the hypothalamus. These "stress" neurons are activated by stress and are responsible for controlling the level of stress hormones in the body. Karl's research focuses on understanding how these neurons function and how hormone levels are controlled by these cells. This research is leading to a better understanding of how the brain normally responds to stress as well as what may go wrong in neurological disorders associated with abnormal stress responses.

"What I find particularly fascinating is the way that the experiences we have in our day to day lives all induce small changes in the structure of cells in different parts of our brains. These changes not only allow us to store memories but also allow us to subconsciously adapt how our bodies function in an ever-changing environment."

Ryan Ward

Behavioural neuroscience, with a particular emphasis on neural processes and circuits underlying motivation, cognition, and their interaction is Ryan's main research interest. "To understand how the brain works is to understand what makes us human. How does the brain take sensory inputs from the external world, translate this information into a computationally accessible form, then use the results to make decisions about an appropriate course of action. What a monumental task!"

Ryan's work looks at deficits in motivation and cognition which are symptomatic of psychiatric diseases such as schizophrenia. We know that motivational and cognitive impairments interact to produce functional impairments, but the neural basis of this interaction is not well known and current treatments fail to treat these deficits. We use sophisticated behavioural analysis combined with molecular genetic manipulation of defined neural circuits to study this interaction.

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Alex Tup

Alex Tup is based in the Department of Physiology at the Otago School of Medical Sciences. Alex's focus is on brain cells' regulation of metabolism. In particular Alex is interested in the interplay of the hormones leptin and insulin in the hypothalamus of the brain, which appears crucial for the maintenance of energy and glucose balance. Loss of central leptin action during obesity leads to impaired insulin action, which might explain the striking correlation of obesity and type 2 diabetes. "The brain is a fascinating and complex organ. We are only scratching at its surface so far but we always find novel fascinating aspects like the possible link between type 2 diabetes and Alzheimer's disease." Some researchers are already starting to name Alzheimer's as type 3 diabetes.

Shakila Rizwan

Nature has cleverly crafted an almost impermeable fortress known as the blood-brain barrier (BBB) to protect our brain from foreign material circulating in the blood. The BBB regulates the selective and specific transport of materials into and out of the brain. However, in safeguarding the brain, the BBB simultaneously presents a formidable obstacle to getting therapeutic concentration of drugs into the brain. This research is centred around designing different drug carrier systems that may enable therapeutic concentrations of poorly permeable drugs to reach the brain.

"I think of my research as trying to find different ways to trick the BBB in order to smuggle drugs across it and into the brain. What drives me is the hope that one day my research may contribute towards effective therapies for patients."

Dynamic de Ridder Duo on campus



Our researchers were treated to a rare opportunity recently when our own Chair in Neurosurgery Professor Dirk de Ridder had a visit from his father, Emeritus Professor Leo de Ridder. Professor de Ridder senior, based in Belgium, has specialised in Nuclear medicine and Radiotherapy since the 1970s. Leo shared his research utilising and growing tumour biopsies in the laboratory. These cultured cells are observed to try and understand how the tissue behaves. This information is used to predict growth patterns in tumours in the human brain. Ultimately the benefit in the future would be in treating those who have residual tumour tissue unable to be removed by surgery. The hope is that by better understanding the growth patterns of residual tissue, improved outcomes will be established for those patients.

Professor David Bilkey and Deputy Director Associate Professor Christine Jason – new leaders at BHRC



David is a Professor in the Psychology Department. He has two main research interests. The first involves studying how neurons in the brain change the way they process and communicate information in schizophrenia. This work is aimed at better understanding the illness and developing new therapeutic approaches. He is also interested in understanding how information is stored in the brain and how the brain makes decisions based on that information. This second area will help to understand brain function in neurodegenerative diseases where decision making is compromised.

Professor Bilkey enjoys his work because everything he learns is completely new. "We are constantly pushing forward at the edges of knowledge, and we are in a position where we can potentially help everyone's understanding of brain disorders."

He was looking forward to continuing to develop the BHRC by facilitating novel high-quality neuroscience research at Otago, and communicating that research to New Zealand and the rest of the world. He looks forward to having the BHRC continuing its public seminars and talks around Otago and Southland.

Christine is an Associate Professor in the Anatomy Department. Her research interest is understanding how maternal health during pregnancy affects the development of the fetal brain. In particular, she focuses on pregnancy complications like infection and obesity, which have been shown in public health studies to increase the risk of developing schizophrenia, autism and childhood obesity.

"I enjoy learning how the brain develops – it's so complicated that putting it all together is amazing – but also, because I'm looking at how a mother's health can affect her offspring's health I feel like I'm making a contribution to understanding health and wellbeing of people across their lives."

She likes how the BHRC provides excellent support for its researchers, whose research covers the life span of brain health from fetal development through to aging and age-related disorders.

"The other thing the BHRC does really well is giving back to the community. Letting people in the community know what we do and getting kids interested in the brain and in science are both very important aspects of our research centre."

The joint minds of seven universities shine in Dunedin



Matariki is the cluster of stars, also known as the Pleiades star cluster, which makes up the seven sisters' constellation in Māori legend. When a new collaboration of seven universities was developed, it seemed Matariki was the perfect name for this network. In December last year our Centre brought together integrative neuroscience researchers from Perth (Australia), Durham (UK), Uppsala (Sweden), Kingston (Canada), Dunedin (New Zealand), Tübingen (Germany) and Hanover (USA) as part of this network. We may be one of the southern-most research centres in the world, but this geographical isolation does not mean that our research is undertaken in an isolated environment. The bringing together of these diverse researchers to share their findings, spend time working together and also see some of our beautiful country was beneficial to all. It is hoped that these types of collaboration will become more regular in the future.

The sound of the brain

What sound does a brain make? During this year's Brain Week you will have the opportunity to hear and see just what does go on in our brain when we listen to music. University of Otago Mozart Fellow, Jeremy Mayall, has worked in conjunction with our neuroscientists to create a composition "Musico in Cerebro." Our scientists have captured the sound of our brain waves and Jeremy has incorporated them into a musical composition designed to stimulate our emotions

and reactions. During this performance you will also be able to see patterns of the brain on the big screen as interpreted by EEG.

This World Premiere will take place at the Otago Museum on Sunday 15 March at 2.30pm in the Hutton Theatre. A full list of Brain Week 2015 events is listed on page 4.



Message from our Director

Professor David Bilkey

Hello and greetings. This is my first communication as the new Director of the BHRC and I am writing it after having enjoyed one of the best summers we have had here in the south for some time (for any of you on farms, I know that you might be looking at things rather differently). I hope that you too have had an enjoyable holiday period and are looking forward to 2015. For me, I am most excited about being able to assist the BHRC in moving forward with its mission of supporting excellent, international quality research into brain health and disease, translating this into new treatment options and communicating this work to our supporters and the broader community. I am lucky to be working with a great team of people who are all committed to helping us move towards these goals. In particular, however, I would like to thank Associate Professor Christine Jasoni who has come on board as deputy director. Christine is a very skilled neuroscientist who also has a great background in outreach with the community. Dr Nick Cutfield will continue as clinical deputy director. I look forward to working with them both.

Over the last few years we have adopted a theme for each year, around which we have built seminars and meetings. Last year it was

stroke, and prior to that Aging. This year, however, our theme is 'The Healthy Brain' with a focus on what makes for a healthy and resilient brain, both physically and psychologically. We have a number of events planned for this year, many of these linked to this theme so I do hope that you will be able to be involved in at least some of them.

The fact that Christine and I are new to these positions is to some degree a result of the previous BHRC Director Professor Cliff Abraham and Deputy Director Associate Professor John Reynolds taking on new roles in the new national Centre for Research Excellence 'Brain Research New Zealand'. I wish to acknowledge the huge impact that both Cliff and John have had in developing the BHRC over the previous eight years. They have done a marvellous job and have left the centre in a fine state as one of Otago University's premiere research Centres. I should emphasise that both Cliff and John will remain members of the BHRC, but I do wish them well with their new endeavour, I thank them once again for their fine work, and I very much look forward to the possibility of future collaborations between the BHRC and the national centre.

Brain Week 2015 Programme

Friday 13 – Thursday 19 March 2015 Brain Awareness Week, the global campaign to increase public awareness of the progress and benefits of brain research. All events at the Otago Museum.

Programme

Mental or menstrual: female hormones' influence on the Brain

Professor Inger Sundstrom, Women and Children's Health Uppsala University Sweden

Free, 5.30pm, 13 March, Hutton Theatre

Neurological Foundation Event – Bright Young Things

Free, 10am–3pm, Saturday 14 March, Hutton Theatre

A panel event organised by the Neurological Foundation of New Zealand. International experts will feature alongside local brain health agency representatives.

Brain Awareness Family Day

When I grow up I want to... be a Brainiac – a Brain Surgeon or a Toxicologist or Have a Healthy Brain!

Free, 11am–3pm, Sunday 15 March, Atrium level 1

2.30pm *musica in cerebro* World premiere of the composition by Mozart Fellow Jeremy Mayall, utilising sounds of the brain and emotion.

Brain Bites 1 Focus on Parkinson's

Free, 12–1pm, Monday 16 March, Hutton Theatre

Building Resilience in Children and within Whānau and Community

Free, 7pm, Monday 16 March, Hutton Theatre

Brain Bites 2 Focus on Schizophrenia

Free, 12–1pm, Tuesday 17 March, Hutton Theatre

The Neurobiology of Schizophrenia

Free, 7pm, Tuesday 17 March, Hutton Theatre

Brain Bites 3 Focus on Concussion

Free, 12–1pm, Wednesday 18 March, Hutton Theatre

The power of the brain in Stroke therapy

Free, 5.30pm, Wednesday 18 March, Queenstown Memorial Centre

Are birds really bird-brained?

Free, 7pm, Wednesday 18 March, Hutton Theatre

Brain Bites 4 - World War One Brain Injuries – prognosis then and now

Free, 12–1pm, Thursday 19 March, Hutton Theatre

It's brawn over brain, every time- The Great Brain Debate II

Free, 7pm, Thursday 19 March, Hutton Theatre

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Three good reasons to eat walnuts



A shelled walnut not only looks a little like a brain, it contains nutrients that are known to be good for our brain health. Our brain needs high quality fats like omega-3s to function properly. Walnuts contain high levels of these fats and so are an ideal snack.

This little nut also contains high levels of melatonin, which is a hormone in our brain which regulates our sleep patterns. It seems a handful of walnuts before bedtime may be an ideal late night snack.

The third reason walnuts are good for our brain is because they contain manganese, copper, iron, phosphorus, magnesium, and calcium, nutrients that are vital for good brain health.

News in Brief



Steve Seo has been awarded the Brain Health Research Centre (BHRC) 2015 Roche Hanns Möhler Scholarship. Steve is conducting research on the contribution of thalamic (grey matter) GABA_A receptors in the generation of absence seizures, which have detrimental effects on childhood learning, psychosocial abilities and physical safety.



Philip Aitken has been announced as the recipient of the Helen Rosa Thacker PhD scholarship. Philip's research is around the impact that vestibular (part of our sense of balance) modulation has on hippocampal spatial memory.