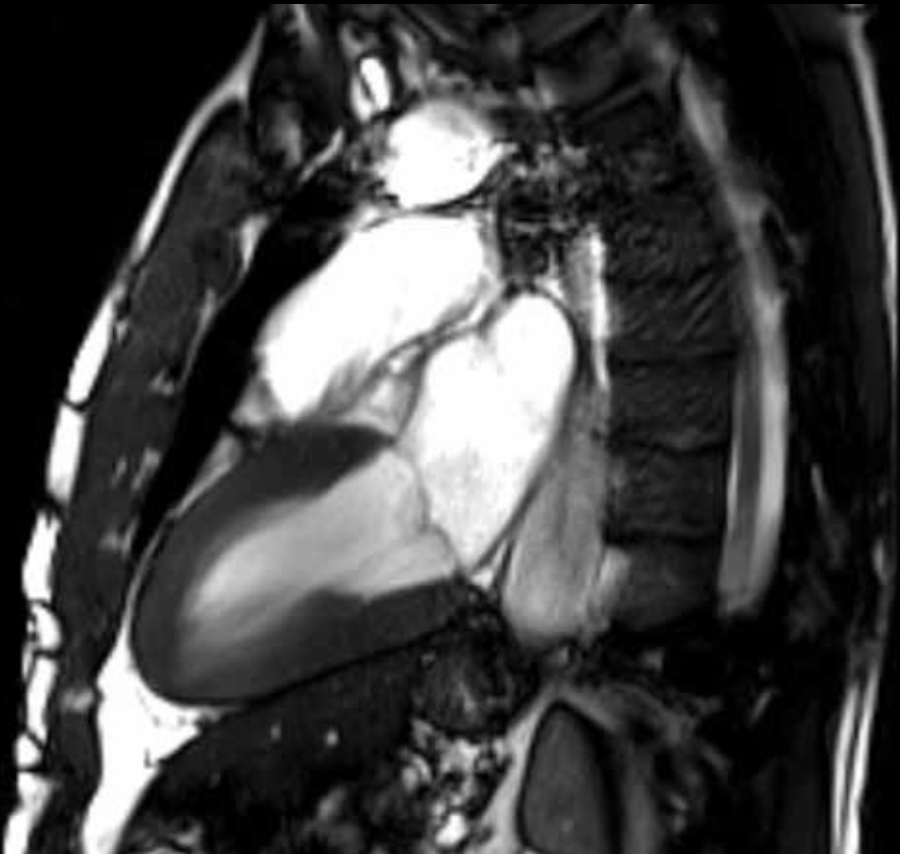




MONASH
University

MONASH
BIOMEDICAL
IMAGING
AND LINKED
LABORATORIES

ANNUAL REPORT
2017





MONASH BIOMEDICAL IMAGING

Member



Monash MedTech

Supporters



Collaborators



Partners



Table Of Contents

Vice-Provost's Report	4
Director's Report	5
Overview Facilities Governance 2017 Snapshot	6-7
Personnel Staff Students	8
Research Activities Monash Biomedical Imaging Monash Brain and Mental Health Monash Neuroscience of Consciousness	9-21
Collaborations	22
Partnerships	23
Research Outputs	24-31

Vice- Provost's Report



2017 was another highly successful year for Monash Biomedical Imaging (MBI). Throughout the year MBI continued to experience growth in the provision of research imaging services with expanded scanning capabilities.

I am pleased to report that 2017 was another highly successful year for Monash Biomedical Imaging (MBI). Throughout the year MBI continued to experience growth in the provision of research imaging services with expanded scanning capabilities. In particular, the increased uptake of the MBI research platform by both Monash researchers and external users, and the expanded collaborative links with the broader Monash research community demonstrate the excellence of the research imaging services and scientific collaborations being undertaken at MBI.

In partnership with the Commonwealth Scientific Industrial Research Organisation (CSIRO) the MR-PET imaging facility is now fully integrated as part of the Monash Medtech (M2) initiative, which is a joint venture between Monash, CSIRO, and the Monash Health Technology precinct. Furthermore, the installation of a Siemens CT whole body scanner has further strengthened the University's partnership with Siemens Healthcare. A number of exciting new collaborative projects have been agreed between MBI and Siemens, including a major Linkage Project funded by the Australian Research Council to develop computational imaging technologies on the simultaneous MR-PET scanner. These partnerships and collaborations have further strengthened the comprehensive suite of biomedical imaging facilities at MBI, and demonstrate Monash's long-term commitment and collaborative approach with its partners, particularly CSIRO.

In 2017 a number of significant enhancements were undertaken of the MBI research platform facilities. In the Preclinical Imaging laboratories the 9.4Tesla small animal MRI scanner was upgraded, and the large animal holding and experimental laboratories were modified to provide direct access to the preclinical MR and PET scanners. As a result, MBI now has unsurpassed facilities to undertake simultaneous cellular and molecular imaging in human volunteers and in large animal models of disease. Co-operation between the Australian Synchrotron Imaging and Medical Beam Line (IMBL) continued during 2017, with important new research studies in preclinical models of renal, respiratory and cardiovascular disease undertaken. Significant progress was made in fundamental cardiovascular research and testing of therapeutic interventions in animal models using the MBI preclinical facilities.

The future establishment of the Victorian Heart Hospital (VHH) is closer to being realised after Daniel Andrews, the Premier of Victoria, announced additional funding for the new hospital. The VHH will be dedicated to the treatment of patients with cardiovascular disease as well as research and clinical translation, to develop new treatments for these diseases. MonashHeart, as the new hospital will be known, is a collaboration between the Victorian Government, Monash University, and Monash Health, and will

operate as a specialist cardiac hospital on the University's Clayton campus. The close proximity of MBI to MonashHeart will lead to exciting new opportunities for cardiac and cardiovascular imaging using the suite of facilities at MBI.

The Monash Institute for Cognitive and Clinical Neuroscience (MICCN) has two research laboratories located at MBI including the Brain and Mental Health and the Monash Neuroscience of Consciousness linked laboratories. MBI is also the headquarters of the Australian Research Council Centre of Excellence for Integrative Brain Function that provides a critical springboard for advancing the international reputation of MBI in biomedical imaging and brain research. The leadership of MBI staff in communities of interest, including the Victorian Biomedical Imaging Capability (VBIC) and the National Imaging Facility (NIF), enables the platform to make a major contribution and make a significant impact amongst imaging researchers across Melbourne and Australia.

MBI is poised for further significant development based on the growth of industry links and collaborative agreements with partner companies including Siemens Healthcare. An exciting new development called BrainPark, which has been funded by the David Winston Turner Endowment Fund, is being constructed at MBI. The facility will provide a clinical research laboratory for trialing and translating highly novel therapeutic discoveries in brain disorders and diseases. BrainPark is an exciting and bold vision led by the MICCN, in partnership with MBI, and is scheduled to open in mid-2018.

My thanks to the MBI Director and to all MBI staff for their dedicated work throughout the year that has resulted in another highly successful year for the platform. I look forward to seeing the outcomes of the experimental research programs, and to an expanded focus on the translation of scientific discoveries for innovative and transformative application to the needs of the healthcare industry sector.

Professor Ian Smith

Vice-Provost
(Research and Research Infrastructure)



Director's Report

During 2017 Monash Biomedical Imaging continued to grow and expand the range of biomedical imaging research capabilities and services that are provided to the Monash University and Victorian imaging research communities.

MBI had a number of major achievements in 2017. These included the construction and installation of a new laboratory and console room facilities to accommodate a new computed tomography (CT) scanner for the CT imaging research community. The Siemens Somatom Go.Up scanner is being used in large animal and medical anatomy imaging projects. In an intriguing and important series of studies, the scanner is now being used to provide digital datasets for advanced 3D printing applications, including the creation of virtual and 3D printed copies of specimens from the Melbourne Museum.

After nearly five years of operation, in late 2017 the 9.4T small animal MRI scanner located at MBI was upgraded and converted to a Bruker operating platform. The scanner is now operational and has been equipped as a state-of-the-art system to provide a high quality preclinical and ex vivo specimen MR imaging capability. This capability will be complemented by the installation of a new 9.4T MRI scanner that will be installed at the Monash Baker Preclinical Imaging Facility in early 2018. Together these instruments will provide Monash University's preclinical imaging researchers with unprecedented access to ultrahigh field MR imaging technology and expertise.

In 2017 a major milestone was achieved for the hyperpolarised gas MR imaging project at MBI. Undertaken in collaboration with Dr Hal Lee from ANSTO, the research team has constructed a laser based hyperpolariser to magnetically hyperpolarise helium-3 and xenon-129 gases. The first preliminary imaging tests using the system were undertaken in late 2017. The respiratory imaging research team now has a unique opportunity to evaluate the use of hyperpolarised Xenon-129 in ventilation imaging in preclinical and clinical imaging experiments. The research program has the potential to greatly enhance our understanding of animal and human lung physiology and pathophysiology.

Throughout 2017 MBI staff continued

their long standing support for the neuroscience research communities from the School of Psychological Sciences, the Monash Institute of Cognitive and Clinical Neurosciences (MICCN), and the School of Biomedical Sciences in the Faculty of Medicine, Nursing and Health Sciences. The MICCN Linked Laboratories located at MBI including the Brain and Mental Health (BMH) Laboratory, led by Professor Murat Yucel and Associate Professor Alex Fornito, and the Monash Neuroscience of Consciousness (MoNoC) Laboratory, jointly led by Associate Professors Nao Tsuchiya and Jeroen van Boxtel, have continued to undertake outstanding research to understand the neural bases of mental health and consciousness.

MBI is a member organisation of the Monash MedTech consortium (M2), which is a joint venture between CSIRO, Monash University and the Monash Health Translation Precinct (MHTP). M2, which was previously known as the Biomedical Materials Translational Facility, specialises in the development of biomedical materials and coatings, regenerative medicine and advanced biomedical imaging technologies to bridge a critical capability gap in the Australian MedTech SME value chain. By providing advanced research infrastructure the M2 consortium can rapidly translate new discoveries from the bench to scaled-up trials, for the production of prototypes, for preclinical model testing, to enable industry to rapidly evaluate and adopt new biomedical technologies. MBI provides the M2 consortium and industry partners with access to invaluable real time non-invasive simultaneous MR-PET imaging facilities for large animal and human studies.

The Australian Research Council Centre of Excellence for Integrative Brain Function (CIBF) is headquartered at MBI. The Centre's researchers are undertaking research by investigating complex functions to discover how the brain interacts with the world. The three integrative functions being investigated include attention, prediction, and decision-making. These complex functions require coordination of information processing across multiple regions of the brain. Centre researchers using the MBI Research Platform have been featured in the Centre's 2017 Annual Report that is available at brainfunction.edu.au

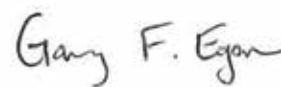
MBI is a founding consortium member of the Victorian Biomedical Imaging Capability (VBIC), and a node of the National Imaging Facility. During 2017 MBI scientists have led a number of VBIC activities including hosting a number of meetings of the Victorian biomedical and molecular imaging community to develop a plan for future imaging research infrastructure investments. MBI also hosted the VBIC Network meeting in October 2017 where the excellence of biomedical imaging research applications, techniques and expertise from across the VBIC partner organisations was presented.

I would like to extend my congratulations to

Dr Philip Ward who was awarded a 2017 Victoria Fellowship. Phil is a post-doctoral research fellow at MBI and was one of only 12 early career researchers from across the state who were awarded a Fellowship. Phil will use his Fellowship to study new MRI techniques at the Cardiff University Brain Research Imaging Centre, UK and learn the skills needed to bring MR-based oxygen and blood-flow imaging into MR-PET research in Victoria. He will also visit the Helmholtz laboratory at Forschungszentrum Jülich, Germany where one of the first high-field MR-PET scanners was developed.

I would like to thank Professor Ian Smith for his continued unwavering support for MBI during 2017. I would also like to thank Ms Sue Renkin, Chair of the MBI Advisory Board, and the other Advisory Board members for their insight, guidance and advice regarding the operations and development of the MBI research platform. My thanks also to Drs Simon Harris and Lisa Hutton for their excellent management of the day-to-day operations of the MBI facilities throughout 2017.

I particularly want to acknowledge and thank all MBI staff for their excellent contributions throughout the year. The hard work by all of the MBI teams including the Administrative, the Clinical Imaging, the Preclinical Imaging, the Imaging Methods & Analysis, and the Cognitive Neuroimaging team continues to put the MBI Research Platform at the national and international forefront of biomedical imaging excellence. I am proud that MBI has continued to provide excellence in biomedical imaging research services throughout 2017, and I sincerely thank all staff for their invaluable contributions.



Professor Gary Egan

Director MBI and CIBF; Distinguished Professorial Fellow, School of Psychological Sciences.



Overview

including Electroencephalogram (EEG), Transcranial Magnetic Stimulation (TMS), and ocularmotor testing equipment.

Throughout 2017 renovation works were completed to significantly enhance the MBI facilities through the installation of a new CT scanner for preclinical imaging research, and scanning of a broad range of samples, specimens, and other materials. The existing 9.4T MRI scanner underwent a significant rebadging and upgrade to a revitalised state-of-the-art modality that has greatly expanded the capabilities of MBI to deliver high quality preclinical MRI and molecular imaging. This capability will be complemented by the installation of a new 9.4T MRI in early 2018 that will be housed at the Monash Baker IDI Preclinical Imaging Facility in Prahran.

MBI oversaw the construction of a laser based hyperpolariser to magnetically hyperpolarise helium-3 and xenon-129 gases as another complementary tool for preclinical and clinical imaging, particularly to greatly enhance our scientific understanding of animal and human lung physiology and pathophysiology.

The expertise and technological capabilities at MBI support a wide range of preclinical and clinical research projects undertaken by researchers and clinicians from Monash University and collaborating organisations throughout Victoria. These facilities are colocated with the Australian Synchrotron Imaging and Medical Beam Line, providing capability for ultra-high resolution imaging of soft tissues in living animals. MBI scientists collaborate with global experts in medicine, science and engineering, as well as industry and government to create innovative solutions to clinical health challenges.

Facilities

MBI is one of the world's pre-eminent sites for biomedical imaging and cognitive and systems neurosciences research. MBI facilities are located primarily at the Monash University Clayton Campus, and include high-resolution clinical and preclinical magnetic resonance imaging (MRI) scanners, and preclinical X-Ray computed tomography (CT), Positron Emission Tomography (PET), and Single Photon Emission CT (SPECT). We manage access to offsite preclinical scanners including a PET-CT scanner (Mediso) at the Alfred Medical Research and Education Precinct (AMREP, Prahran), and Fluorescent Emission Computed Tomography (FLECT) and CT scanners (TriFoil and Mediso) at the Monash Institute of Pharmaceutical Sciences (MIPS) located at the Parkville campus. The 3-D FLECT machine at our MIPS site was replaced with a brand new state of the art TriFoil™ FLECT-CT system, also greatly enhancing its capabilities. We also manage access to a suite of clinical testing facilities at the Clayton campus,



Governance

MBI has an Advisory Board with an independent chairperson that meets three times per year. The functions of the Board are to:

- assist the Director with strategic planning including advice in alignment with government policy on research

- infrastructure and industry trends;
- monitor the utilisation of MBI facilities;
- help define appropriate metrics (key performance indicators) for the platform;
- provide representation for stakeholders; and
- make recommendations on strategies for the further development of MBI facilities and operations.

MBI Advisory Board

Chair

Ms Sue Renkin

Director, Intuitively Focused; Distinguished Alumnus, Monash University

Deputy Chair

Professor Ian Smith

Vice-Provost, Research and Research Infrastructure, Monash University

Members

Professor Paul Bonnington

Director, Monash e-Research Centre

Professor John Carroll

Dean, Biomedical & Psychological Sciences; Director, Monash Biomedicine Discovery Institute; Head, School of Biomedical Sciences, Monash University

Professor Ross Coppel

Deputy Dean (Research), Faculty of Medicine, Nursing and Health Sciences, Monash University

Professor Gary Egan

Director, Monash Biomedical Imaging, Monash University, CIBF

A/Professor Nicholas Ferris

Clinical Head, Monash Biomedical Imaging, Monash University

Dr Lisa Hutton

Centre Manager, Monash Biomedical Imaging, CIBF

Dr Michael James

Head of Science, Australian Synchrotron

Dr Gareth Moorhead

Research Program Leader, Materials Science and Engineering, CSIRO

Professor Andrew Peele

Director, Australian Synchrotron

Professor Stephen Stuckey

Director Diagnostic Imaging, Monash Health (formerly Southern Health)

Professor Murat Yücel

Director, Monash Brain and Mental Health, Monash Institute of Cognitive and Clinical Neurosciences, Faculty of Medicine, Nursing & Health Sciences

2017 Snapshot



PROJECTS

83

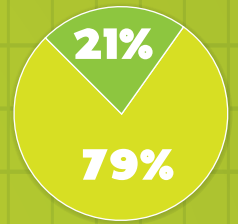
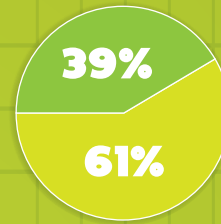
52 31

NEW

CONTINUING

PRECLINICAL

EXTERNAL



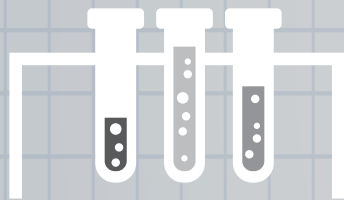
CLINICAL

INTERNAL



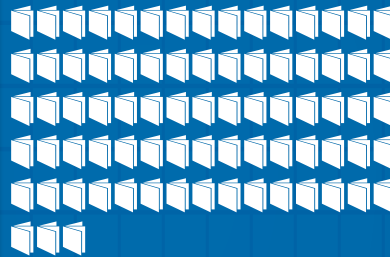
LINKED LABS

3

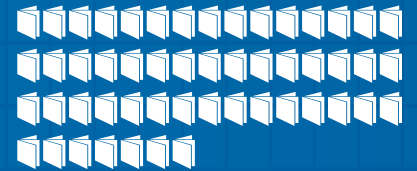


PUBLICATIONS

130



LINKED LABS



MBI

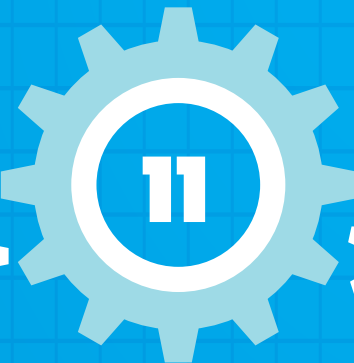


MAJOR EQUIPMENT

15



PRAHRAN



CLAYTON



PARKVILLE



EQUIPMENT USAGE



4316

HOURS



GRANTS

33



10

MBI



23

LINKED LABS



RESERVATIONS



2411

MBI Personnel

Director



Professor Gary Egan
Director, MBI and CIBF; Distinguished Professorial Fellow, School of Psychological Sciences

Associate Directors



Professor Michael Farrell
Associate Director, MBI (Academic)



Professor Jon Shah
Director, Monash Institute for Medical Engineering & Associate Director, MBI

Management & Administration



Dr Simon Harris
Research Platform Manager, MBI



Dr Lisa Hutton
General Manager, MBI & Centre Manager, CIBF



Ms Janelle Gilling
Administrative Officer

Ms Ashlee Hutchinson
Receptionist



Ms Nichola Thompson
Resources Coordinator



Ms Louise Mitchell
Research Administrative Officer



Ms Merrin Morrison
Communications Officer

Students

Shenjun Zhong
PhD Candidate

Jakub Baran
Trainee

Magdalena Kolodziej
Trainee

Anjan Bhattarai
Postgraduate student

Preclinical Imaging



Dr Michael de Veer
Head, NIF Fellow



Dr Gang Zheng
Research Fellow



Dr Zhaolin Chen
Head



Dr Thomas Close
Senior Informatics Officer, NIF Informatics Fellow



Dr Shenpeng Li
Research Fellow



Ms Tara Sephezadeh
Technical Assistant



Ms Peggy Chen
Research Officer



Dr Kamlesh Pawar
Research Fellow



Dr Shenjun Zhong
Imaging scientist



Mr Francesco Sforzini
Research Assistant

Clinical Research Imaging



A/Prof Nicholas Ferris
Head, Clinical MRI, MBI and Clinical Radiologist, Monash Health



Mr Richard McIntyre
Radiographer, Monash Health & MBI

Alexandra Carey
NMT, Monash Health & MBI

Helen Kyprianou
NMT, Monash Health & MBI

Lauren Hudswell
NMT, Monash Health & MBI

Patricia Heidmann
Radiographer, Monash Health & MBI

Arlene Hobson
Radiographer, Monash Health & MBI

Fiona Gould
Radiographer, Monash Health & MBI

Van Vu
Radiographer, Monash Health & MBI

Elisha Leong
Radiographer, Monash Health & MBI

Cuong Tran
Radiographer, Monash Health & MBI

Jeff Chen
Radiographer, Monash Health & MBI

Paul Beech
Radiologist, MBI

ICON Group/Cognitive Neuroimaging Research



Assoc. Professor Jeroen van Boxtel
Senior Research Fellow, School of Psychological Sciences and MBI



Dr Sharna Jamadar
Research Fellow, School of Psychological Sciences and MBI



Dr Phil Ward
Research Fellow



Ms Parisa Zakavi
Technical Assistant



Ms Christina van Heer
Research Support Officer



Ms Katharina Voigt
Technical Assistant

Winnie Orchard
Research Assistant

Irene Graafma
Research Assistant

Disha Sasan
Research Assistant

This important dissociation of coughing and the urge-to-cough may indicate potential routes for treatment or intervention...



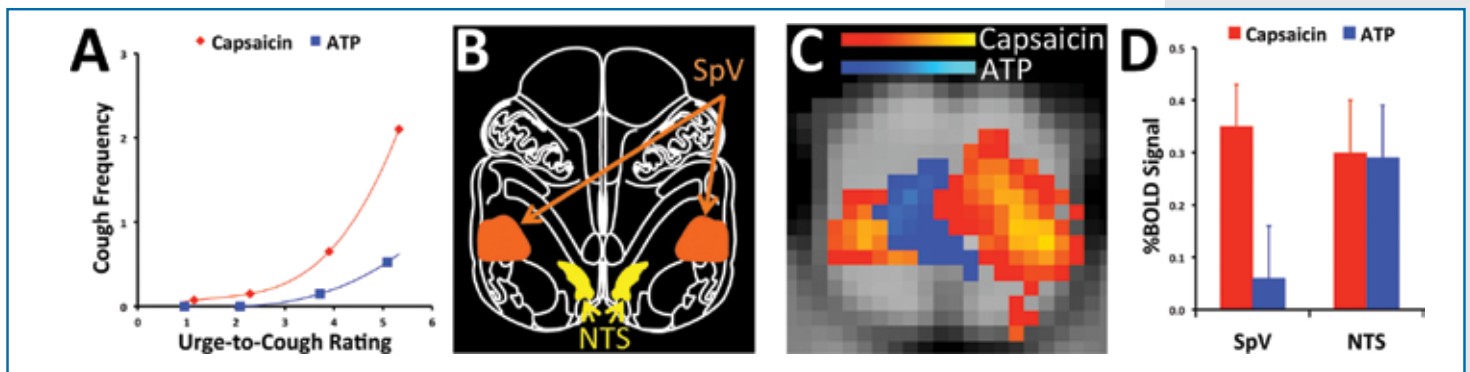
Sensory information from the airways has two routes to the brain

Farrell M.

The windpipe and lungs contain small nerve fibres that send information from the airways to the brain, and irritating substances in the airways can stimulate these nerves that trigger coughing and/or a sensation of 'urge-to-cough'. These nerves and the responses

they trigger protect the airways from obstruction. However, chronic, unproductive cough can become a problem for people with airways disease whereby this unwanted coughing is a response to an inappropriate feeling of urge-to-cough. Animal studies have identified two separate pathways for sensory information to get to the brain that may have different contributions to coughing and the urge-to-cough. Studies at MBI have now shown that humans also have two separate regions in the brainstem involved in airway sensations. Furthermore, selectively stimulating the pathways to

produce similar feelings of urge-to-cough leads to very different amounts of coughing. This important dissociation of coughing and the urge-to-cough may indicate potential routes for treatment or intervention that block or switch off the troublesome airway sensations while leaving the critical cough reflex unaffected.



- A. Stimulating both airways sensory pathways (Capsaicin) evokes more coughing than stimulating one pathway (Adenosine Triphosphate).
- B. The pathways go through either the spinal trigeminal nuclei (SpV) or the nuclei of the solitary tract (NTS) in the brainstem of animals.
- C. Capsaicin inhalation in humans stimulates the SpV and NTS, whereas ATP activation is confined to the NTS.
- D. Signals from the regions confirm that the two pathways can be activated independently in humans.

Brain substrates of unhealthy versus healthy food choices: influence of homeostatic status and body mass index

Harding IH, Andrews ZB, Mata F, Orlandea S, Martínez-Zalacaín I, Soriano-Mas C, Stice E, Verdejo-García A.

Unhealthy food choices are a major contributor to the current obesity epidemic. We have interrogated the brain systems involved in deliberating between unhealthy and healthy food options. We were particularly interested in the effects of hunger and body mass index (BMI) on brain activation and connectivity. Adult participants (n = 30) performed a food-choice task involving preference-based selection between beverage pairs consisting of high-calorie (unhealthy) or low-calorie (healthy) options, concurrent with functional magnetic resonance imaging (fMRI). Participants actually received their selected

food choice using an MRI-compatible gustometer, and fMRI scans were performed after 10h of fasting and again when sated.

Our results show that overweight and obese people have less activation of energy-regulating brain regions, and greater activation of reward-valuation brain regions while making choices between unhealthy vs healthy foods. These results suggest a shift towards pleasure-based influences, and away from energy-based mechanisms, of food selection in obesity.

IMAGING, COGNITION, AND NEUROSCIENCE (ICON) LABORATORY

Our ICON team bridges the fields of cognitive neuroscience, neuroimaging methods and analysis, and neuropsychology to understand brain function in health and disease. With strengths in the use of multimodal imaging in ageing research, we use structural, functional and vascular MRI and simultaneous MR-PET to study healthy older adults.

In 2017, our key focus was on the development of simultaneous fMRI and 'functional' PET imaging, which has led to key technological and methodological advancements that will form the basis of experimental work in the coming year.

Vein imaging and blood oxygen assessment

Ward P, Egan, G.

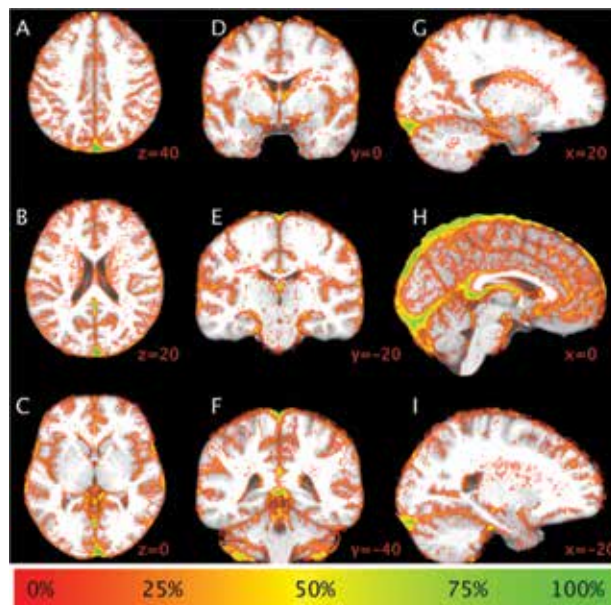
Vascular function is of utmost importance to brain health. The energy needs of brain tissue change rapidly and these needs must be met quickly by a tightly regulated blood supply. A breakdown in this regulation is associated with depression and vascular dementia in older individuals. Our goal is to track vascular health and develop biomarkers and predictors of disease and dysfunction. To this end, we have recently created three new techniques:

- imaging the veins by pulling together information from two advanced MRI techniques and a database of anatomical knowledge
- using machine learning to identify and extract the veins within images, and construct a whole brain vascular model
- measuring the oxygenation of blood along the vascular model and providing a map of vascular regulation throughout the brain.

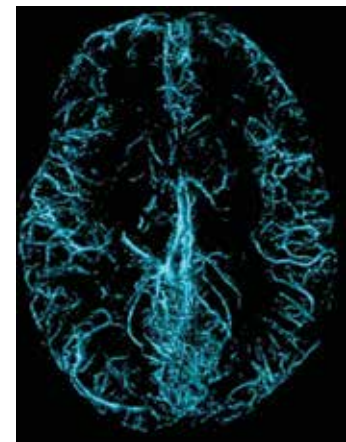
With these techniques, we are ready to begin large cohort studies of the ageing brain and the role vascular health plays in disability and disease.



Our goal is to track vascular health and develop biomarkers and predictors of disease and dysfunction.



Anatomical map of vein probability throughout the brain. Colours represent how consistent vein location is between people.



An 18mm slab of a vascular model from a human subject.



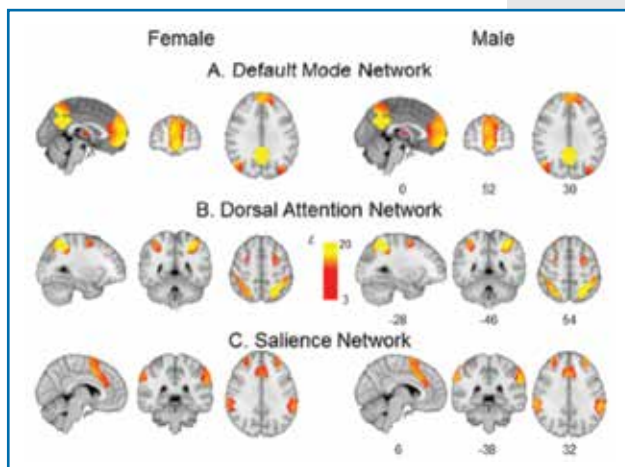
3D rendering of human brain vasculature

Sexual dimorphism of resting-state network connectivity in healthy ageing

Jamadar SD, Sforzini F, Raniga P, Ferris NJ, Paton B, Bailey MJ, Brodtmann A, Yates PA, Donnan GA, Ward SA, Woods RL, Storey E, McNeil JJ, Egan G.

In this examination of ASPREE Neuro data, we examined neural differences between older men and women at rest.

The onset of many illnesses is confounded with age and sex. Increasing age is a risk factor for the development of many illnesses, and sexual dimorphism influences brain anatomy, function and cognition. We have quantified frequency-specific connectivity in three resting-state networks that are known to be implicated in age-related decline - the default mode, dorsal attention and salience networks - using multiband functional magnetic resonance imaging to examine the differences in connectivity between the sexes in these networks. Each network showed the largest intensity and spatial extent at low frequencies, and the smallest intensity and extent at high frequencies. Males showed greater connectivity than females in the salience network, whereas the opposite was observed in the default mode network. Results from this healthy aged cohort are compatible with those obtained from younger cohorts, suggesting that frequency-specific connectivity, and differences between sexes, are maintained into older age. Our results indicate that sex should be considered as an influencing factor in studies of resting-state connectivity.



(A) Default mode, (B) dorsal attention, and (C) salience network differences between sexes.

Development of simultaneous fMRI – fPET imaging capabilities at Monash Biomedical Imaging

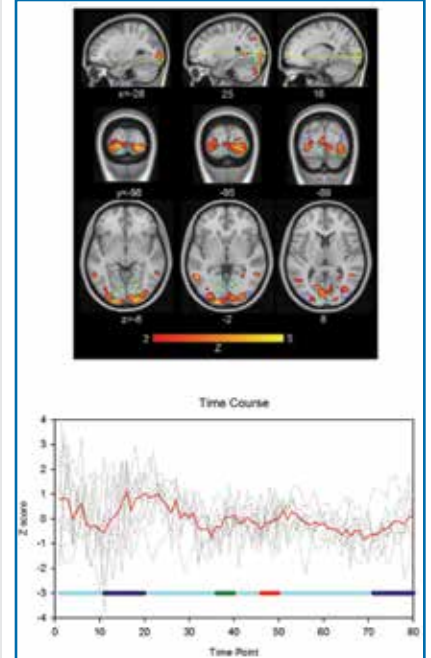
Egan G, Jamadar SD, Chen J, Sforzini F, Li S, Ward P, Baran J, McIntyre R, Carey A, Zakavi P, Orchard W, Graafsma I, Sasan D.

The flagship project of 2017 at Monash Biomedical Imaging, involving collaboration across multiple groups, has been the development of simultaneous fMRI-fPET imaging.

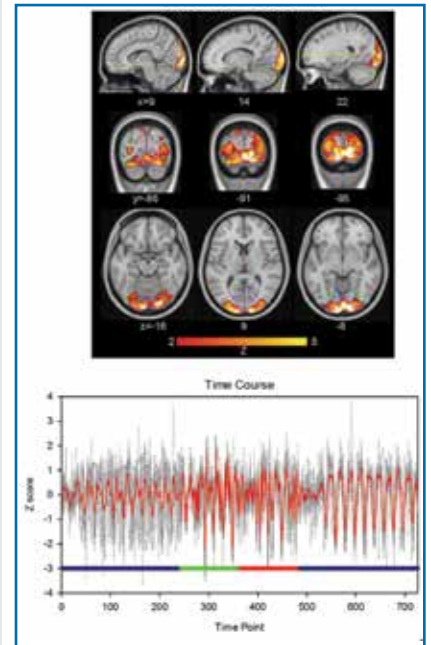
BOLD-fMRI provides a regionally-specific, but non-quantitative and indirect measure of neuronal activity. [18F]-fludeoxyglucose positron emission tomography (FDG-PET) provides an index of neuronal glucose metabolism, which is quantitative and tightly coupled to synaptic activity. However, while the temporal resolution of fMRI is in the order of seconds, standard FDG-PET represents a static snapshot of glucose metabolism over the course of a ~45-min scan. We have developed a novel protocol that increases the temporal resolution of FDG-PET to 1-min, while simultaneously providing BOLD-fMRI contrast.

Our work has focused on developing novel design, acquisition, and analysis techniques and methodologies, and that our novel approach shows powerful BOLD-fMRI activity and increased FDG-PET glucose metabolism in the visual cortex, which highlights great promise for the future of dynamic simultaneous haemodynamic (fMRI)-metabolic (PET) imaging in the study of human brain function.

Checkerboard visual stimulation evoked changes in visual cortex (A) glucose metabolism and (B) blood oxygenation. Our novel design allowed - for the first time - dynamic measurement of changes in glucose metabolism over time, simultaneously with dynamic changes in blood oxygenation.



(A) Dynamic FDG-fPET



(B) Conventional BOLD-fMRI

The flagship project of 2017 at Monash Biomedical Imaging... has been the development of simultaneous fMRI-fPET imaging.



PRECLINICAL IMAGING

The news in 2017 from the MBI preclinical team was all about growth: in staff, machine numbers and hours scanned. Many new projects were initiated and all our equipment continued to see an increase in usage hours. We added a few big-ticket items in 2017, including a new Siemens Somatom Go.Up large bore CT machine, and our 9.4T MRI received a major upgrade with the imaging hardware being converted to the Bruker platform to dramatically enhance its capabilities. The 3-D fluorescence tomography (FLECT) machine at our MIPS site was replaced with a brand new state of the art TriFoil™ FLECT-CT system, also greatly enhancing its capabilities. All our animal holding facilities passed inspection and are now fully operational. The team was also involved in helping to design a new preclinical imaging facility at the Alfred Hospital that will house the Mediso PET-CT in mid 2018.

The new CT has already done some exciting scans: Dr Justin Adams and Associate Professor Alistair Evans have 3-D rendered bone features from numerous museum skeletons, including a brolga, leopard seal and polar bear skull. Colleagues from The Australian Synchrotron even brought over a rhinoceros

skull to scan for comparison of the CT images with their monochromatic 3-D tomography. The upgraded and rebadged Bruker 9.4 Tesla MRI was commissioned just prior to Christmas 2017, and we are looking forward to seeing some great images from it in 2018.

A high-impact study with Dr Garron Dodd and Professor Tony Tiganis' group used the PET-CT to look at activation of fat and its ramifications for obesity and is highlighted in the research section.

The Xenon gas hyperpolariser reliably produced high quality Xenon for MRI imaging towards the end of 2017, and we had some early successes measuring lung structure in ventilated lambs in collaboration with Professor Stuart Hooper and Professor Frank Thien from the Richie Centre.

Some new faces joined the preclinical team: Dr Gang Zheng our 9.4T MRI expert has jumped right in at the deep end with the hyperpolariser, and is looking forward to optimizing the Bruker system and using our equipment to generate some fantastic imaging for our users in 2018.

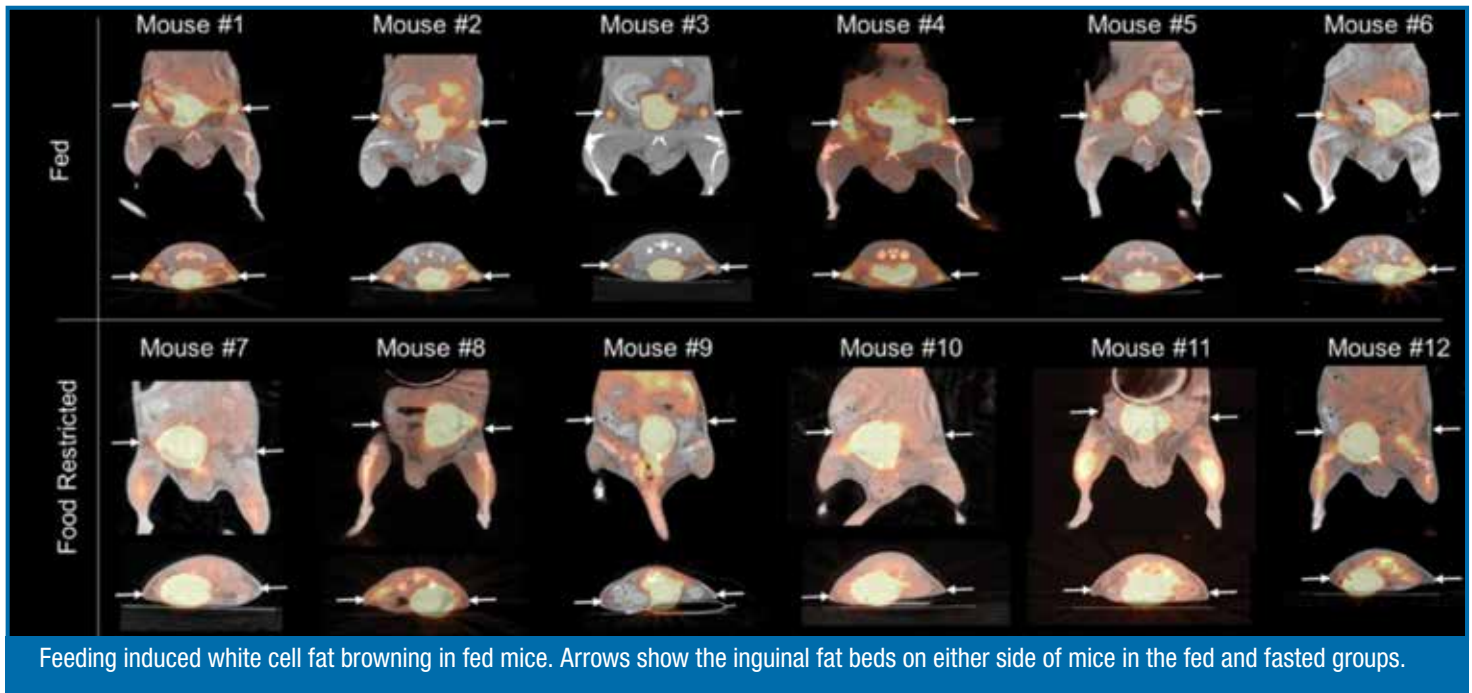
A hypothalamic phosphatase switch coordinates energy expenditure with feeding

Dodd GT, Andrews ZB, Simonds SE, Michael NJ, de Veer M, Brüning JC, Spanswick D, Cowley MA, Tiganis T.

This study aimed at showing how mice alter their energy balance after feeding and how a regulatory phosphatase within the brain is involved in the process. The mice were injected with a radioactive glucose tracer and PET-CT imaging was used to show the distribution of the glucose throughout the body and the CT to locate individual fat depots. The amount of glucose within each specific fat bed was then carefully measured. The results clearly demonstrated that mice can activate standard white fat cells to become "beige" fat cells that take up and utilise more glucose from the blood post-feeding to help control blood glucose levels and burn excess energy. This work identified a critical switch that controls this mechanism to maintain a healthy energy balance when excess food is available and to minimise energy waste when food is scarce.



The mice were injected with a radioactive glucose tracer and PET-CT imaging was used to show the distribution of the glucose throughout the body...

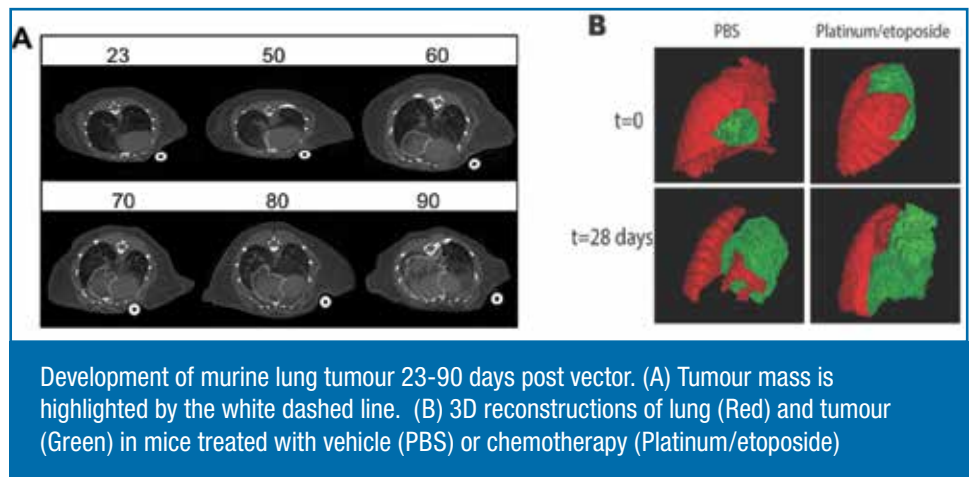


Feeding induced white cell fat browning in fed mice. Arrows show the inguinal fat beds on either side of mice in the fed and fasted groups.

Imaging non-small cell lung tumours in live mice

Gough D, Chen J, Guanizo A, Sepehrizadeh T, de Veer M.

Dr Gough's research group at the Hudson Research Institute are using the Inveon PET-CT to measure lung tumour progression in live mice. A harmless virus vector is used to induce genetic changes specifically in the lung such that they now express a mix of cancer-causing genes observed in human patients with Small Cell Lung Cancer. The PET-CT scanner monitors how quickly the tumours develop and how fast they grow. Cohorts of mice are treated with the current chemotherapy regime used in patients or with novel targeted drugs to identify treatment conditions that will benefit patients. Imaging of lungs can be difficult as they move during breathing, so the images are collected during a single period in the breathing cycle and then collated to generate a 3-D image of the mouse lung with any tumour masses present, and then rendered to quantify tumour volumes. The PET-CT can also measure glucose uptake similar to how oncologists are increasingly using PET-CT to monitor tumour progression in humans to see how the mouse lung tumours are spreading.



Development of murine lung tumour 23-90 days post vector. (A) Tumour mass is highlighted by the white dashed line. (B) 3D reconstructions of lung (Red) and tumour (Green) in mice treated with vehicle (PBS) or chemotherapy (Platinum/etoposide)



The PET-CT scanner monitors how quickly the tumours develop and how fast they grow.

IMAGING ANALYSIS

In 2017, the imaging analysis team has initiated the installation, implementation, and operation of a new informatics platform called XNAT that has superseded the original DaRIS

system. Our team has also made significant progress in developing new imaging methods to enable fast and quantitative imaging, including MR-PET head motion correction algorithm, MR-PET

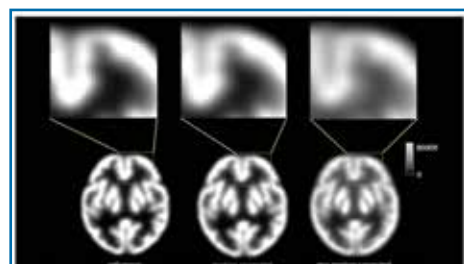
attenuation correction algorithm, and a non-Fourier encoded MR imaging method. Novel analysis methods for dynamic functional MRI and functional PET have also been developed.

Multi-contrast image co-registration based MR-PET motion correction

Our fully integrated MR-PET scanner enables multi-parametric imaging of structural, functional and metabolic changes in the human brain, but a single experiment can take more than 1 hour to acquire data. In this scenario, head motion is very likely to occur causing a significant degradation in the final PET image quality.

Hybrid MR-PET scanners offer the new possibility to model head movements taking advantage of the simultaneously acquired data from the two modalities, whereas most older methods exploit information from just one modality at a time to correct data from motion.

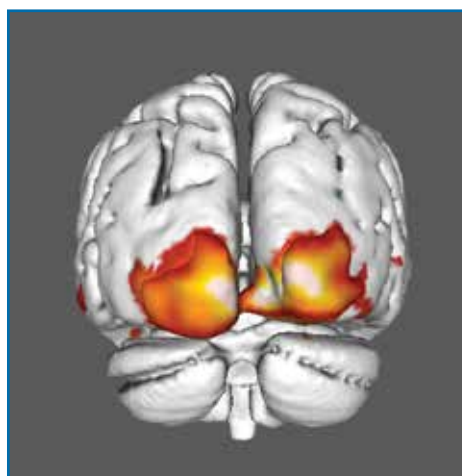
In this project, we have developed a new motion correction method using data from both MR and PET, providing an improved framework to accurately model head movements. Results on a 3D printed human brain phantom demonstrate the ability of the proposed technique to restore the original PET quality with respect to the motion corrupted PET image which is highly blurred, with no clear grey/white matter boundaries.



Results for the human brain phantom PET motion correction.

Estimation of simultaneous BOLD and dynamic FDG metabolism using a coherent ICA method

Constant infusion dynamic ¹⁸F-fluorodeoxyglucose (FDG) PET can provide a direct measure of neuronal activity by measuring glucose metabolism associated with task-induced or synaptic activity in semi-real time. The Independent Component Analysis (ICA) is a data-driven method to explore brain connectivity without prior temporal information. In the task functional PET with designated visual stimulation, the coherent joint ICA analysis of simultaneous BOLD-fMRI/FDG-PET can detect the designated BOLD fluctuation and higher glucose uptake in the visual cortex. We have identified 8 resting state glucose utilisation networks in a cohort of 28 healthy subjects.



Joint BOLD and FDG metabolism brain activation map

Chirp-Encoded MRI

The process of imaging in MRI is a sequence of excitation and data acquisition events that needs to be repeated multiple times to get an image, which makes MRI a slow imaging modality. Reduced scan times are usually achieved by acquiring less data (Accelerated imaging) and an image is generated at the expense of image quality degradation.

We have developed a novel imaging sequence that improves the image quality in accelerated imaging. A 3D MPRAGE sequence that acquires data in chirp modulated Fourier space (CMFS) has been developed, and some experimental results clearly shows improved images quality in terms of resolution.

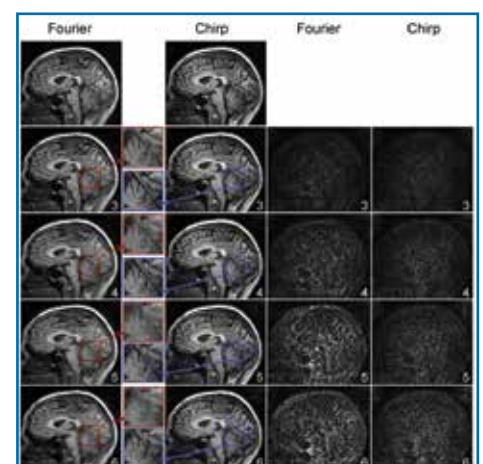


Image reconstruction on the acquired Fourier-encoded and chirp-encoded data show that the chirp encoding is able to preserve resolution better than the Fourier encoding.

Clinical imaging data access and storage improved

Magnetic resonance imaging (MRI) scanners are expensive equipment capable of producing large amounts of valuable research data. For investigators to maximise their research outcomes, the data they obtain from MRIs must be stored securely, its quality verified, and it should be accessible to the wider research community.

As part of a national project, Delivering durable, reliable, high-quality image data, jointly funded by the National Imaging Facility (NIF), Australian National Data Service (ANDS) and Research Data Services (RDS), informatics experts from around Australia have combined their expertise to build a network of Trusted Data Repository Services (TDRS) to provide researchers with secure places to store, share and/or publish their imaging data easily and freely. The TDRS are guaranteed to store the data and sufficient metadata for at least 10 years for use in future research.

Monash Biomedical Imaging (MBI) and the Monash eResearch Centre at Monash University, along with informatics colleagues from the University of Western Australia, University of Queensland and University of NSW, has established best practices for TDRS that store imaging

data from clinical MRI scanners.

The team developed an example repository based on the open source imaging informatics software platform, XNAT, including plugins that enable the automation of QC/QA procedures and upload of raw imaging data. They will also publish a 'compose' script for the leading containerisation platform 'Docker' that will enable other research facilities to easily mirror the setup of MBI's repository.

MBI Director Professor Gary Egan said their clinical MRI TDRS would soon be able to connect to the Australian Access Federation.

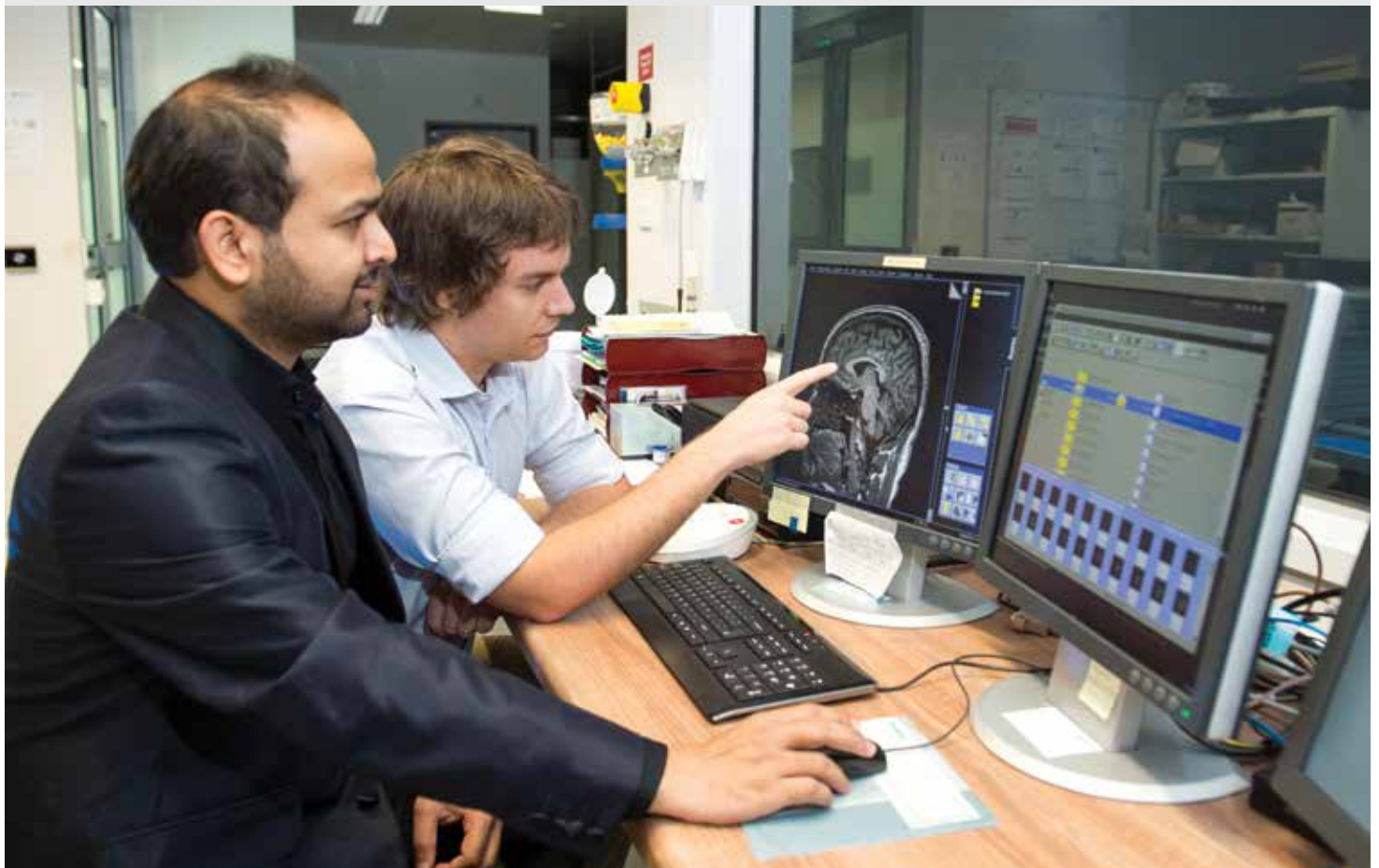
"We want to streamline access to TDRS so that anyone with an Australian university email address can easily log in and access their data," Professor Egan said.

"We're connecting to the Australian Access Federation via an 'OpenID Connect' plugin, which in theory could also be used to authenticate users against their Google or Facebook accounts. Our next steps are to enhance the XNAT architecture so that we can add value to our existing informatics services.

"As one of the largest and most advanced biomedical imaging research facilities in Australia, we're always working to improve our imaging data quality and analysis to benefit the researchers using our imaging equipment," he said.



As one of the largest and most advanced biomedical imaging research facilities in Australia, we're always working to improve our imaging data quality and analysis to benefit the researchers using our imaging equipment.



THE BRAIN AND MENTAL HEALTH LABORATORY (BMH)

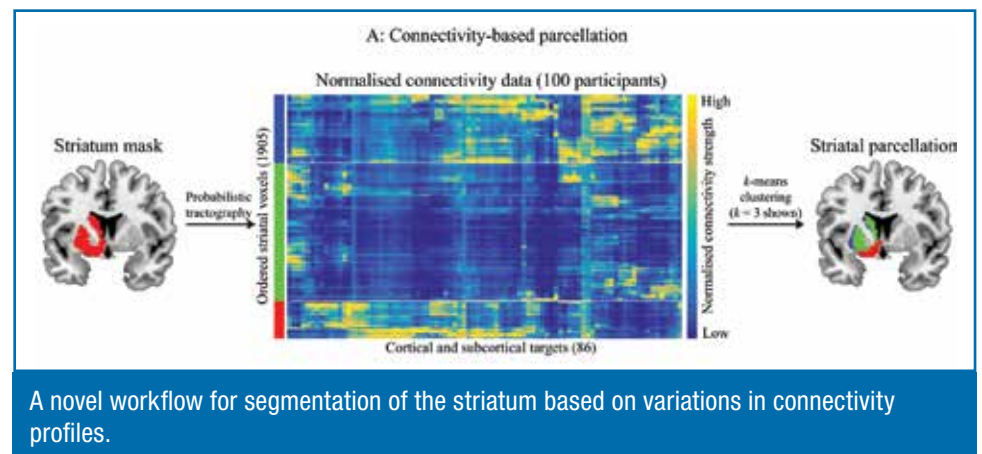
Systems Neuroscience

The Systems Neuroscience stream seeks to understand the network organisation of the brain. Diverse brain imaging methods allow us to map how different parts of the brain connect to each other, and to understand how these patterns of connectivity influence brain function in both health and mental illness.

Combining MRI with whole brain gene expression data, we have shown that specific sub-regions of the striatum, which plays a central role in several disorders including schizophrenia, drug addiction and Parkinson disease, have distinct transcriptional signatures. We found a close link between regional variations in transcriptional activity and how the striatum connects to other areas of the brain.



We found a close link between regional variations in transcriptional activity and how the striatum connects to other areas of the brain.



The Brain and Mental Health Laboratory aims to unravel the mysteries of the brain, understand the causes of addiction and mental illness, and to develop effective interventions for improving brain health and mental wellbeing.

Our research is interdisciplinary and links basic and applied neuroscience to develop new clinical interventions. In particular, we integrate computational, molecular, imaging and clinical neuroscience with lifestyle modifications, technological advances and policy considerations. Our approach allows us to translate discoveries into effective, safe and accessible treatments.

Here we present highlights of our work across our six core research streams. You can see other aspects of our work, including recent research outcomes, on our website: www.bmh.org.au

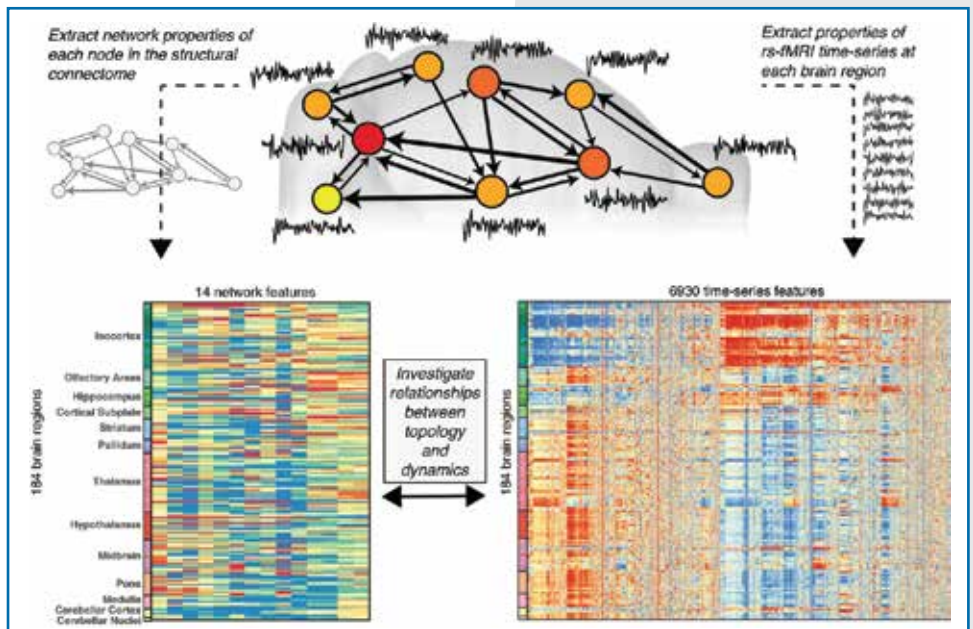
Find out more about the Brain and Mental Health Laboratory's work.



Computational Modelling

The Computational Modelling stream is developing new analytic methods and mathematical models to understand the brain. The core focus is on using bioinformatics and multivariate analysis to understand genetic influences on brain organisation, graph theory to develop models of how brain networks develop, and biophysical models of neural activity to generate realistic simulations of whole-brain dynamics.

In recent work to understand how brain network structure relates to function, we found that regions with many incoming axonal connections show slowly-fluctuating dynamics, consistent with a role for the integration of diverse inputs. This finding clarifies how the brain's structure constrains function.

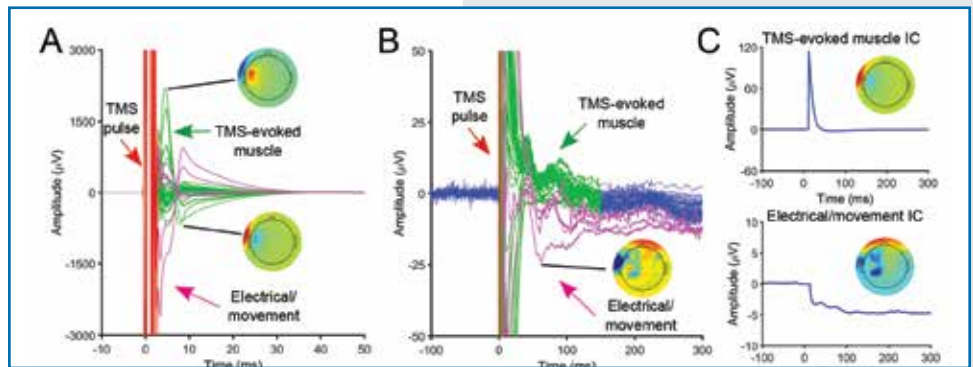


A workflow for relating measures of brain network structure to regional dynamics.

Brain Stimulation

To develop methods for probing and manipulating brain function, and to identify novel treatment approaches for mental illness, the Brain Stimulation stream combines non-invasive brain stimulation, such as transcranial magnetic stimulation (TMS) with neurophysiological recordings using electroencephalography (EEG) and neuroimaging modalities including functional magnetic resonance imaging (fMRI), diffusion tensor imaging (DTI), and magnetic resonance spectroscopy (MRS).

Alongside international collaborators, our team developed the TMS-EEG signal analyser (TESA), an open-source toolbox for cleaning and analysing TMS-EEG data. TESA overcomes many of the previous TMS-EEG limitations such as artifacts that distort the underlying neural signals, and TESA users do not require coding knowledge.



Artifacts present in EEG signals during TMS (A and B) and extraction of independent components of artifacts (C).

Interventions

In recent decades, significant neuroscientific discoveries have illustrated how lifestyle and technology-based techniques can have a potent impact on brain health and psychological wellbeing. The Interventions stream harnesses the therapeutic potential of these discoveries to develop non-medication treatments for impulsive-compulsive conditions. Through physical exercise and meditation, along with emerging technologies such as virtual reality, we are modifying the underlying neurological, psychological and environmental drivers of addictive and compulsive behaviours. Our research is retraining brain circuits to break bad habits and help create new healthy ones that enhance overall mental health and quality of life.



Testing of physical fitness (VO2 max) is conducted prior to participation in an exercise intervention study.

Assessment

The Assessment stream investigates the convergence of cognition, behaviour and technology to phenotype the core cognitive and behavioural constructs across mental health and illness. Using integrated knowledge of clinical and cognitive neuroscience, we translate this into engaging and accessible technologies that have the potential to be commercialised for the treatment of mental health conditions.

Known as the 'MonCog Project', BMH is working with industry partner Torus Games to develop a scalable, app-based assessment tool that is informed by neuroscience, gamified, engaging, and clinically useful for the evaluation and monitoring of individuals with impulsive and compulsive problems. By better characterising these disorders, we aim to identify predictors of treatment response across a suite of next-generation therapeutics and move towards more holistic and personalised medicine.



Screenshot of a gamified task to measure impulse control.

Neuroscience and Society

Neuroscience promises to revolutionise our ability to treat and prevent mental illness and neurological disorders through the use of powerful new technologies that allow us to monitor and manipulate brain activity, cognition and behaviour. The use of novel neurotechnologies also raises important ethical and social challenges.

We conduct interdisciplinary research to translate neuroscience research into ethical treatments, social initiatives and public health policies that maximise benefit for all members of society, while minimising any harms. Our recent research has explored the impact of neuroscientific perspectives on stigma, agency, authenticity, and moral responsibility as well as the use of emerging technologies such as deep brain stimulation, brain imaging, transcranial direct current stimulation, virtual reality and wearable technologies.

Head of the Neuroscience and Society stream, A/Prof Adrian Carter, recently contributed to a paper in the leading journal Nature, exploring ethical implications related to the use of emerging neurotechnologies including artificial intelligence and brain-computer interfaces.

Read the full article via this QR Code



Our recent research has explored the impact of neuroscientific perspectives on stigma, agency, authenticity, and moral responsibility as well as the use of emerging technologies such as deep brain stimulation, brain imaging, transcranial direct current stimulation, virtual reality and wearable technologies.

BMH Personnel

Staff



Prof Murat Yücel
Co-Director



Prof Alex Fornito
Co-Director



Prof Leonardo Fontenelle
Visiting Professor of Clinical Neuropsychiatry



A/Prof Adrian Carter
NHMRC Career Development Fellow



Dr Rebecca Segrave
David Winston Turner Senior Research Fellow



Dr Rico Lee
Research Fellow



Dr Lucy Albertella
Research Fellow



Dr Ella Dilkes-Frayne
Research Fellow



Dr Nigel Rogasch
ARC DECRA Fellow



Dr Ben Fulcher
Research Fellow



Dr Kevin Aquino
Research Fellow



Dr Chao Suo
Lab Manager and Research Fellow



Amy Allen
Operations Manager

Research Assistants

- James Morrow
- Lisa Greenwood
- Jeggan Tiego
- Sid Chopra
- Alex Boland
- Andrea Zdral
- Erin Oldenhof
- Mitch Stevenson
- Nathan Dowling
- Adam Rubenis

PhD Candidates

- Simon Baker
- Leah Braganza
- Michelle Lamblin
- Linden Parkes
- Joshua Hendrikse
- Yann Chye
- Andrew Dawson
- Tony Barnett
- Aurina Arnatkeviciute
- Stuart Oldham
- Mana Biabanimoghdam
- Kristina Sabaroedin
- Xiaoliu Zhang
- Daniel Myles



Artist's impression of the BrainPark facility

BrainPark®

A long-term transformational gift from the David Winston Turner Endowment Fund (DWTEF) is enabling us to conduct world-leading research into compulsive disorders, including obsessive-compulsive disorder (OCD) and addiction. Advances in treatment will be accelerated into the clinical setting at BrainPark, a purpose-built neuroscience intervention platform that will literally change lives. BrainPark is a partnership between MBI and the Monash Institute of Cognitive and Clinical Neurosciences (MICCN), supported by the DWTEF and Monash University.

BrainPark will enable researchers to undertake large-scale integrated

lifestyle and technology-based intervention studies that will, in turn, benefit the community through more targeted, more effective, and more real solutions for people suffering from addictions and compulsions. A key differentiating aspect will be the radical departure from the traditional research lab and clinical treatment environment. People who come to BrainPark will be immersed in an interactive, creative and energising environment, removing many of the traditional barriers to engagement for participants in clinical interventions. BrainPark will fast track the translation of knowledge from BMH's research into clinical and public good.

For more information, see www.brainpark.com

DPsych Students

- *Alison Cullen*
- *Lauren den Ouden*
- *Cassie Thomson*
- *Sian Virtue-Griffiths*

Honours Students

- *Catherine Brown*
- *Kimberly Daniels*
- *Louisa Detez*
- *John Fallon*
- *Michelle James*
- *Tara Liang*
- *Jess Reid*
- *Kate Thompson*
- *Sarah Thompson*
- *Theoni Whyman*



Advances in treatment will be accelerated into the clinical setting at BrainPark, a purpose-built neuroscience intervention platform that will literally change lives.

MONASH NEUROSCIENCE OF CONSCIOUSNESS

The Monash Neuroscience of Consciousness (MoNoC) Research Laboratory aims to understand the neural basis of consciousness. Our approaches focus on two areas:

- 1) Consciousness itself - developing the theory of consciousness and empirically testing it, revealing the boundary condition of conscious and non-conscious processing.
- 2) Attention - the relationship between consciousness and attention.

Although IIT predictions are indirectly supported by numerous experiments, validation is required through quantifying integrated information directly from experimental neural data.

Developing the measures of consciousness: measuring integrated information from the decoding perspective

Oizumi M, Amari S, Yanagawa T, Fujii N, Tsuchiya N.

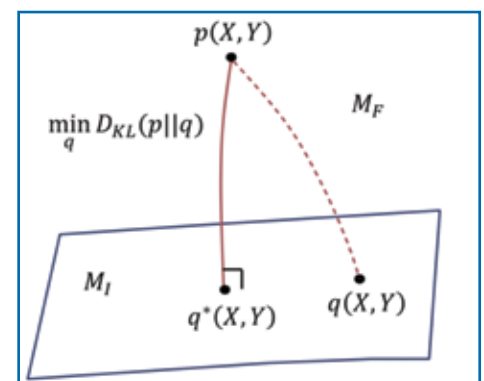
Integrated Information Theory (IIT) is a framework for understanding consciousness owing to its explanatory, inferential and predictive powers for understanding the neural properties of consciousness. IIT predicts that the levels of consciousness are related to the quantity of information integrated in the brain, called integrated information, which measures excess information generated by a system as a whole above and beyond the amount of information independently generated by its parts. Although IIT predictions are indirectly supported by numerous experiments, validation is required through quantifying integrated information directly from experimental neural data. Practical difficulties account for the absence of direct quantitative support, and several practical measures of integrated information have been proposed to resolve these difficulties. However, we found that these measures do not satisfy the theoretical requirements of integrated information: integrated information should not be less than 0, and should not exceed the quantity of information generated by the whole system. We have proposed a novel practical measure of integrated information, designated as Φ^* , that satisfies these theoretical requirements by introducing the concept of mismatched decoding developed from information theory. Φ^* creates the possibility of empirical and quantitative validations of IIT to gain novel insights into the neural basis of consciousness.



Unified framework for information integration based on information geometry

Oizumi M, Tsuchiya N, Amari SI.

Measuring the degree of causal influences among multiple elements of a system is a fundamental problem in physics and biology. We propose a unified framework for quantifying any combination of causal relationships between elements in a hierarchical manner based on information geometry. Our measure of integration, called geometrical integrated information, quantifies the strength of multiple causal influences among elements by projecting the probability distribution of a system onto a constrained manifold. This measure overcomes mathematical problems of existing measures and enables an intuitive understanding of the relationships between integrated information and other measures of causal influence such as transfer entropy. Inspired by the integration of neural activity in consciousness studies, our measure should have general utility in analysing complex systems.



Information geometric diagram for minimising the KL divergence between the full model $p(X, Y)$ and the disconnected model $q(X, Y)$.

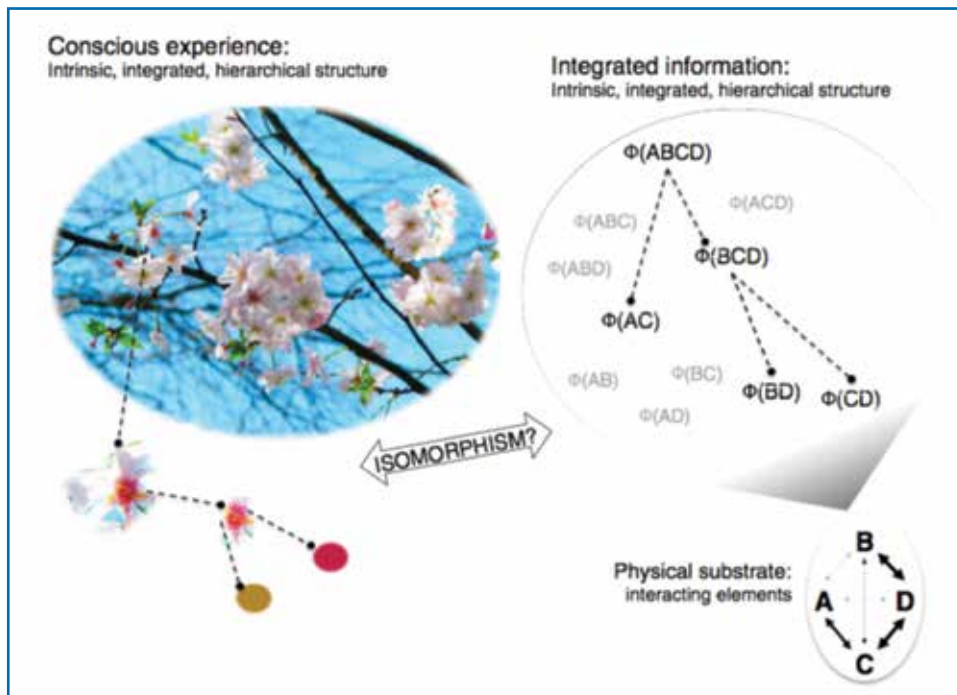
Conscious perception as integrated information patterns in human electrocorticography

Haun AM, Oizumi M, Kovach CK, Kawasaki H, Oya H, Howard MA, Adolphs R, Tsuchiya N.

What is the link between neural activity and conscious experience? It is clear that experience is generated in the brain, as conscious experience occurs even without sensory inputs, but it is also clear that not everything that occurs in the brain is correlated with consciousness. There must be some phenomenon occurring in brains that is critical for consciousness. We tackle this issue from a new direction: starting from conscious phenomenology, we derive a novel measure of distributed population neural activity, the integrated information pattern, and find that, when applied to intracranial field potential recordings (electrocorticography, ECoG), this measure can be used to classify the conscious perceptual experiences of human subjects.



It is clear that experience is generated in the brain, as conscious experience occurs even without sensory inputs, but it is also clear that not everything that occurs in the brain is correlated with consciousness.



Left: Conscious experience is a multilevel integrated pattern. Right: A system of interacting elements (ABCD, lower right corner) generates a multilevel pattern of integrated information.

MoNoC Personnel

Staff



A/Prof Naotsugu Tsuchiya
Co-Head



A/Prof Jeroen van Boxtel
Co-Head



Dr Masafumi Oizumi
Visiting Postdoctoral Fellow from RIKEN Brain Science Institute, Japan

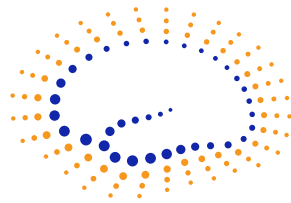
Students

- Dror Cohen, PhD Candidate
- Julian Mathews, PhD Candidate
- Matt Davidson, PhD Candidate
- Irene Graafsma, visiting Masters Student
- William Wong, PhD Candidate
- Elise Rowe, PhD Candidate
- Alon Loeffler, Honours Student
- William Mithen, Honours Student
- Angus Leung, Honours Student

Collaborations



The partnership established through the formation of the Victorian Biomedical Imaging Capability (VBIC) has been led from MBI for almost seven years. During that time, VBIC has supported major initiatives across the biomedical imaging community. It has also supported the development and release of imaging research guidelines covering the Management of Incidental Findings, and a separate document on Quality Control within 3T MRI Research Facilities. MBI hosted the VBIC Network Meeting on November 27th 2017, and which was also prominently featured in the November edition of the VBIC newsletter *Topics*. The efforts of VBIC since 2010 have seen Victoria establish itself as a major imaging hub in Australia and internationally.



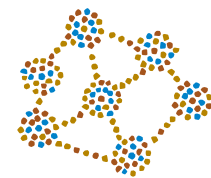
Australian Research Council Centre of Excellence for Integrative Brain Function

Led by Monash University, the Centre of Excellence for Integrative Brain Function (CIBF) aims to understand how the brain interacts with the world. CIBF is a collaboration between Monash University, the University of Queensland, the University of Melbourne, the University of Sydney, the Australian National University, the University of New South Wales, and twelve international partner institutions from Europe, North America and Asia. Several CIBF researchers are based at MBI and extensively use the imaging research facilities located at MBI. The Centre's researchers are actively pursuing multidisciplinary approaches to investigate integrative brain functions including attention, predictive coding and decision-making. CIBF provides the opportunity for MBI-based researchers to participate in one of Australia's leading neuroscience research centres.



The collaboration formed with CSIRO in 2011 has been further strengthened in 2017 with the MR-PET imaging facility now being fully integrated as part of the Monash MedTech (M2) initiative. M2 is a joint venture between CSIRO, Monash University and the Monash Health Translation Precinct (MHTP) that specialises in the development of biomedical materials and coatings, regenerative medicine and advanced biomedical imaging technologies to bridge a critical capability gap for development of medical devices by creating a pipeline and solving the bottle neck in the Australian MedTech SME value chain. Through our involvement with M2, MBI provides access to real time non-invasive imaging facilities for large animal and human studies, including:

- MR-PET scanner capable of simultaneous MRI (Magnetic Resonance Imaging) and PET (Positron Emission Tomography) scans (60cm bore - for humans and large animals)
- PET and computed tomography (CT) for device imaging, and
- radiopharmacy and radiochemistry laboratories for preparation and dispensing of radiopharmaceuticals



National Imaging Facility

Established in 2007, the National Imaging Facility (NIF) is a nationally integrated imaging technology-based technology platform that includes 10 universities and research institutes, along with ANSTO. The NIF network spans across all major states of mainland Australia, and continues to provide open access of an array of world-leading imaging infrastructure and capabilities to the Australian research community. MBI continued to participate in the NIF network, through the provision of access to scanners and infrastructure. Throughout 2017, NIF continued to provide salary support for Facility Fellows, Drs Michael de Veer and Thomas Close, enabling researchers to utilise the state of the art imaging facilities resident at MBI.

MBI is focused on collaborative research efforts for both the development of biomedical imaging research techniques as well as their use in research projects. Throughout 2017 we continued to develop and maintain relationships with key research organisations and partners.



Since commencing operations in 2007, the Australian Synchrotron is Australia's largest, and most successful, scientific user facility by providing access to researchers from academia, medical research institutes, government and other research organisations, and industry. Scientific research and innovation at the Australian Synchrotron spans a broad range of disciplines, including medical and life sciences, materials and engineering, earth and environmental sciences, and accelerator science and synchrotron research methods. MBI is uniquely advantaged by being situated right next door to the Australian Synchrotron, and has direct access to their facilities, for continuing cooperation and collaboration on preclinical models of renal, respiratory, and cardiac disease.

MonashHealth

The clinical research activities at MBI are undertaken in cooperation with the Monash Health Diagnostic Imaging department located at Monash Medical Centre (MMC), Clayton. Clinical staff, including radiographers and nuclear medicine technologists, from MMC operate the MRI and MR-PET scanners at MBI, and liaise with and provide guidance and expert research support to researchers from Monash and other universities, research institutes and organisations, and industry.



In 2017, MBI and Jülich Forschungszentrum (FZJ) continued their collaboration in the field of hybrid MR-PET and ultra high field (human) functional MRI. MBI and FZJ have an agreement to exchange staff and students between the facilities in Melbourne and Germany in order to promote knowledge transfer and exchange, and to develop new simultaneous MR-PET applications to enhance and expand the capabilities and offerings at MBI. Professor Jon Shah is currently the Director of JARA Institute Molecular Neuroscience and Neuroimaging (INM-11) at Jülich Forschungszentrum. Dr Phil Ward will visit the Helmholtz laboratory at Jülich in 2018 to gain invaluable knowledge and experience using the ultra-high field MR and MR-PET imaging instrumentation.

Partnerships

MBI recognises the importance of forming and maintaining strategic alliances with key partners for the development of imaging infrastructure and research capabilities.

SIEMENS

Since the opening of MBI, Siemens and MBI have continued to work collaboratively on a number of research projects including: (i) application of Siemens MEGAPRESS sequence for GABA spectroscopy to investigate inhibitory mechanisms in the brain, (ii) development of quantitative susceptibility imaging methods to examine brain iron content, and (iii) applications to high resolution imaging in kidney and brain using Siemens ZOOMIT multi-channel transmit technology. The recent installation of the new CT scanner will further strengthen this partnership and expand the suite of capabilities available at MBI.

In 2017, MBI and Siemens signed a collaborative agreement for the development of motion correction methods for MR-PET brain imaging by integrating the acquired information from one modality (MR) to inform the processing of acquired information from the other (PET), e.g. motion information.



MBI entered into an arrangement with Bruker whereby the 9.4T MRI scanner received a major upgrade, with the imaging hardware being converted to the Bruker platform, to dramatically enhance its capabilities. This now represents a revitalised state-of-the-art modality that has greatly expanded the capabilities of MBI to deliver high quality preclinical MRI and molecular imaging.

MBI

- Alahmari DM, Chan KYY, Stojanovska V, LaRosa D, Barton SK, Nitsos I, Zahra V, Barbuto J, Farrell M, Yamaoka S, Pearson JT, Polglase GR (2017). Diffusion tensor imaging detects ventilation-induced brain injury in preterm lambs. *PLoS One* 12(12): e0188737.
- Alahmari DM, Skiöld B, Barton SK, Nitsos I, McDonald C, Miller SL, Zahra V, Galinsky R, Wu Q, Farrell MJ, Moss TJ, Hooper SB, Pearson JT, Polglase GR (2017). Diffusion Tensor Imaging Colour Mapping Threshold for Identification of Ventilation-Induced Brain Injury after Intrauterine Inflammation in Preterm Lambs. *Front Pediatr*. 2017 Apr 5;5:70.
- Alahmari DM, Barton SK, Galinsky R, Nitsos I, Atik A, Farrell MJ, Pearson, JT, Polglase, GR (2017). Correlation between diffusion tensor imaging and histological brain injury in ventilated preterm lambs, *Imaging in Medicine* 9: 67-76.
- Arjmand HA, Hohagen J, Paton B, Rickard NS. (2017). Emotional Responses to Music: Shifts in Frontal Brain Asymmetry Mark Periods of Musical Change. *Front Psychol* 8: 2044.
- Biabani M, Farrell MJ, Egan GE, Zoghi M, Jaberzadeh S (2017). Crossover design in transcranial direct current stimulation studies on motor learning: Potential pitfalls and difficulties in interpretation of findings, *Reviews in the Neurosciences*.
- Bosker WM, Neuner I, Shah NJ (2017). The role of impulsivity in psychostimulant- and stress-induced dopamine release: Review of human imaging studies. *Neurosci Biobehav Rev*. 78: 82-90.
- Choi CH, Hong SM, Ha Y, Shah NJ (2017). Design and construction of a novel 1H/19F double-tuned coil system using PIN-diode switches at 9.4T. *J Magn Reson*. 279: 11-15.
- Cropley VL, Klauser P, Lenroot RK, Bruggemann J, Sundram S, Bousman C, Pereira A, Di Biase MA, Weickert TW, Weickert CS, Pantelis C, Zalesky A (2017). Accelerated Gray and White Matter Deterioration With Age in Schizophrenia. *Am J Psychiatry*. 174(3): 286-295.
- Dissanayaka T, Zoghi M, Farrell M, Egan GF, Jaberzadeh S (2017). Does transcranial electrical stimulation enhance corticospinal excitability of the motor cortex in healthy individuals? A systematic review and meta-analysis. *Eur J Neurosci*. 46(4): 1968-1990.
- Dissanayaka TD, Zoghi M, Farrell MJ, Egan GE, Jaberzadeh S (2017). Sham transcranial electrical stimulation and its effect on corticospinal excitability: a systematic review and meta-analysis, *Reviews in the Neurosciences*.
- Dodd GT, Andrews ZB, Simonds SE, Michael NJ, DeVeer M, Brüning JC, Spanswick D, Cowley MA, Tiganis T (2017). A Hypothalamic Phosphatase Switch Coordinates Energy Expenditure with Feeding. *Cell Metab*. 2017 26(2): 375-393.
- Domínguez D JF, Poudel G, Stout JC, Gray M, Chua P, Borowsky B, Egan GF, Georgiou-Karistianis N (2017). Longitudinal changes in the fronto-striatal network are associated with executive dysfunction and behavioral dysregulation in Huntington's disease: 30 months IMAGE-HD data. *Cortex*. 92: 139-149.
- Driessen AK, McGovern AE, Narula M, Yang SK, Keller JA, Farrell MJ, Mazzone SB (2017). Central mechanisms of airway sensation and cough hypersensitivity. *Pulm Pharmacol Ther*. 47: 9-15.
- Duché Q, Saint-Jalmes H, Acosta O, Raniga P, Bourgeat P, Doré V, Egan GF, Salvado O (2017). Partial volume model for brain MRI scan using MP2RAGE. *Hum Brain Mapp*. 38(10): 5115-5127.
- Dunkelmann T, Teichmann K, Ziehler T, Schemmert S, Frenzel D, Tusche M, Dammers C, Jürgens D, Langen KJ, Demuth HU, Shah NJ, Kutzsche J, Willuweit A, Willbold D (2017). A oligomer eliminating compounds interfere successfully with pEA (3-42) induced motor neurodegenerative phenotype in transgenic mice. *Neuropeptides*. 2017 Nov 27.
- Esteban-Cornejo I, Cadenas-Sanchez C, Contreras-Rodríguez O, Verdejo-Roman J, Mora-Gonzalez J, Migueles JH, Henriksson P, Davis CL, Verdejo-García A, Catena A, Ortega FB (2017). A whole brain volumetric approach in overweight/obese children: Examining the association with different physical fitness components and academic performance. *The ActiveBrains project*. *Neuroimage*. 159: 346-354.
- Farrell MJ, Cole LJ (2017). Central pathophysiology of dementia and pain, in S Lautenbacher, SJ Gibson, (eds.) *Pain in Dementia*, 55-70, (IASP Press, Seattle).
- Farrher E, Lindemeyer J, Grinberg F, Oros-Peusquens AM, Shah NJ (2017). Concerning the matching of magnetic susceptibility differences for the compensation of background gradients in anisotropic diffusion fibre phantoms. *PLoS One*. 2017 May 3;12(5): e0176192.
- Filss CP, Cicone F, Shah NJ, Galdiks N, Langen KJ (2017). Amino acid PET and MR perfusion imaging in brain tumours. *Clin Transl Imaging*. 5(3): 209-223.
- Flemmer AW, Thio M, Wallace MJ, Lee K, Kitchen MJ, Kerr L, Roehr CC, Fouras A, Carnibella R, Jani JC, DeKoninck P, Te Pas AB, Pearson JT, Hooper SB (2017). Lung hypoplasia in newborn rabbits with a diaphragmatic hernia affects pulmonary ventilation but not perfusion. *Pediatr Res*. 82(3): 536-543.
- Furtado MB, Wilmanns JC, Chandran A, Perera J, Hon O, Biben C, Willow TJ, Nim HT, Kaur G, Simonds S, Wu Q, Williams D, Salimova E, Plachta N, Denegre JM, Murray SA, Fatkin D, Cowley M, Pearson JT, Kaye D, Ramialison M, Harvey RP, Rosenthal NA, Costa MW (2017). Point mutations in murine Nkx2-5 phenocopy human congenital heart disease and induce pathogenic Wnt signaling. *JCI Insight*. 2(6): e88271.
- Gao XM, Wu QZ, Kiriazis H, Su Y, Han LP, Pearson JT, Taylor AJ, Du XJ (2017). Microvascular leakage in acute myocardial infarction: characterization by histology, biochemistry, and magnetic resonance imaging. *Am J Physiol Heart Circ Physiol*. 312(5): H1068-H1075.
- Harding IH, Andrews ZB, Mata F, Orlandea S, Martínez-Zalacáin I, Soriano-Mas C, Stice E, Verdejo-García A (2017). Brain substrates of unhealthy versus healthy food choices: influence of homeostatic status and body mass index. *Int J Obes (Lond)*. 2017 Sep 25.
- Harding IH, Corben LA, Delatycki MB, Stagnitti MR, Storey E, Egan GF, Georgiou-Karistianis N (2017). Cerebral compensation during motor function in Friedreich ataxia: The IMAGE-FRDA study. *Mov Disord*. 32(8): 1221-1229.
- Hermans L, Beeckmans K, Michiels K, Lafosse C, Sunaert S, Coxon JP, Swinnen SP, Leunissen I (2017). Proactive Response Inhibition and Subcortical Gray Matter Integrity in Traumatic Brain Injury. *Neurorehabil Neural Repair*. 31(3): 228-239.
- Heywood SE, Richart AL, Henstridge DC, Alt K, Kiriazis H, Zammit C, Carey AL, Kammoun HL, Delbridge LM, Reddy M, Chen YC, Du XJ, Hagemeyer CE, Febbraio MA, Siebel AL, Kingwell BA (2017). High-density lipoprotein delivered after myocardial infarction increases cardiac glucose uptake and function in mice. *Sci Transl Med*. 2017 Oct 11;9(411). pii: eaam6084.
- Jamadar SD, Sforzini F, Raniga P, Ferris NJ, Paton B, Bailey MJ, Brodtmann A, Yates PA, Donnan GA, Ward PGD, Woods RL, Storey E, McNeil JJ, Egan GF, and on behalf of the ASPREE investigator group (2017). Sexual dimorphism of resting state network connectivity in healthy ageing. *Journal of Gerontology: Psychological Sciences*, accepted for publication 27 December 2017.
- Kashuk SR, Williams J, Thorpe G, Wilson PH, Egan GF (2017). Diminished motor imagery capability in adults with motor impairment: An fMRI mental rotation study. *Behav Brain Res*. 334: 86-96.
- Kolodziej M, de Veer MJ, Cholewa M, Egan GF, Thompson BR (2017). Lung function imaging methods in Cystic Fibrosis pulmonary disease. *Respir Res*. 18(1): 96.
- Labuschagne I, Poudel G, Kordsachia C, Wu Q, Thomson H, Georgiou-Karistianis N, Stout JC (2017) Oxytocin selectively modulates brain processing of disgust in Huntington's disease gene carriers. *Prog Neuropsychopharmacol Biol Psychiatry*. 81: 11-16.
- Lang JA, Pearson JT, Binder-Heschl C, Wallace MJ, Siew ML, Kitchen MJ, Te Pas AB, Lewis RA, Polglase GR, Shirai M, Hooper SB (2017). Vagal denervation inhibits the increase in pulmonary blood flow during partial lung aeration at birth. *J Physiol*. 2017 595(5): 1593-1606.
- Langen KJ, Galdiks N, Hattingen E, Shah NJ. (2017). Advances in neuro-oncology imaging. *Nat Rev Neurol*. 13(5): 279-289.
- Lohmann P, Willuweit A, Neffe AT, Geisler S, Gebauer TP, Beer S, Coenen HH, Fischer H, Hermanns-Sachweh B, Lendlein A, Shah NJ, Kiessling F, Langen KJ (2017). Bone regeneration induced by a 3D architected hydrogel in a rat critical-size calvarial defect. *Biomaterials*. 113: 158-169.
- McGovern AE, Ajayi IE, Farrell MJ, Mazzone SB (2017). A neuroanatomical framework for central modulation of respiratory sensory processing and cough by the periaqueductal grey. *Journal of Thoracic Disease* 9: 4098-4107.
- Navas JF, Contreras-Rodríguez O, Verdejo-Román J, Perandrés-Gómez A, Albein-Urios N, Verdejo-García A, Perales JC (2017). Trait and neurobiological underpinnings of negative emotion regulation in gambling disorder. *Addiction* 112(6): 1086-1094.
- Ngo JP, Le B, Khan Z, Kett MM, Gardiner BS, Smith DW, Melhem MM, Maksimenko A, Pearson JT, Evans RG (2017). Micro-computed tomographic analysis of the radial geometry of intraneural artery-vein pairs in rats and rabbits: Comparison with light microscopy. *Clin Exp Pharmacol Physiol*. 44(12): 1241-1253.
- Park HJ, Pae C, Friston K, Jang C, Razi A, Zeidman P, Chang WS, Chang JW (2017) Hierarchical Dynamic Causal Modeling of Resting-State fMRI Reveals Longitudinal Changes in Effective Connectivity in the Motor System after Thalatomy for Essential Tremor. *Front Neurol*. 8: 346.
- Pearson JT, Yoshimoto M, Chen YC, Sultani R, Edgley AJ, Nakaoka H, Nishida M, Umetani K, Waddingham MT, Jin HL, Zhang Y, Kelly DJ, Schwenke DO, Inagaki T, Tsuchimochi H, Komuro I, Yamashita S, Shirai M (2017). Widespread Coronary Dysfunction in the Absence of HDL Receptor SR-B1 in an Ischemic Cardiomyopathy Mouse Model. *Sci Rep*. 7(1):18108.
- Picó-Pérez M, Alonso P, Contreras-Rodríguez O, Martínez-Zalacáin I, López-Solà C, Jiménez-Murcia S, Verdejo-García A, Menchón JM, Soriano-Mas C (2017). Dispositional use of emotion regulation strategies and resting-state cortico-limbic functional connectivity. *Brain Imaging Behav*. 2017 Sep 2.

40. Pitchaimuthu K, Wu QZ, Carter O, Nguyen BN, Ahn S, Egan GF, McKendrick AM (2017). Occipital GABA levels in older adults and their relationship to visual perceptual suppression. *Sci Rep.* 2017 Oct 27;7(1):14231.
41. Provost A, Jamadar S, Heathcote A, Brown SD, Karayanidis F (2017). Intertrial RT variability affects level of target-related interference in cued task switching. *Psychophysiology.* 2017 Aug 4.
42. Rajkumar R, Rota Kops E, Mauler J, Tellmann L, Lerche C, Herzog H, Shah NJ, Neuner I (2017). Simultaneous trimodal PET-MR-EEG imaging: Do EEG caps generate artefacts in PET images? *PLoS One.* 12(9): e0184743.
43. Razi A, Seghier ML, Zhou Y, McColgan P, Zeidman P, Park HJ, Sporns O, Rees G, Friston KJ (2017). Large-scale DCMs for resting-state fMRI. *Netw Neurosci* 1(3): 222-241.
44. Schartmann E, Schemmert S, Ziehler T, Leithold LHE, Jiang N, Tusche M, Jon Shah N, Langen KJ, Kutzsche J, Willbold D, Willuweit A (2017). Comparison of blood-brain barrier penetration efficiencies between linear and cyclic all-d-enantiomeric peptides developed for the treatment of Alzheimer's disease. *Eur J Pharm Sci.* 114: 93-102.
45. Shah NJ, Arrubla J, Rajkumar R, Farrher E, Mauler J, Kops ER, Tellmann L, Scheins J, Boers F, Dammers J, Sripath P, Lerche C, Langen KJ, Herzog H, Neuner I (2017). Multimodal Fingerprints of Resting State Networks as assessed by Simultaneous Trimodal MR-PET-EEG Imaging. *Sci Rep.* 7(1): 6452.
46. Sung S, Vijaratnam N, Chi Chan DW, Farrell M, Evans AH (2017). Pain sensitivity in Parkinson's disease: Systematic review and meta-analysis, Parkinsonism and Related Disorders, E-Pub 29/12/2017.
47. Tse DHY, da Silva NA, Poser BA, Shah NJ (2017). B1+ inhomogeneity mitigation in CEST using parallel transmission. *Magn Reson Med.* 78(6): 2216-2225.
48. Warbrick T, Rosenberg J, Shah NJ (2017). The relationship between BOLD fMRI response and the underlying white matter as measured by fractional anisotropy (FA): A systematic review. *Neuroimage.* 153: 369-381.
49. Ward PG, Fan AP, Raniga P, Barnes DG, Dowe DL, Ng AC, Egan GF (2017). Improved Quantification of Cerebral Vein Oxygenation Using Partial Volume Correction. *Front Neurosci.* 11: 89.
50. Ward SA, Raniga P, Ferris NJ, Woods RL, Storey E, Bailey MJ, Brodtmann A, Yates PA, Donnan GA, Trevaks RE, Wolfe R, Egan GF, McNeil JJ (Joint Senior authorship) on behalf of the ASPREE investigator group. (2017). ASPREE-NEURO study protocol: A randomized controlled trial to determine the effect of low-dose aspirin on cerebral microbleeds, white matter hyperintensities, cognition, and stroke in the healthy elderly. *Int J Stroke.* 12(1): 108-113.
51. Williams J, Kashuk SR, Wilson PH, Thorpe G, Egan GF (2017). White matter alterations in adults with probable developmental coordination disorder: an MRI diffusion tensor imaging study. *Neuroreport.* 28(2): 87-92.
52. Yong J, Hassan B, Liang Y, Ganesan K, Rajasekharan R, Evans R, Egan G, Kavehei O, Li J, Chana G, Nasr B, Skafidas E (2017). A Silk Fibroin Bio-Transient Solution Processable Memristor. *Sci Rep.* 7(1): 14731.
53. Bailey NW, Rogasch NC, Hoy KE, Maller JJ, Segrave RA, Sullivan CM, Fitzgerald PB (2017). Increased gamma connectivity during working memory retention following traumatic brain injury. *Brain Inj.* 31(3): 379-389.
54. Barnett AI, Hall W, Fry CL, Dilkes-Frayne E, Carter A (2017). Drug and alcohol treatment providers' views about the disease model of addiction and its impact on clinical practice: A systematic review. *Drug Alcohol Rev.*
55. Barnett AI, Hall W & Carter A (2017). Substance use terminology. *Jama,* 317(7), 769-770.
56. Bennett D, Oldham S, Dawson A, Parkes L, Murawski C, Yücel M (2017). Systematic overestimation of reflection impulsivity in the information sampling task. *Biol Psychiatry,* 82(4), e29-e30.
57. Bennett D, Yücel M, Murawski C (2017). Reply to: The choice of prior in bayesian modeling of the Information Sampling Task. *Biol Psychiatry,* S0006-3223(17), 31628-31621.
58. Berk M, Daglas R, Dandash O, Yücel M, Henry L, Hallam K, Macneil C, Hasty M, Pantelis C, Murphy BP, Kader L, Damodaran S, Wong MTH, Conus P, Ratheesh A, McGorry PD, Cotton SM (2017). Quetiapine v. lithium in the maintenance phase following a first episode of mania: Randomised controlled trial. *Br J Psychiatry,* 210(6), 413-421.
59. Berk M, Dandash O, Daglas R, Cotton SM, Allott K, Fornito A, Suo C, Klausner P, Liberg B, Henry L, Macneil C, Hasty M, McGorry P, Pantelis C, Yücel M (2017). Neuroprotection after a first episode of mania: A randomized controlled maintenance trial comparing the effects of lithium and quetiapine on grey and white matter volume. *Transl Psychiatry,* 7(1), e1011.
60. Bird F, Cornish KM, Lockley SW (2017). Sleep patterns predictive of daytime challenging behavior in individuals with low-functioning autism. *Autism Res.*
61. Carter A, Hall W (2017). Looking to the future: Clinical and policy implications of a brain disease model of addiction. In J. Illes (Ed.), *Neuroethics: Anticipating the future.* Oxford: Oxford University Press.
62. Cheetham A, Allen NB, Whittle S, Simmons, J, Yücel M & Lubman DI (2017). Orbitofrontal cortex volume and effortful control as prospective risk factors for substance use disorder in adolescence. *Eur Addict Res,* 23(1), 37-44.
63. Chung SW, Lewis BP, Rogasch NC, Saeki T, Thomson RH, Hoy KE, Bailey NW, Fitzgerald PB (2017). Demonstration of short-term plasticity in the dorsolateral prefrontal cortex with theta burst stimulation: A TMS-EEG study. *Clin Neurophysiol.* 128(7): 1117-1126.
64. Chung SW, Rogasch NC, Hoy KE, Sullivan CM, Cash RFH, Fitzgerald PB (2017). Impact of different intensities of intermittent theta burst stimulation on the cortical properties during TMS-EEG and working memory performance. *Hum Brain Mapp.* 2017 Nov 9.
65. Chye Y, Solowij N, Ganella EP, Suo C, Yücel M, Batalla A, Cousijn J, Goudriaan AE, Martin-Santos R, Whittle S, Bartholomeusz CF, Lorenzetti V (2017). Role of orbitofrontal sulcogyral pattern on lifetime cannabis use and depressive symptoms. *Prog Neuropsychopharmacol Biol Psychiatry,* 79, 392-400.
66. Chye Y, Solowij N, Suo C, Batalla A, Cousijn J, Goudriaan AE, Martin-Santos R, Whittle S, Lorenzetti V, Yücel M (2017). Orbitofrontal and caudate volumes in cannabis users: A multi-site mega-analysis comparing dependent versus non-dependent users. *Psychopharmacology (Berl),* 234(13), 1985-1995.
67. Chye Y, Suo C, Yücel M, den Ouden L, Solowij N, Lorenzetti V (2017). Cannabis-related hippocampal volumetric abnormalities specific to subregions in dependent users. *Psychopharmacology (Berl),* 234(14), 2149-2157.
68. Bird F, Cornish KM, Lockley SW (2017). Sleep patterns predictive of daytime challenging behavior in individuals with low-functioning autism. *Autism Res.*
69. Cohen S, Fulcher BD, Rajaratnam SMW, Conduit R, Sullivan JP, Hilaire MAS, Phillips AJ, Lodenkemper T, Kothare SV, McConnell K, Ahearn W, Braga-Kenyon P, Shlesinger A, Potter J, Bird F, Cornish KM, Lockley SW (2017). Behaviorally-determined sleep phenotypes are robustly associated with adaptive functioning in individuals with low functioning autism. *Sci Rep,* 7(1), 14228.
70. Coxon JP, Cash RFH, Hendrikse JJ, Rogasch NC, Stavrinou E, Suo C Yücel M (2017). GABA concentration in sensorimotor cortex following high-intensity exercise and relationship to lactate levels. *J Physiol.*
71. Cullen AJ, Barnett A, Komesaroff PA, Brown W, O'Brien KS, Hall W Carter A (2017). A qualitative study of overweight and obese Australians' views of food addiction. *Appetite,* 115, 62-70.
72. Daglas R, Allott K, Yücel M, Henry LP, Macneil CA, Hasty MK, Berk M, Cotton SM. (2017) Cognitive functioning following stabilisation from first episode mania. *Int J Bipolar Disord.* 5(1):39.
73. Dandash O, Pantelis C, Fornito A (2017). Dopamine, fronto-striato-thalamic circuits and risk for psychosis. *Schizophr Res.* 180: 48-57.
74. Dileo JF, Brewer W, Northam E, Yücel M, Anderson V (2017). Investigating the neurodevelopmental mediators of aggression in children with a history of child maltreatment: An exploratory field study. *Child Neuropsychol,* 23(6), 655-677.
75. Dilkes-Frayne E, Fraser S, Pienaar K, Kokanovic R (2017). Iterating 'addiction': Residential relocation and the spatio-temporal production of alcohol and other drug consumption patterns. *Int J Drug Policy,* 44, 164-173.
76. Ferreira GM, Fontenelle LF, Lorenzetti V, Luigjes J, Yücel M (2017). An investigation into the phenomenology of reward and habit in OCD: Looking for sociodemographic and clinical correlates. *European Neuropsychopharmacol,* 27(6), 621-622.
77. Ferreira GM, Yücel M, Dawson A, Lorenzetti V, Fontenelle LF (2017). Investigating the role of anticipatory reward and habit strength in obsessive-compulsive disorder. *CNS Spectr,* 22(3), 295-304.
78. Fornito A (2017). How do connectomes contribute to human cognition? *Scientific American: Mind,* 28(1).
79. Fornito A, Bullmore ET, Zalesky A (2017). Opportunities and challenges for psychiatry in the connectomic era. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging,* 2(1), 9-19.
80. Fulcher BD & Jones NS (2017). hctsa: A computational framework for automated time-series phenotyping using massive feature extraction. *Cell Syst,* 5(5), 527-531. e523.
81. Fraser S, Pienaar K, Dilkes-Frayne E, Moore D, Kokanovic R, Treloar C, Dunlop A. (2017). Addiction stigma and the biopolitics of liberal modernity: A qualitative analysis. *Int J Drug Policy,* 44, 192-201.
82. Garfield JBB, Cotton SM, Allen NB, Cheetham A, Kras M, Yücel M, Lubman DI (2017). Evidence that anhedonia is a symptom of opioid dependence associated with recent use. *Drug Alcohol Depend,* 177, 29-38.
83. Gilbert F, Goddard E, Viaña JNM, Carter A, Horne M (2017). I miss being me: Phenomenological effects of deep brain stimulation. *AJOB Neuroscience,* 8(2), 96-109.
84. Guo K, Youssef GJ, Dawson A, Parkes L, Oostermeijer S, Lopez-Sola C, Lorenzetti V, Greenwood C, Fontenelle LF, Yücel M (2017). A psychometric validation study of the Impulsive-Compulsive Behaviours Checklist: A transdiagnostic tool for addictive and compulsive behaviours. *Addict Behav,* 67, 26-33.
85. Hall W, Carter A Barnett A (2017). Disease or developmental disorder: Competing perspectives on the neuroscience of addiction. *Neuroethics,* 10(1), 103-110.

BMH

86. Hendrikse J, Kandola A, Coxon J, Rogasch N, Yücel M (2017). Combining aerobic exercise and repetitive transcranial magnetic stimulation to improve brain function in health and disease. *Neurosci Biobehav Rev*, 83, 11-20.
87. Hermens DF, Hatton SN, Lee RS, Naismith SL, Duffy SL, Paul Amminger G, Kaur M, Scott EM, Lagopoulos J, Hickie IB (2017). In vivo imaging of oxidative stress and fronto-limbic white matter integrity in young adults with mood disorders. *Eur Arch Psychiatry Clin Neurosci*.
88. Hill AT, Rogasch NC, Fitzgerald PB, Hoy KE (2017). Effects of prefrontal bipolar and high-definition transcranial direct current stimulation on cortical reactivity and working memory in healthy adults. *Neuroimage*. 152: 142-157.
89. Hordacre B, Moezzi B, Goldsworthy MR, Rogasch NC, Graetz LJ, Ridding MC (2017). Resting state functional connectivity measures correlate with the response to anodal transcranial direct current stimulation. *Eur J Neurosci*. 45(6): 837-845.
90. Jung WH, Yücel M, Yun JY, Yoon YB, Cho KI, Parkes L, Kim SN, Kwon JS (2017). Altered functional network architecture in orbitofronto-striato-thalamic circuit of unmedicated patients with obsessive-compulsive disorder. *Hum Brain Mapp*. 38(1): 109-119.
91. Klauser P, Baker ST, Croypley VL, Bousman C, Fornito A, Cocchi L, Fullerton JM, Rasser P, Schall U, Henskens F, Michie PT, Loughland C, Catts SV, Mowry B, Weickert TW, Shannon Weickert C, Carr V, Lenroot R, Pantelis C, Zalesky A (2017). White Matter Disruptions in Schizophrenia Are Spatially Widespread and Topologically Converge on Brain Network Hubs. *Schizophr Bull*. 2017 43(2): 425-435.
92. Koenders L, Lorenzetti V, de Haan L, Suo C, Vingerhoets W, van den Brink W, Wiers RW, Meijer, CJ, Machielsen M, Goudriaan AE, Veltman DJ, Yücel M Cousijn J (2017). Longitudinal study of hippocampal volumes in heavy cannabis users. *J Psychopharmacol*, 31(8), 1027-1034.
93. Lamblin M, Murawski C, Whittle S, Fornito A (2017). Social connectedness, mental health and the adolescent brain. *Neurosci Biobehav Rev*. 80: 57-68.
94. Lee RSC, Hermens DF, Scott J, O'Dea B, Glozier N, Scott EM, Hickie IB (2017). A transdiagnostic study of education, employment, and training outcomes in young people with mental illness. *Psychol Med*, 47(12), 2061-2070.
95. Mata F, Treadway M, Kwok A, Truby H, Yücel M, Stout JC, Verdejo-Garcia A (2017). Reduced willingness to expend effort for reward in obesity: Link to adherence to a 3-Month weight loss intervention. *Obesity*, 25(10), 1676-1681.
96. Mavros Y, Gates N, Wilson GC, Jain N, Meiklejohn J, Brodaty H, Wen W, Singh N, Baune BT, Suo C, Baker MK, Foroughi N, Wang Y, Sachdev PS, Valenzuela M & Fiatarone Singh MA (2017). Mediation of cognitive function improvements by strength gains after resistance training in older adults with mild cognitive impairment: Outcomes of the study of mental and resistance training. *J Am Geriatr Soc*, 65(3), 550-559.
97. Moore D, Pienaar K, Dilkes-Frayne E, Fraser S (2017). Challenging the addiction/health binary with assemblage thinking: An analysis of consumer accounts. *Int J Drug Policy*, 44, 155-163.
98. Morphet K, Carter A, Hall W & Gartner C (2017). Medicalisation, smoking and e-cigarettes: Evidence and implications. *Tob Control*, 26(e2), e134-e139.
99. Morphet K, Carter A, Hall W, Gartner C (2017). Framing tobacco dependence as a "Brain Disease": Implications for policy and practice. *Nicotine Tob Res*, 19(7), 774-780.
100. Morphet K, Carter A, Hall W, Lucke J, Partridge B, Gartner C (2017). Do neurobiological understandings of smoking influence quitting self-efficacy or treatment intentions? *Nicotine Tob Res*.
101. Opie GM, Sidhu SK, Rogasch NC, Ridding MC, Semmler JG (2017). Cortical inhibition assessed using paired-pulse TMS-EEG is increased in older adults. *Brain Stimul*. 2017 Dec 30.
102. Opie GM, Rogasch NC, Goldsworthy MR, Ridding MC, Semmler JG (2017). Investigating TMS-EEG Indices of Long-Interval Intracortical Inhibition at Different Interstimulus Intervals. *Brain Stimul*. 10(1): 65-74.
103. Parkes L, Fulcher BD, Yücel M, Fornito A (2017). Transcriptional signatures of connectomic subregions of the human striatum. *Genes Brain Behav*.
104. Parkes L, Fulcher BD, Yücel M, Fornito, A (2017). An evaluation of the efficacy, reliability, and sensitivity of motion correction strategies for resting-state functional MRI. *Neuroimage*, S1053-8119(17), 31097-31092.
105. Pienaar K & Dilkes-Frayne E (2017). Telling different stories, making new realities: The ontological politics of 'addiction' biographies. *Int J Drug Policy*, 44, 145-154.
106. Pienaar K, Moore D, Fraser S, Kokanovic R, Treloar C, Dilkes-Frayne E (2017). Diffracting addicting binaries: An analysis of personal accounts of alcohol and other drug 'addiction'. *Health*, 21(5), 519-537.
107. Prochazkova L, Parkes L, Dawson A, Youssef G, Ferreira GM, Lorenzetti V, Segrave RA, Fontenelle LF & Yücel M (2017). Unpacking the role of self-reported compulsivity and impulsivity in obsessive-compulsive disorder. *CNS Spectr*, 1-8.
108. Rogasch NC, Sullivan C, Thomson RH, Rose NS, Bailey NW, Fitzgerald PB, Farzan F, Hernandez-Pavon JC (2017). Analysing concurrent transcranial magnetic stimulation and electroencephalographic data: A review and introduction to the open-source TESA software. *Neuroimage*. 147: 934-951.
109. Savic M, Dilkes-Frayne E, Carter A, Kokanovic R, Manning V, Rodda SN, Lubman DI (2017). Making multiple 'online counsellings' through policy and practice: an evidence-making intervention approach. *Int J Drug Policy*, 53, 73-82.
110. Schmaal L, Yücel M, Ellis R, Vijayakumar N, Simmons JG, Allen NB, Whittle S (2017). Brain structural signatures of adolescent depressive symptom trajectories: A longitudinal magnetic resonance imaging study. *J Am Acad Child Adolesc Psychiatry*, 56(7), 593-601.
111. Sethi SS, Zerbi V, Wenderoth N, Fornito A, Fulcher BD (2017). Structural connectome topology relates to regional BOLD signal dynamics in the mouse brain. *Chaos*. 27(4): 047405.
112. Suo C, Gates N, Fiatarone Singh M, Saigal N, Wilson GC, Meiklejohn J, Sachdev P, Brodaty H, Wen W, Singh N, Baune BT, Baker M, Foroughi N, Wang Y, Valenzuela MJ (2017). Midlife managerial experience is linked to late life hippocampal morphology and function. *Brain Imaging Behav*, 11(2), 333-345.
113. Thomson C, Segrave RA (2017). I miss you too: More voices needed to examine the phenomenological effects of Deep Brain Stimulation. *AJOB Neuroscience*, 8(2), 122-123.
114. Tickell AM, Lee RSC, Hickie IB, Hermens DF (2017). The course of neuropsychological functioning in young people with attenuated vs discrete mental disorders. *Early Interv Psychiatry*.
115. Verdejo-Román J, Fornito A, Soriano-Mas C, Vilar-López R, Verdejo-García A (2017). Independent functional connectivity networks underpin food and monetary reward sensitivity in excess weight. *Neuroimage*. 146: 293-300.
116. Wang C, Lee J, Ho NF, Lim JKW, Poh JS, Rekihi G, Krishnan R, Keefe RSE, Adcock RA, Wood SJ, Fornito A, Chee MWL, Zhou J (2017). Large-Scale Network Topology Reveals Heterogeneity in Individuals With at Risk Mental State for Psychosis: Findings From the Longitudinal Youth-at-Risk Study. *Cereb Cortex*. 2017 Oct 27:1-10.
117. Yücel M, Carter A, Allen AR, Balleine B, Clark L, Dowling NA, Gainsbury SM, Goudriaan AE, Grant J, Hayes A, Hodgins D, van Holst R, Lattimore R, Livingstone C, Lorenzetti V, Lubman D, Murawski C, Parkes L, Petry N, Room R, Singh B, Thomas A, Townshend P, Youssef G, Hall W (2017). Neuroscience in gambling policy and treatment: An interdisciplinary perspective. *Lancet Psychiatry*, 4(6), 501-506.
118. Yuste R, Goering S, Arcas BAY, Bi G, Carmena JM, Carter A, Fins JJ, Friesen P, Gallant J, Huggins JE, Illes J, Kellmeyer P, Klein E, Marblestone A, Mitchell C, Parens E, Pham M, Rubel A, Sadato N, Sullivan LS, Teicher M, Wasserman D, Wexler A, Whittaker M, Wolpaw J (2017). Four ethical priorities for neurotechnologies and AI. *Nature*, 551(7679), 159-163.

MoNoC

119. Amari S-I, Tsuchiya, N, Oizumi M (2017) "Geometry of Information Integration" ArXiv.
120. Baroni F, van Kempen J, Kawasaki H, Kovach C, Oya H, Howard M, Adolphs R, Tsuchiya N (2017) "Intracranial Markers of Conscious Face Perception in Humans" *Neuroimage*.
121. Boly M, Massimini M, Tsuchiya N, Postle BR, Koch C, Tononi G (2017). "Are the neural correlates of consciousness in the front or in the back of the cerebral cortex? Clinical and neuroimaging evidence" *Journal of Neuroscience*.
122. Cohen D, Tsuchiya, N (2017). "A unified framework for dissecting the effects of common signals on functional and effective connectivity analyses: power, coherence, and Granger causality" *bioRxiv*.
123. Ding C, Palmer C, Hohwy J, Youssef G, Paton B, Tsuchiya N, Stout J, Thyagarajan D (2017). "Parkinson's disease alters multisensory perception: Insights from the Rubber Hand Illusion" *Neuropsychologia* 97: 38-45.
124. Fujiwara M, Ding C, Kaunitz L, Stout J, Thyagarajan D, Tsuchiya N (2017) "Optokinetic nystagmus reflects perceptual directions in the onset binocular rivalry in Parkinson s disease" *PLoS One*
125. Garrido MI, Rowe EG, Halasz V, Mattingley JB (2017). Bayesian mapping reveals that attention boosts neural responses to predicted and unpredicted stimuli. *Cerebral Cortex*.
126. Gordon N, Koenig R, Tsuchiya N, van Boxtel J, Hohwy J (2017). "Neural markers of predictive coding under perceptual uncertainty revealed with Hierarchical Frequency Tagging" *eLife*.
127. Haun AM, Oizumi M, Kovach CK, Kawasaki H, Oya H, Howard MA, Adolphs R, Tsuchiya N (2017) "Conscious perception as integrated information patterns in human electrocorticography" *eNeuro*.
128. Haun A, Koch C, Tononi G, Tsuchiya N (2017). "Are we underestimating the richness of visual experience?" *Neuroscience of Consciousness*.
129. Matthews J, Schröder P, Kaunitz L, van Boxtel J, Tsuchiya N (2017). "Conscious access in the near absence of attention: Critical extensions on the dual-task paradigm" *psyarxiv*.
130. Thomas V, Davidson M, Zakavi P, Tsuchiya N, van Boxtel J (2017). Simulated forward and backward self motion, based on realistic parameters, causes motion induced blindness. *Sci Rep*. 7(1): 9767.
131. Tsuchiya N (2017) ""What is it like to be a bat? - a pathway to the answer from the Integrated Information Theory". *Philosophy Compass*.
132. Tsuchiya N, Haun A, Cohen D, Oizumi M (2017). "Empirical tests of integrated information theory of consciousness" *Return of Consciousness*, edited by Anders Haag.

MBI

1. Reignwood Culture Foundation Grant: "Quantitative simultaneous MR-PET imaging of dementia", Chen, Egan, Li. (2016 - 2019)
2. ARC Linkage Project # LP170100494, Gary Egan, Simultaneous to synergistic MR-PET: integrative brain imaging technologies. Jamadar, Chen, Premaratne, Fornito, Schmitt, Gaass, Shah. (2018-2021)
3. ARC Discovery Grant 2018. The influence of attentional selection on perceptual decision making. Bellgrove, O'Connell, Coxon
4. ARC Discovery Grant 2018. Mechanisms and contexts driving impulsivity. Verdejo-Garcia, Stout, Bellgrove
5. NHMRC Project Grant 2018. The neurocircuitry of food choice in obesity. Verdejo-Garcia, Andrews, Lockie, Harding
6. NHMRC Project Grant 2018. Neurophysiology of attention deficits after right hemisphere stroke. Bellgrove, Mattingley, O'Connell, Molenberghs, New, Stolwyk
7. Siemens MoCo project: "Development of motion correction strategy for quantitative MR-PET imaging", Chen, Pawar, Sforazzini, Zhong.
8. 2018 Faculties of Science, IT and Engineering, ECR Interdisciplinary Research Seed Grant Scheme, "SeSaMI, Secure Sharing of Medical Images", Zolotavkin, Herrmann, Li, Ward
9. Nectar resource grant: "MBI-webservices", Chen, Sforazzini (May 2017 - May 2018)
10. ARC Discovery Project (2017-). Modelling trajectories of cognitive control in adolescents and young adults. Karayanidis, Forstmann, Steyvers, Jamadar, Hawkins, Lenroot, Michie

BMH

11. The David Winston Turner Endowment Fund and Monash University (2017-18): Addiction and obsessive-compulsive disorder project: BrainPark: The David W Turner Clinic (BrainPark). Yücel, Segrave, Fontenelle, Cornish
12. NHMRC Principal Research Fellowship (2017-21): Enhancing and integrating addiction neuroscience knowledge with clinical practice, by transforming the approach to assessment and classification protocols, and improving outcomes by using neurocognitive phenotypes for tailored treatments. Yücel
13. ARC Discovery Project (2017-19): How inhibition shapes human brain oscillations and working memory capacity. Rogasch, Fornito, Hawi, Yücel
14. NHMRC Career Development Fellowship (2017-21): Translating neuroscience into treatments and public health policies for addictive behaviours. O'Brien, Carter
15. NHMRC Project Grant (2014-17): Predicting treatment response in youth depression with brain imaging. Harrison, Davey, Yücel, Whittle, Fornito, Pujol
16. NHMRC Equipment Grant (2016-17): Portable Neurophysiological Assessment Suite. Bellgrove, Egan, Rosa, Yücel, Rajaratnam, Fornito, Cornish, Fitzgerald, Mansouri, Chong, Johnson, Morris, Rogasch, Smith, Sundram, Srikanth
17. Victorian Responsible Gambling Foundation (2017-18): Extent of, and young people's exposure to, gambling advertising and sponsorship messages in sport and non-sport TV. Carter
18. Innovations Connections Partnership (2016-17): Torus Games (Industry) & (Monash Institute of Cognitive and Clinical Neurosciences (Research)). Yücel, Segrave, Lee
19. Cientista de nosso Estado (Scientist of Our State) fellowship (2017-20). Fontenelle
20. Brain & Behavior Research Foundation (2016-18). Assessing GABAergic dysfunction in the prefrontal cortex of people with schizophrenia. Rogasch
21. ARC Discovery Early Career Researcher Award 2018. Harnessing neural plasticity with brain stimulation. Nigel Rogasch
22. NHMRC RD Wright Biomedical CDF 2018. Maps, models and modifiers of brain dysfunction in psychosis. Fornito

23. NHMRC Project Grant 2018. Maps, models and modifiers of brain dysfunction in psychosis. Yücel, Solowij
24. NHMRC Project Grant 2018. Efficacy of a 3-month aerobic exercise regime for restoring 'brain health' in heavy cannabis users. Yücel, Solowij, Coxon, Lubman
25. NHMRC Project Grant 2018. A dimensional approach to mapping the risk mechanisms of mental illness. Fornito, Bellgrove, Yücel, Fulcher, Hawi

MoNoC

26. National Computational Merit Allocation Scheme 2018 (200,000 CPU-core hours). Tsuchiya
27. ARC Discovery Grant 2018. Neural origins of conscious perception in no-report paradigms. Tsuchiya, Oizumi, Kawasaki, Tononi
28. ARC Discovery Grant 2018. Multimodal testing for a fast subcortical route for salient visual stimuli. Garrido, Tsuchiya, Rutishauser, Adolphs
29. Arts-Medicine Interdisciplinary Research Support Program 2017. Wanderlust : Identifying and manipulating the neural basis of mind wandering with electroencephalography and transcranial alternating current stimulation Windt, van Boxtel, Tsuchiya
30. Network of Excellence 2017 Bayne, Modi, Tsuchiya, Hohwy
31. Interdisciplinary Research Support Program 2017. Tsuchiya, Hohwy, Drummond
32. MICCN Brainstorming Grant 2017, Tsuchiya, van Boxtel
33. Platform Access Grant 2017 Measuring internal noise in the brain. van Boxtel, Tsuchiya, Bellgrove

Professional Contributions

MBI

Memberships and Registrations

1. Royal Australian and New Zealand College of Radiologists (Ferris, N)
2. Australian and New Zealand Society for Neuroradiology (Ferris, N)
3. Society for Imaging Informatics in Medicine (Ferris, N)
4. Australian Medical Association (Ferris, N)
5. Radiological Society of North America (Ferris, N)
6. European Society for Radiology (Ferris, N)
7. International Society for Magnetic Resonance in Medicine (Ferris, N; Egan GF; Chen, Z)
8. International Organisation for Human Brain Mapping (Egan, GF; Jamadar, S)
9. Australasian Neuroscience Society (Egan, GF; Jamadar, S)
10. Society for Neuroscience (Egan, GF; Jamadar, S)
11. Society for Psychophysiological Research (Jamadar, S)
12. Australasian Cognitive Neuroscience Society (Jamadar, S)
13. Australian Society of Immunology (de Veer, M)

Assessorships

14. National Health & Medical Research Council Project Grants (Jamadar, S; de Veer, M)
15. Computerized Medical Imaging and Graphics (Chen, Z)
16. Australian Research Council (Chen, Z; Jamadar, S; de Veer, M)

Editorships

17. Co-Editor-in-Chief, Human Brain Mapping (Egan, GF)
18. International Journal of Imaging Systems and Technology (Egan, GF)
19. Frontiers in Neuroscience, Frontiers Research Foundation, (Egan, GF)
20. Frontiers in Psychology Cognition, Associate Editor (Jamadar, S)

Committees

21. International Neuroinformatics Co-ordinating Facility, Governing Board Member, (Egan GF)
22. ISMRM Annual Meeting & Exhibition, Local Organising Committee (LOC), (Egan, GF)
23. Human Brain Project, International Expert Review Panel (Egan, GF)
24. Herston Imaging Research Facility, Scientific Advisory Board Member (Egan, GF)
25. Australian Academy of Science Brain Implementation Committee (Egan, GF)
26. Club Melbourne, Member & Ambassador, State Government of Victoria (Egan, GF)
27. Australian Cognitive Neuroscience Society Executive, (Jamadar, S)
28. ARC Centre of Excellence for Integrative Brain Function Early Career Researcher Committee (Jamadar, S)
29. Co-chair, Diagnostic Imaging Program, Australian Digital Health Agency (Ferris NJ) from 2017

30. Specialist Advisor, Advisory Committee on Medical Devices, Therapeutic Goods Administration (Ferris NJ) from 2017
31. Chair of the MRI Reference Group of the RANZCR 2000-17, now member (Ferris NJ).
32. Chair of the e-Radiology Reference group of the RANZCR, 2009-present (Ferris NJ).
33. Australasian Neuroscience Society Gender Equity and Diversity Committee (Jamadar S)
34. ARC Centre of Excellence for Integrative Brain Function Gender Equity and Diversity Committee (Jamadar S)
35. Society for Psychophysiological Research Young Investigator Award Committee (Jamadar S)
36. Chair, Local Organising Committee, Emerging Researchers in Ageing Conference (Jamadar S)
37. Co-founder, Australasian Women in Neuroscience (Jamadar S)
38. Australian National Imaging Facility, Molecular Imaging Thematic Group and Industry Engagement Committee (de Veer, M)
39. Australian National Imaging Facility, Operations Committee (Egan, GF)

BMH

Memberships and Registrations

40. APS College of Clinical Neuropsychologists (Yücel, M)
41. APHRA endorsement in the clinical practise area of Clinical Neuropsychology (Yücel, M; Segrave, R)
42. Australian Health Practitioner Registration Agency (Yücel, M; Segrave, R)
43. Australian Psychological Society (Yücel, M)
44. Member, Biological Psychiatry Australia (Yücel, M; Segrave, R)
45. Member, Australasian Society for Psychiatric Research (Yücel, M)
46. Member of Australian Academy of Science's National Committee on Brain and Mind Science (Fornito, A)
47. Organization for Human Brain Mapping (Fornito, A; Rogasch, N)
48. Australasian Cognitive Neuroscience Society (Rogasch, N)
49. Australasian Psychophysiology Society (Segrave, R)

Committees

50. Program Leader, 'Addiction Studies', Monash Institute of Cognitive and Clinical Neurosciences, Monash University (Yücel, M)
51. Director, Brain and Mental Health Laboratory, Monash University (Yücel, M)
52. Listed on 2017 Thompson Reuters Highly Cited Researchers List (top 1% internationally) (Yücel, M.)
53. Executive Council Member, Biological Psychiatry Australia (Fornito, A)
54. Organization for Human Brain Mapping, Australian Chapter (Fornito, A)
55. Australian Brain Alliance Steering Committee (Fornito, A)
56. Treasurer, Australasian Brain Stimulation Society (Rogasch, N)

Editorships

57. Editorial Board Member, Neuroscience Biobehaviour Review (Yücel, M)
58. Psychiatry Research and Neuroimag (Yücel, M)
59. The Open NeuroImaging Journal (Yücel, M)
60. Editorial Board, Journal of Neuroscience (Fornito, A)
61. Editorial Board, Biological Psychiatry (Fornito, A)
62. Editorial board, Biological Psychiatry: Cognitive Neuroscience and Neuroimaging (Fornito, A)
63. Associate Editor, Science Advances (Fornito, A)
64. Editorial Board, Neuroimage (Fornito, A)
65. Senior Editor, Network Neuroscience (Fornito, A)

Assessorships

66. National Health & Medical Research Council of Australia (Yücel, M; Rogasch, N; Segrave, R)
67. Australian Research Council (Yücel, M; Rogasch, N)
68. National Institute of Health, (USA) (Yücel, M)
69. Medical Research Council, (UK) (Yücel, M)
70. ZonMW (NETH) (Yücel, M)
71. NHMRC (Fornito, A)
72. ARC (Fornito, A)
73. Wellcome Trust (Fornito, A)
74. Research Foundation - Flanders, International Fellowship Assessor (Segrave, S)

MoNoC

Memberships

75. Association for the Scientific Study of Consciousness (Tsuchiya, N; van Boxtel, J)
76. Vision Sciences Society (van Boxtel, J)
77. Australasian Cognitive Neuroscience Society (van Boxtel, J)
78. Australasian Society for Cognitive Science (van Boxtel, J)

Committees

79. Initiative for Synthetic Study of Awareness, Summer School (Tsuchiya, N)
80. Association for the Scientific Study of Consciousness (Tsuchiya, N)

Editorships

81. Neuroscience of Consciousness (Tsuchiya, N)
82. Consciousness and cognition (Tsuchiya, N)

Assessorships

83. Israel Science Foundation (van Boxtel, J)
84. Australian Research Council (Tsuchiya, N)

Outreach Activities

MBI

Locally organised symposia and workshops

1. Close T, Egan GF. Monash Biomedical Imaging, Computational Neuroscience Symposium, 3 February, Melbourne, Australia
2. Close T, Egan GF. Monash Biomedical Imaging, Characterisation Informatics Workshop, 28 February, Melbourne, Australia
3. Egan GF. Brain Dialogue Event: Machines That Read Your Mind, 03 March, Deakin Edge, Melbourne, Australia
4. de Veer M. CSIRO Scientists in Schools Program
5. Ward P. Monash Dementia & Neurodegeneration Research Symposium, 2017
6. Ward P. Monash University Faculty of Medicine, Nursing and Health Sciences Early Career Researcher Symposium, 2017

Attendance and presentations at international symposia/conferences

7. Egan GF. Brain Tech 2017: Converging Technologies, 06-07 March. Tel Aviv, Israel
8. Egan GF. IEEE International Symposium on Biomedical Imaging, 18-21 April, Melbourne Australia
9. Egan GF. Dr Phil Ward. ISMRM (International Society for Magnetic Resonance in Medicine) 25th Annual Meeting & Exhibition, 22-27 April, Honolulu, Hawaii
10. Egan GF 2017 OHBM: 23rd Annual Meeting of the Organisation for Human Brain Mapping, 25-29 June, Vancouver, Canada
11. de Veer M. AusMedtech 2017, 24-25 May Melbourne, Victoria Australia
12. Jamadar S. 7th Australasian Society for Cognitive Neuroscience Conference, 23-26 November, Adelaide Australia
13. Jamadar S. NHMRC Australian Dementia Forum, 15-17 October, Melbourne Australia
14. Jamadar S. 37th Annual Meeting of the 3-6 December, Australasian Neuroscience Society, Sydney Australia
15. Ward P. Student Co-Chair of the 2017 IEEE International Symposium for Biomedical Imaging
16. Ward P. Committee Member, Panel Chair and Session Organiser for the Inaugural International Society for Magnetic Resonance in Medicine Trainee Program (Secret Sessions)
17. Ward P. IEEE 14th International Symposium on Biomedical Imaging, 2017

Media

18. Farrell MJ and other MBI staff appeared on an episode of the ABC TV program "Ask The Doctor" (2017)
19. Jamadar S. Interview for 2GB and 2SM Radio News segments 5 May 2017
20. Jamadar S. Feature on SBS World News National 6 May 2017
21. Jamadar S. Feature on Channel 10 News National 6 May 2017
22. Jamadar S. Feature on Channel 9 news Melbourne/Adelaide/Perth 4 May 2017
23. Jamadar S. Feature in Herald Sun, 'Secrets of the agers' <https://tinyurl.com/m4e2tss>
24. Jamadar S. Feature in Adelaide Advertiser, 'Unlocking age old secrets of the brain' <https://tinyurl.com/kcd594w>
25. Jamadar S. Feature in the Herald Sun/Courier Mail/Gold Coast Bulletin/Adelaide Now/Daily Telegraph newspapers 'Australia's 'super agers' have brain scans to unlock health secrets' <https://tinyurl.com/m4fauug>

26. Ward P. science blog <http://blog.ismrm.org/2017/07/12/secret-sessions/>
27. Ward P. BrainSTEM Innovation Challenge Mentor - a high school science program (<http://brainstem.org.au/index.html>)

BMH

Locally organised symposia and workshops

28. Dawson A. Neuroscience and Society: Ethical, Legal & Clinical Implications of Neuroscience Research. Sydney, Australia
29. Fornito A. Australian Brain Alliance Workshop, Melbourne, Australia
30. Fornito A. Neuroscience colloquium at NeuRA, Sydney, Australia
31. Fornito A. Florey Institute of Neuroscience and Mental Health Colloquium, Melbourne, Australia
32. Fornito A. Symposium on Computational Neuroscience, Monash Institute of Cognitive and Clinical Neurosciences, Melbourne, Australia
33. Fornito A. Monash Institute of Cognitive and Clinical Neurosciences Workshop on Computational Neuroscience, Melbourne, Australia
34. Thomson C, Carter A, Segrave R. Monash Dementia & Neurodegeneration Research Symposium, Melbourne, Australia
35. Yücel M. Keynote presentation, Australian and New Zealand Addiction Conference, Gold Coast, Australia
36. Segrave R. Australasian Psychophysiology Conference, Adelaide, Australia

Attendance and presentations at international symposia/ conferences

37. Barnett AI, Fry C, Hall W, Carter, A. Contemporary Drug Problems, Helsinki, Finland
38. Carter A. Global Neuroethics Summit, Daegu, Korea
39. Carter A. Canadian Obesity Network, Banff, Canada
40. Carter, A. International Neuroethics Society Meeting, Washington DC, USA
41. Chye Y. Lisbon Addictions Congress, Lisbon, Portugal
42. Fornito A. The Annual Congress of the International Consortium for Neuroinformatics (ICNF), Kuala Lumpur, Malaysia
43. Fornito A. International School and Conference on Network Science (NetSci), Indianapolis, USA
44. Fornito A. International Society for Magnetic Resonance in Medicine (ISMRM), Honolulu, USA
45. Fornito A. Cognomics conference, Nijmegen, Netherlands
46. Fornito A. The International Brain Research Organization (IBRO) School on Neuroinformatics for Brain Network and Connectivity Analysis, Kuala Lumpur, Malaysia
47. Fornito A. Annual Meeting of the Organization for Human Brain Mapping (OHBM), Vancouver, Canada
48. Fornito A. Educational Workshop, Annual Meeting of the Organization for Human Brain Mapping (OHBM), Vancouver, Canada
49. Rogasch N. BrainBox Initiative Conference, London, UK
50. Rogasch N. TMS-EEG Workshop and Summer School, Espoo, Finland
51. Yücel M. Lisbon Addictions Congress, Lisbon, Portugal
52. Yücel M, Suo C. Teaching at IEEE EMBS International summer school of neural engineering: Multimodal neuroimaging, Shanghai, China

Media

53. Carter A: Monash University mini-documentary "A Different Lens: The Ethics of Neuroscience" 4 December, 2017
54. Carter A, Allen A, Dilkes-Frayne E, Segrave R, Lee R, Kakoschke N, Castine B, Yücel M: Public engagement event "Hooked on gambling: By choice or by design?" 11 October 2017

MoNoC

Locally organised symposia and workshops

55. Tsuchiya N. Monash Institute of Cognitive and Clinical Neuroscience (MICCN) Computational Neuroscience Symposium 2017, (Tsuchiya, N)
56. Tsuchiya N. Chair, Australasian Neuroscience Society Conference 2017

Attendance and presentations at international symposia/ conferences

57. Tsuchiya N. Monash Institute of Cognitive and Clinical Neuroscience (MICCN) Computational Neuroscience Symposium 2017, (Tsuchiya, N)
58. Tsuchiya N. Chair, Australasian Neuroscience Society Conference 2017
59. Tsuchiya N. Initiative for the Synthesis of Studies of Awareness (ISSA) 2017, Japan
60. Tsuchiya N. Scientific Study of Consciousness, 22th annual meeting. Krakow, Poland
61. Tsuchiya N. Consciousness and artificial intelligence, Artificial General Intelligence, Melbourne, Australia
62. Tsuchiya N. Asia Pacific Vision Conference 2017, Taiwan
63. Tsuchiya N. Brain Dynamics on Multiple Scales - Paradigms, their Relations, and Integrated Approaches 2017, Dresden, Germany
64. Tsuchiya N. Chair, Satellite symposium on consciousness at Japan Neuroscience Society 2017, Debates on consciousness

Abbreviations

3D	3-Dimensional
3T/9.4T	3 Tesla / 9.4 Tesla
AMREP	Alfred Medical Research and Education Precinct
ANSTO	Australian Nuclear Science and Technology Organisation
ARC	Australian Research Council
ASPREE	Aspirin Reducing Events in the Elderly
BMH	Brain and Mental Health (research laboratory)
BMTF	Biomedical Materials Translational Facility
BOLD	Blood-Oxygen-Level Dependent
CIBF	Australian Research Council Centre of Excellence for Integrative Brain Function
CMFS	Chirp Modulated Fourier Space
CSIRO	Commonwealth Scientific Industrial Research Organisation
CT	Computed Tomography
DaRIS	Distributed and Reflective Informatics System
DTI	Diffusion Tensor Imaging
DWTEF	David Winston Turner Endowment Fund
ECoG	Electrocortigraphy
EEG	Electroencephalogram
FDG	18F-fluorodeoxyglucose
FDG-PET	Fluorodeoxyglucose-Positron Emission Tomography
FLECT	Fluorescence Emission Computed Tomography
fMRI	Functional Magnetic Resonance Imaging
FZJ	Jülich Forschungszentrum
GABA	Gamma-Aminobutyric acid
ICA	Independent Component Analysis
IIT	Integrated Information Theory
IMBL	Imaging and Medical Beam Line
INM-11	JARA Institute of Molecular Neuroscience and Neuroimaging
M2	Monash Medtech
MBI	Monash Biomedical Imaging
MHTP	Monash Health Translation Precinct
MICCN	Monash Institute of Cognitive and Clinical Neurosciences
MIPS	Monash Institute of Pharmaceutical Sciences
MMC	Monash Medical Centre
MoNoC	Monash Neuroscience of Consciousness (research laboratory)
MPRAGE	Magnetization Prepared Rapid Acquisition Gradient Echo
MR-PET	Magnetic Resonance - Positron Emission Tomography
MRI	Magnetic Resonance Imaging
MRS	Magnetic Resonance Spectroscopy
NIF	National Imaging Facility
OCD	Obsessive Compulsive Disorder
PET	Positron Emission Tomography
PET-CT	Positron Emission Tomography – Computed Tomography
SPECT	Single Photon Emission CT
TESA	TMS-EEG Signal Analyser
TMS	Transcranial Magnetic Stimulation
VBIC	Victorian Biomedical Imaging Capability
VHH	Victorian Heart Hospital
XNAT	Extensible Neuroimaging Archive Toolkit (informatics platform)

MONASH BIOMEDICAL IMAGING

Monash Biomedical Imaging
Monash University
770 Blackburn Road
Clayton VIC 3800
Telephone: (03) 9905 0100
Email: enquiries.mbi@monash.edu

platforms.monash.edu/mbi/



All information contained in this document is current at the time of publication. Monash University reserves the right to alter this information at any time (should the need arise). Please check the Monash University website for updates: www.monash.edu

Published May 2018.

CRICOS provider:
Monash University 00008C