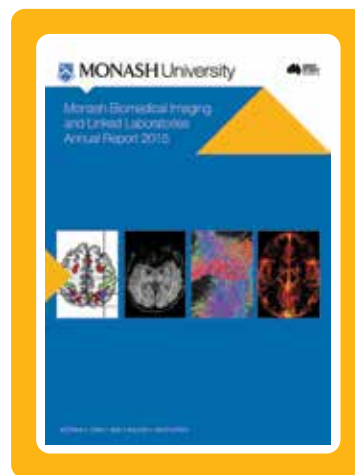




## Monash Biomedical Imaging Lustrum Report 2012-2016



2013

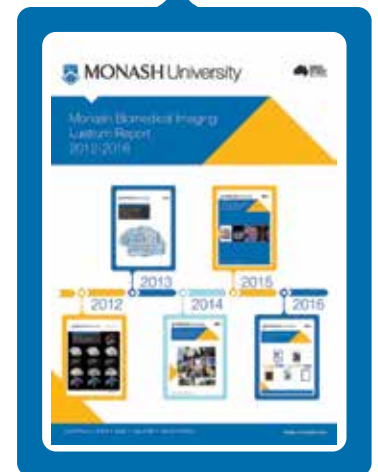
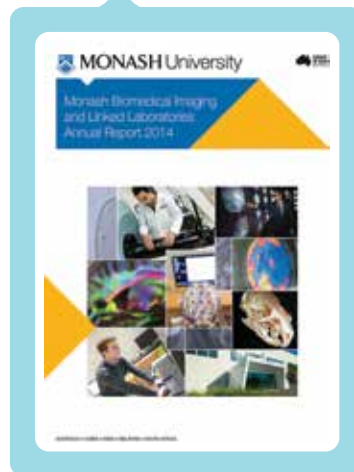


2015

2012

2014

2016



# Monash Biomedical Imaging



## Member



VBIC



National  
Imaging  
Facility



National Node of  
Victoria, Australia

## Supporters



Australian Government  
Department of Innovation  
Industry, Science and Research



## Collaborators



CSIRO



MonashHealth

## Partners

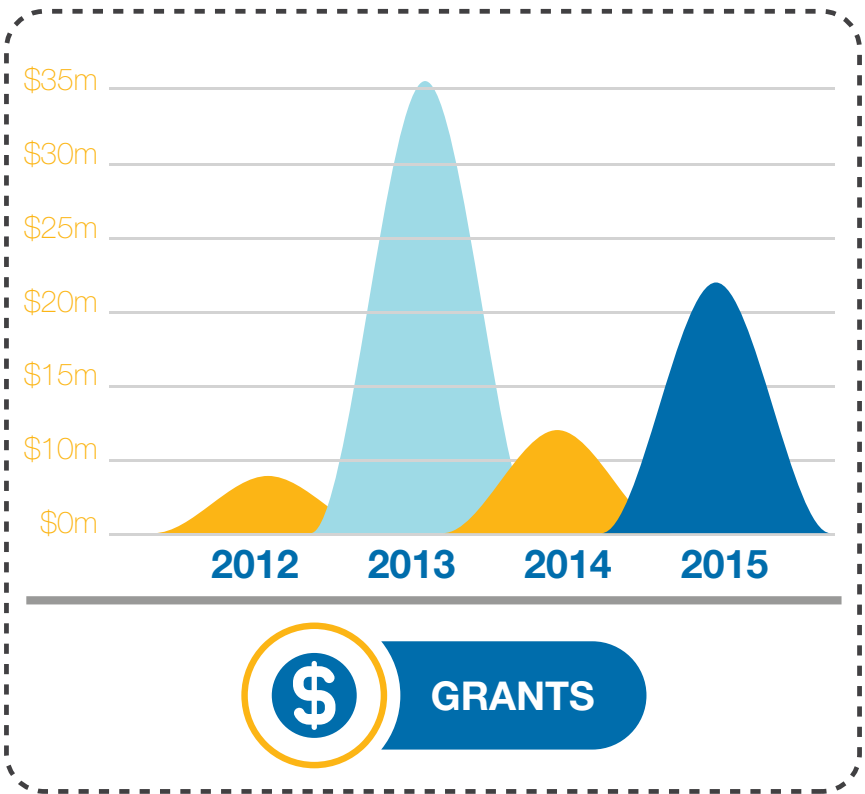
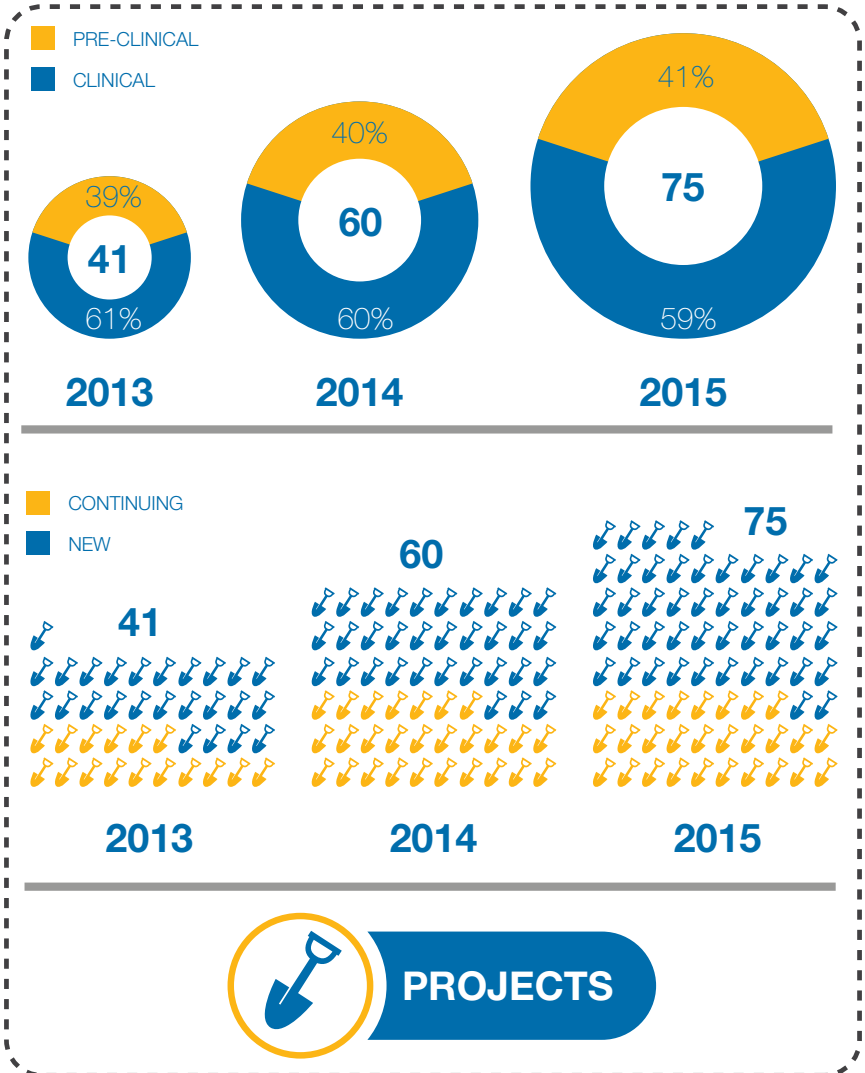
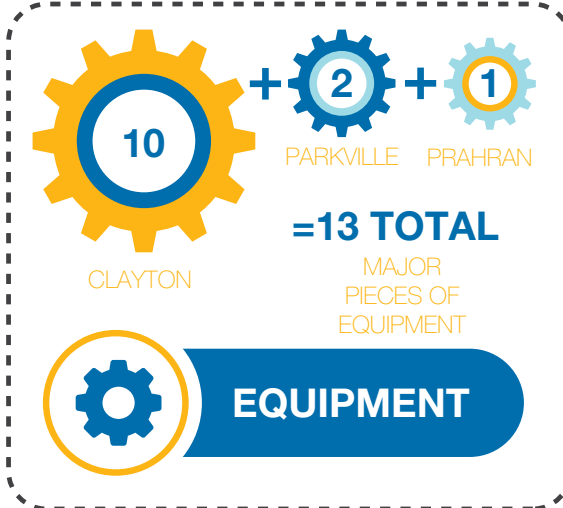
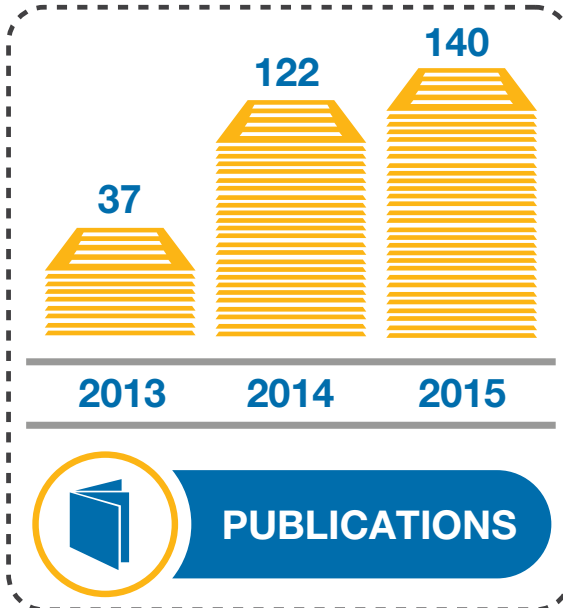
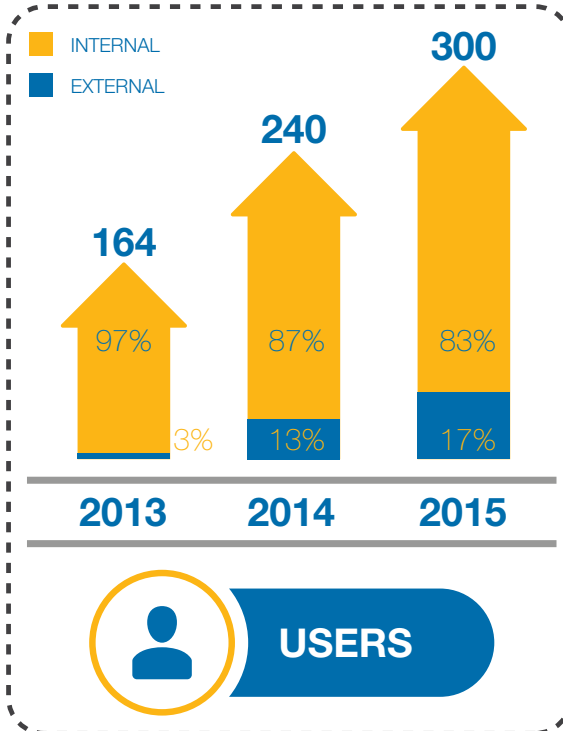
SIEMENS

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# Monash Biomedical Imaging Milestones

- In 2010, Monash University as part of a Victoria wide consortium was awarded a grant from the Victorian State Government to support the establishment of the Victorian Biomedical Imaging Capability (VBIC).
- The Monash University vision for a multimodal, biomedical imaging research facility became a reality when Monash Biomedical Imaging (MBI) was officially opened in May 2012.
- The VBIC funding together with co-investment from Monash University enabled to establishment an imaging research platform for researchers from the academic and industry sectors.
- Since its establishment MBI has been governed by an Advisory Board that provides strategic and scientific oversight of the research platform activities.
- The MBI research platform has facilitated and strengthened partnerships between Monash University and the Australian Synchrotron, CSIRO and Monash Health, as well as industry partners including Siemens.
- Leadership of the VBIC and involvement in the National Imaging Facility (NIF) provides open access to the MBI imaging services and expertise to researchers across Melbourne and Australia.
- In 2013 the MBI Linked Laboratories were formed with the co-location at MBI of two research laboratories from the Monash Institute for Cognitive and Clinical Neuroscience (MICCN).
- The collaborative arrangements between MBI and MICCN included an MBI-MICCN Seed Grants scheme to support early career researchers through the provision of small grants to undertake imaging research projects.
- Throughout 2013 senior MBI staff led a successful application to the Australian Research Council (ARC) to establish the ARC Centre of Excellence for Integrative Brain Function that is headquartered at MBI.
- In 2014 MBI experienced continued growth in the provision of research services, with the initial MRI research focus on brain imaging expanded to include lung, kidney and cardiovascular imaging in collaboration with the Imaging and Medical Beam Line at the Australian Synchrotron.
- The research platform was incorporated into the Australian Research Infrastructure Network (ARIN) system in 2014 to provide researchers with streamlined access to the biomedical imaging equipment and expertise at MBI.
- In late 2014 Monash University, in partnership with CSIRO, made a successful grant application to the Science and Industry Endowment Fund (SIEF) to establish the Biomedical Materials Translational Facility (BMTF).
- In 2015, with substantial financial support from the Monash University Faculty of Medicine Nursing and Health Sciences, the MBI research platform facility was enhanced with the addition of large animal holding and experimental laboratories.
- In collaboration with the Australian Nuclear Science and Technology Organisation (ANSTO), and with funding from the ARC, a hyperpolarised gas production unit was constructed and successfully produced helium-3 and xenon-129 hyperpolarised gases for MR studies in late 2015.
- Commissioning of the BMTF funded MR-PET scanner in mid 2016 has opened new opportunities for the translation of scientific discoveries and innovation with industry partners.
- The MBI research platform was externally audited and accredited by the Monash University Platform Quality Management System (PQMS), and attained ISO9001 accreditation in late 2016.
- The vision of MBI is to be an international leader of the development and application of biomedical and molecular imaging research technologies to improve human health and wellbeing.
- The MBI research platform is poised for significant further development based on the growth of international collaborations and industry cooperation in the next five year period.



## Monash Biomedical Imaging Highlights of 2011-2016

- Continued growth in the provision of research imaging services to the Monash research community
- Successful establishment of the Science and Industry Endowment Fund supported Biomedical Materials Translational Facility MR- PET imaging facility, in partnership with the Commonwealth Scientific Industrial Research Organisation
- Continued co-operation with the Australian Synchrotron Imaging and Medical Beam Line, particularly applications in renal and respiratory medicine
- Contributions to the Victorian Platform Technology Network and the Australian Research Infrastructure Network
- Continued leadership of the Victorian Biomedical Imaging Capability and contributions to the National Imaging Facility
- Expanded co-operation with the Australian Nuclear Science and Technology Organisation (ANSTO) and Monash Health in molecular imaging
- Continuation of the ASPREE healthy ageing brain imaging study
- Poised for significant growth of biomaterials and medical device industry links in 2016
- MBI management system certified to ISO 9001

Since establishment, MBI has contributed to Monash University's research competitiveness by:

- providing access to cutting-edge imaging equipment and world class experts;
- encouraging multidisciplinary collaborations with the university's clinical research partners to solve complex clinical or disease challenges;
- increasing knowledge by organising workshops and opportunities for skill development and knowledge transfer;
- developing coordinated research capabilities by linking imaging resources across the university;
- developing the next generation of researchers and clinicians to support the applications of biomedical imaging in diagnosis and preventative health; and
- pursuing additional investment in Monash's biomedical imaging infrastructure.

Progress towards this vision began in 2010 seeding the early stages of a collaborative grant to the state government. Later that year, as part of a Victoria-wide consortium, Monash University was awarded a grant from the Victorian State Government to support the establishment of the Victorian Biomedical Imaging Capability (VBIC). This included a state-of-the-art multimodal, biomedical imaging facility at Monash University. In May 2012, this vision became reality when Monash Biomedical Imaging (MBI) was officially opened.

In 2012 the final report on VBIC was

presented to the Victorian State Government. The report highlighted the operational infrastructure, the significant collaborative gain, the enhanced networking between the four VBIC nodes, and the research advances achieved during the first two years.

This start (funding for VBIC and co-investment from Monash University) provided MBI with a large imaging platform on which to build solid relationships with researchers from university and industry alike. Unlike many other facilities already in operation at that time, MBI was unique in its infrastructure and technology mix.

This foundation played a massive part in facilitating partnerships between MBI and industry partners - Siemens, Agilent and Bioscan - switching from equipment installation to on-going operations. In particular, the Monash-Siemens Collaborative Management Committee approved four collaborative research projects, with the results from the first project producing a new accelerated method for image reconstruction. Monash was also a key alliance partner for Agilent in life science, chemical analysis, and bioimaging technologies.

The partnership with Siemens is ongoing. Plans include growth into new (geographical) areas, making use of Monash's international network of campuses, positioning Monash as a global research partner for Siemens. This partnership will provide MBI and its users a unique strategic partnership opportunity in the Australian biomedical imaging research community.

In 2013 MBI staff expanded and



strengthened the imaging research and support activities to help deliver the next generation of significant biomedical research discoveries and to enhance excellence in biomedical imaging to support translational research programs.

Specifically, 2013 saw the formation of MBI Linked Laboratories, an important institutional initiative with the Monash Institute for Cognitive and Clinical Neuroscience (MICCN) within the Faculty of Medicine, Nursing and Health Sciences. The two Linked Laboratories co-located at MBI are the Brain and Mental Health (BMH) and Monash Neuroscience of Consciousness (MoNoC) research groups.

The collaborative arrangements between MBI and MICCN also included a MBI-MICCN Seed Grants scheme. Now an annual event, the funding supports MICCN early career researchers through the provision of small grants to undertake imaging research projects. Outcomes from seeded projects have included presentations at international conferences, publications in high impact scientific journals in the relevant disciplines as well as larger funding applications (e.g. to the ARC and/or NHMRC).

Throughout 2013 senior MBI staff led a successful application to the Australian Research Council (ARC) to establish an ARC Centre of Excellence for Integrative Brain Function. The ultimate goal of the Centre is one of the greatest scientific challenges of our time - to understand the link between brain activity and human behaviour. The Centre's objective is to elucidate the core principles of brain activity underlying perceptual and cognitive functions in our everyday lives.

Demonstrating the national and international competitiveness of MBI, the Centre of Excellence has Australian collaborative partners including the Australian National University, University of New South Wales, University of Queensland, University of Sydney and the University of Melbourne. Internationally, the Centre attracted partners

from Europe, USA and Asia including from Cold Spring Harbour Laboratory, the US National Institutes of Health, the Swiss Federal Institute of Technology, and Sweden's Karolinska Institute. The Centre of Excellence is headquartered at MBI and administered through MICCN.

Throughout 2014 MBI experienced continued growth in the provision of research services, with expanded and increased research utilisation and collaborative links with the broader Monash University research community. Cooperation between the Australian Synchrotron at the Imaging and Medical Beam Line and MBI scientists in preclinical models of cardiovascular dysfunction continued. The expanded focus from primarily brain imaging to lung, kidney and cardiovascular imaging was of strategic importance given the future plans to establish a specialist cardiovascular University hospital on the Clayton campus, opposite MBI and the Australian Synchrotron.

Across the suite of Monash University platform technologies, a systematic improvement was undertaken to ensure the research platform operations to ensure the systems and processes were operating to world's best practice. In 2014 the MBI platform was incorporated and integrated into the Australian Research Infrastructure Network (ARIN) system. The system provides researchers with streamlined access to the biomedical imaging equipment and expertise at MBI. Participation in the Victorian Platform Technology Network (VPTN) and ARIN increased the awareness and knowledge of MBI amongst the research community.

The success of a Science and Industry Endowment Fund (SIEF) grant application late in 2014, in partnership with the Commonwealth Scientific Industrial Research Organisation (CSIRO), enabled establishment of the Biomedical Materials Translational Facility (BMTF). The success of the application was underpinned by Monash University's long-term collaborative approach with its partners, particularly CSIRO. In addition to the CSIRO SIEF funding, capital funding was provided from Monash Strategic Initiative Funds and from the Monash Faculty of Medicine and Nursing Health Sciences.

The BMTF was established to provide three synergistic areas critical to the translation of biomedical materials research, including: clean room materials synthesis, fabrication and surface coating; high throughput biological testing and evaluation of materials; and real time non-invasive simultaneous

MR-PET imaging in preclinical studies. The procurement and installation of a simultaneous Magnetic Resonance Imaging and Positron Emission Tomography (MR-PET) scanner, and associated 'hot lab' for production and dispensing of PET tracers, during 2015-16 has made MBI one of the most comprehensive biomedical imaging facilities in the world. The selection of a Siemens MR-PET scanner has further strengthened our partnership with Siemens Healthcare. During the BMTF building works the MBI research platform was significantly enhanced with the addition of large animal holding and experimental laboratories with direct access to the MBI suit of scanners.

MBI has continued its focus on maintaining its diverse, yet complementary technology and capacity toolkit. This included the initiation of a project to construct a laser based hyperpolariser to magnetically hyperpolarise helium-3 and xenon-129 gases. The system has the potential to greatly enhance our scientific understanding of animal and human lung physiology and pathophysiology. The project was funded by an ARC grant and has been undertaken in collaboration with Australian Nuclear Science and Technology Organisation (ANSTO). In 2015 the project achieved a number of important milestones with the first production of helium-3 hyperpolarised gas successfully achieved in March, and the first successful xenon-129 hyperpolarised gas production and MR scan test successfully completed.

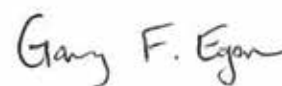
The Monash University platform technologies continue to systematically improve the research platform operations to ensure that each platform's systems and processes are operating to world's best practice. In 2016 the Monash Biomedical Imaging platform was externally audited by SAI Global and accredited with compliance to ISO 9001 Quality Management Systems. The ISO 9001 certification provides researchers with confidence that the biomedical imaging equipment and expertise at MBI is operating at world's best practice.

MBI's involvement in communities of interest including VBIC and the National Imaging Facility (NIF) continues to enable the platform to have a major impact amongst researchers across Melbourne and Australia. Notably, during 2015 co-operation with ANSTO on the construction of a gas hyperpolariser has enabled novel research into the mechanisms of respiratory diseases and neonatal lung development.

Looking forward to the 2016-20 period, MBI is poised for significant further development based on the growth of industry links. The

experimental research programs utilising the MR-PET facility that commenced operation in 2016 greatly expands the opportunities for translation of scientific discoveries and their application to industry innovation and process transformation.

I would like to thank Professor Ian Smith for his unwavering support for the establishment and development of MBI. I would also like to thank Ms Sue Renkin, Chair of the MBI Advisory Board, and the other MBI Advisory Board members who have provided invaluable guidance and advice regarding the operations and development of the MBI research platform.



**Gary Egan**

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

Meeting three times per year, the Advisory Board:

- Assists the Director with strategic planning, including advice in alignment with government policy on research infrastructure and industry trends;
- Monitors the utilisation of MBI facilities;
- Helps define appropriate metrics (key performance indicators – see later) for the platform;
- Provides representation for stakeholders; and
- Makes recommendations on strategies for the further development of MBI facilities and operations.

## Advisory Board

Since its establishment in 2010, MBI has operated with an Advisory Board providing strategic and scientific oversight of facility activities. The board is Chaired by Ms Sue Renkin, an experienced CEO, Chairman and non-Executive Director, who brings a wealth of knowledge in governance, risk management, strategic thinking and leadership. The Deputy Chair is Prof. Ian Smith, Vice-Provost (Research & Research Infrastructure). The board members include key internal and external stakeholders and users of the facility, together with facility management. Monash University representatives include the Faculty of Medicine, Nursing and Health sciences, the School of Biomedical Sciences, and the School of Psychological Sciences,

while external representatives include the Australian Synchrotron, Monash Health and CSIRO.

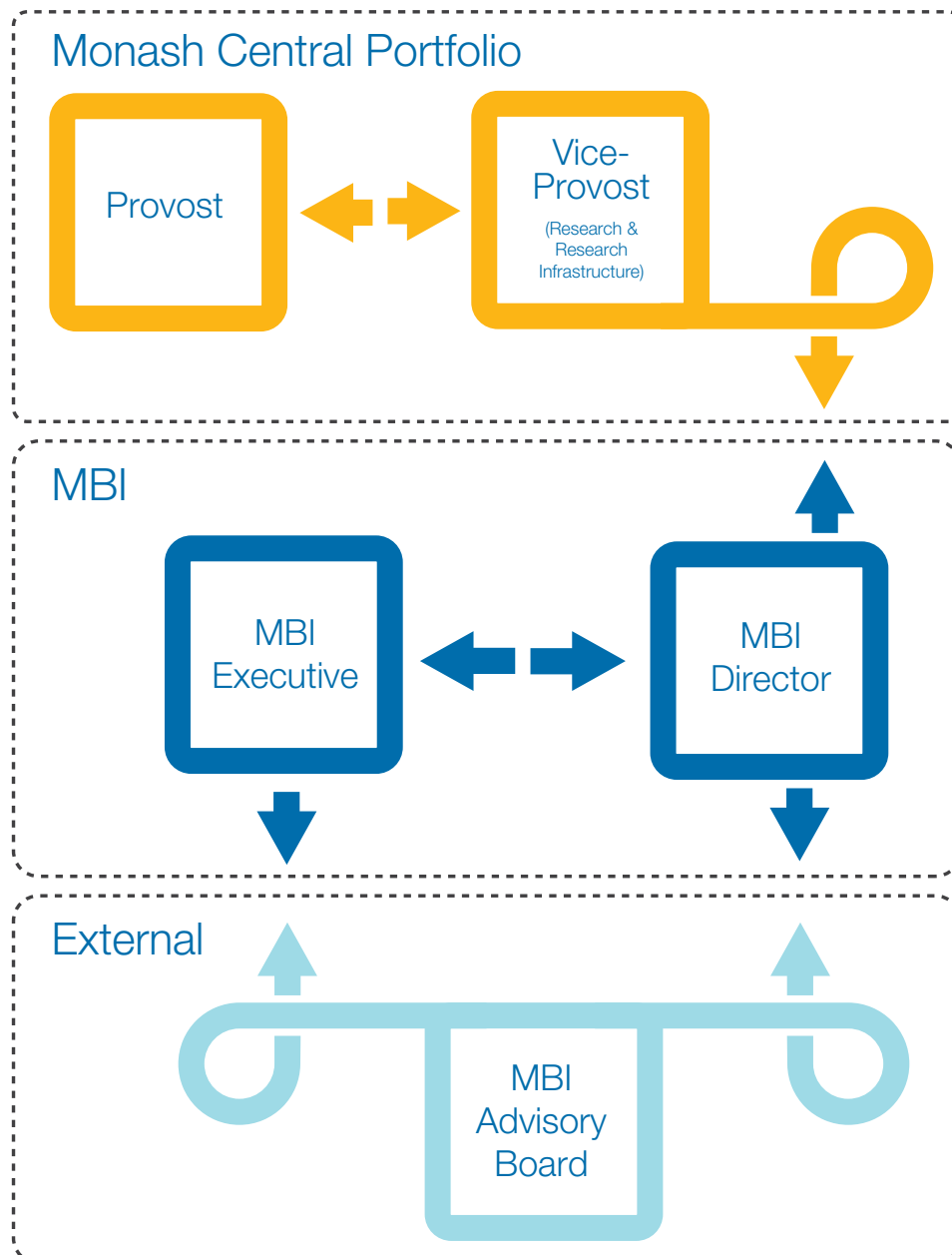
Throughout its operation the Board has been relatively stable, with limited turnover of membership. Board members have also been heavily engaged in their role, with attendance rates greater than 80%.

## Executive Committee

The Day-to-day the activities of MBI are overseen by the Executive Committee which consists of the MBI Director (Professor Gary Egan), the General Manager (Dr Lisa Hutton, 2014 onwards) and the Operations Manager (Dr Lisa Hutton to 2014; Dr Charles Hardy 2014 onwards). The Executive Committee meets weekly and provides guidance on all key issues affecting MBI, including strategic direction, finance and budget, reporting to University and Government bodies, staffing, facilities planning, maintenance and utilisation, and communications, and as such is integral to the successful operation of the platform. The Director meets regularly with the Vice-Provost (Research and Research Infrastructure) to discuss strategic operational and implementation issues.

## Research teams

The major research areas at MBI include Clinical Research Imaging (Associate Professor Nicholas Ferris), Cognitive Neuroimaging (Associate Professor Jeroen van Boxtel from 2014), Pre-clinical Imaging (Dr James Pearson until end 2015, Dr Mike de Veer from 2016) and Imaging Analysis (Dr David Barnes to 2014; Dr Zhaolin Chen from 2014). Each research team has a number of research staff and students, who meet regularly to discuss research goals and outcomes, and to identify technical and logistical problems and opportunities for improvement to the services provided to platform users. Major issues identified by the research teams are placed on the Executive Committee meeting agenda for further discussion and resolution.



Advisory Board Members 2011-2015



**Ms Sue Renkin;**  
Intuitively Focused  
(Chair)  
2011,  
2012,  
2013,  
2014,  
2015



**Professor Ian Smith;** Monash University (Deputy Chair)  
2011,  
2012,  
2013,  
2014,  
2015



**Professor Paul Bonington;** Monash University  
2011,  
2012,  
2013,  
2014,  
2015



**Dr Daniel Hausemann;** Australian Synchrotron  
2011,  
2012,



**Dr Gareth Moorhead;** CSIRO  
2011,  
2012,  
2013,  
2014,  
2015



**Professor Andrew Peele;** Australian Synchrotron  
2011,  
2012,  
2013,  
2014,  
2015



**Professor Stephen Stuckey;** Monash Health  
2011,  
2012,  
2013,  
2014,  
2015



**Associate Professor Nicholas Ferris;** Monash University  
2011,  
2012,  
2013,  
2014,  
2015



**Professor Ross Coppel;** Monash University  
2011,  
2012,  
2013,  
2014,  
2015



**Professor Gillian Duchesne;** Peter MacCallum Cancer Centre  
2011,  
2012 to Q3



**Dr George Borg;** Australian Synchrotron  
2011,  
2012 to Q3



**Professor Nellie Georgiou-Karistianis;** Monash University  
2011,  
2012,  
2013,  
2014,



**Dr Michael James,** Australian Synchrotron  
2013,  
2014,  
2015



**Professor Murat Yücel;** Monash University  
2015



**Professor Gary Egan** (Director, MBI)  
2011,  
2012,  
2013,  
2014,  
2015



**Dr Lisa Hutton,** (General Manager, MBI)  
2011,  
2012,  
2013,  
2014,  
2015



**Dr Charles Hardy** (Research & Operations Manager, MBI)  
2014,  
2015



**Professor Matthew Gillespie;** Monash University  
2015

Monash University has made significant investments in research infrastructure to establish an integrated network of world-class Monash Technology Research Platforms (MTRP), operated with world-best expertise and leadership practices, to enable innovative research of the highest quality. The core technology platforms are openly available and easily accessible to our research and industry partners. The University's research strategy recognises the critical role that the research platforms play in driving research outcomes. As such, world-class research infrastructure is one of the six core pillars that underpins the University's research goal of 'impact through excellence and relevance'. Coordinated by the University's Office of the Vice-Provost (Research and Research Infrastructure), the platforms offer a one-stop technology shop, with strong governance, oversight and quality management practices in place to ensure a seamless user experience. Built on the University's strong commitment to education, the MTRP provide undergraduate and postgraduate students with unprecedented access to cutting-edge technologies for advanced education and training, and the opportunity to work at the academic-industry interface.



MBI aspires to be one of the world's pre-eminent imaging research facilities in biomedical and molecular imaging, in biomedical materials and device development, and to develop the next generation of imaging technologies and innovations. MBI facilitates pre-clinical and clinical imaging research investigations and collaborations with world-class experts in medicine, science and engineering, in concert with industry and government, to create innovative solutions to clinical health challenges.

MBI houses a suite of multi-modality biomedical imaging scanners, including ultra high field magnetic resonance imaging (MRI), positron emission tomography (PET), computed tomography (CT), single photon emission computed tomography (SPECT), fluorescence emission computed tomography (FLECT) and ultrasound scanners for small animal imaging. The facility also houses large bore MRI and state-of-the-art simultaneous MR-PET scanners for MRI and molecular imaging studies in humans and large animals, as well as electromagnetic encephalography (EEG), transcranial magnetic stimulation (TMS) and ocular-motor clinical facilities for advanced clinical functional MRI (fMRI) studies. Researchers at MBI integrate closely with other Monash Platforms and University researchers to perform research across a number of national health priority areas. Areas of investigation range from cognitive brain function in the elderly, the effect of aspirin on blood vessels in the

brain, dementia, and psychiatric disorders including addiction and psychosis, to the effects of stroke and ventilation in pre-term birth on brain injury, and spinal disc injury and regeneration in animal disease models.

Many research programs using MBI imaging technologies facilities are closely integrated with and dependent on other Monash and national world-class e-Research capabilities, in particular the Multi-modal Australian Sciences Imaging and Visualisation Environment (MASSIVE) and the Australian National Data Service (ANDS). MASSIVE is a high-performance computing facility for computational imaging and visualisation that enables ultra-high resolution biomedical imaging data sets to be reconstructed, analysed and visualised. MASSIVE is coordinated by Monash University in partnership with the Australian Synchrotron, CSIRO, and the Victorian Partnership for Advanced Computing. The ANDS is responsible for the Australian Research Data Commons infrastructure, which is a cohesive set of research resources across all Australian research institutions. This infrastructure is enabling biomedical imaging researchers from Monash and other Australian universities to rapidly discover, access, use and publish research data. Monash University is the lead partner of the ANDS together with the Australian National University and CSIRO.

## Directorship



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



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



**Professor Michael Farrell**  
Associate Director (Academic)



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

## General Manager

## Preclinical Imaging



**Dr Michael De Veer**  
Head, Pre-Clinical imaging



**Tara Sepehrizadeh**  
Preclinical Support Scientist



**Dr Zhaolin Chen**  
Head



**Dr Thomas Close**  
Senior Informatics Officer, NIF Informatics Fellow



**Mr Francesco Sforazzini**  
Research Assistant

## Imaging Analysis

**Karen Alt**  
Technical Assistant (AMREP)

**Dr Gang Zheng,**  
MRI Physicist

## Cognitive Neuroimaging Research



**A/Prof Jeroen van Boxtel**  
Head, Senior Research Fellow, School of Psychological Sciences and MBI



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



**Ms Parisa Zakavi**  
Technical Assistant



**Ms Katharina Voigt**  
Technical Assistant

**Nigel Rogasch**  
Transcranial Magnetic Stimulation Leadership

## Clinical Research Imaging



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



**Mr Richard McIntyre**  
Radiographer, Monash Health & MBI

- **Patricia Heidmann**  
Radiographer, Monash Health & MBI
- **Jeff Chen**  
Radiographer, Monash Health & MBI
- **Arlene Hobson**  
Radiographer, Monash Health & MBI
- **Fiona Gould**  
Radiographer, Monash Health & MBI

## Molecular Imaging



**Jason Bradley**  
Chief Nuclear Medicine Technologist

## Management & Administration



**Dr Charles Hardy**  
Research and Operations Manager



**Ms Nichola Thompson**  
Resources Coordinator



**Ms Louise Mitchell**  
Administrative Officer



**Ms Janelle Gilling**  
Administrative Assistant

■ **Ashlee Hutchinson**  
Receptionist

# Operations Timeline



## 2012

MBI official opening (May).

Installation of six scanners by end of 2012

34 new projects

Vevo 2100 ultrasound system installed

## 2013





47 new projects

Building works for installation of simultaneous MR-PET scanner, radiation 'hot lab' and large animal surgery

2014

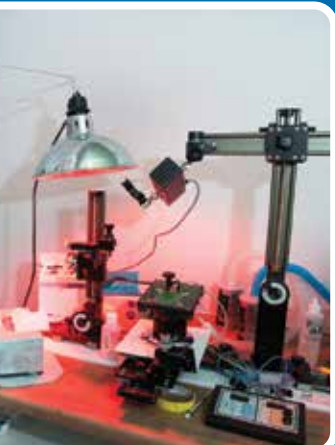
2016

33 new projects

Launch of ARC Centre of Excellence for Integrative Brain Function

2015

Symposium to launch the MR-PET scanner (May)



# Summary of Research

## MBI Research Activities

In addition to providing excellence in biomedical imaging services, MBI has a strong research culture and emphasis on developing new imaging research methods. At establishment, MBI had research expertise in:

- Clinical Imaging;
- Imaging Analysis and Informatics;
- Pre-Clinical Research (also called Fundamental Biomedical Research); and
- Advanced X-Ray Imaging

As MBI has grown, and the staffing profile changed, the areas of research expertise have evolved to their current makeup as:

- Clinical Research Imaging;
- Cognitive Neuroimaging;
- Preclinical Imaging.
- Imaging Methods and Analysis

Each research team has a Head, and responsibility for supporting MBI research users, developing research methods or imaging techniques. Selected research highlights throughout the period 2011 to 2015 are presented below.

## Clinical Research Imaging

The clinical team began MRI sequence testing and protocol development work on the Siemens Skyra 3 Tesla MRI scanner in January 2012, with the first formal imaging studies commenced in June 2012. During 2013 the team completed its 900th clinical research imaging study and there were more than 35 clinical research projects then being undertaken at MBI. Hardware and software upgrades were made to the scanner to further expand the range of studies that could be undertaken.

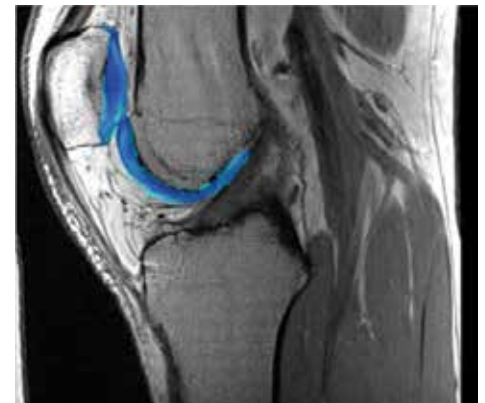
Multi-parametric imaging studies were a feature of the research projects undertaken in 2013, with MRI scans obtained simultaneously with Electroencephalography (EEG) and/or Electrooculography (EOG) recordings. There was increased use of transcranial magnetic stimulation (TMS) as part of preparatory imaging and brain stimulation protocols. During 2013 MBI procured an MRI-compatible TMS device to enable MRI scanning to be performed simultaneously with TMS.

Outside the brain, the Clinical Research Imaging Team has assisted in the development of techniques for non-invasive measurement of body fat composition and contributed to the design of the clinical facilities for the MR-PET scanner facility

## Knee Imaging

**Anita Wluka, Flavia Cicuttini, John McNeil, Robyn Woods, Jurgen Fripp (CSIRO), Nicholas Ferris, Gary Egan**

At establishment, the CSIRO and MBI formed a collaboration focused on two key areas – knee imaging and creating a brain atlas of the common marmoset. The knee imaging was part of a sub-study of the ASPREE trial (Aspirin Preventing Events in the Elderly) called ASPREE IMAGE Osteoarthritis (OA). In 2012 the Clinical Imaging Team established protocols for effective imaging of the knee, particularly the cartilage of the knee joint (important in OA). In 2013 this study progressed with researchers developing protocols that allowed quantification of the amount of cartilage in the knee – and therefore a measure of OA progress in the context of low-dose aspirin in the elderly (the focus of the ASPREE study). In 2014 – present randomly selected participants in the ASPREE study have been invited to join the ASPREE IMAGE OA study to determine the impact of aspirin on knee osteoarthritis.



## Measuring blood flow in the brain

**Parnesh Raniga, Nicholas Ferris, Steffen Kreiger, Qi-Ziu Wu, John McNeil, Phillip Ward, Amanda Ng, Robyn Woods, Elsdon Storey, David Barnes, David Dowe, Stephanie Barnes, Oliver Salvado (CSIRO), Gary Egan, Stephanie Ward**

Blood flow to the brain is thought to be an important indicator of brain health, particularly in the aged. Traditional methods of measuring brain blood flow have required injection of a tracer or contrast medium (inherently risky in terms of both having an injection as well as the tracer/contrast itself). In the early 2010's, an MRI technique called Arterial Spin Labelling (ASL) was developed which uses magnetic tagging of the subject's own blood with no injection of contrast agent required. However, these

versions of the ASL technique produced images of low anatomical resolution. Using the 3T MRI system and a new imaging approach, MBI have substantially improved the quality of brain blood flow images.

This and other advanced imaging techniques (such as Susceptibility Weighted Imaging (SWI)) has allowed MBI researchers to partner with ASPREE Study lead investigators to conduct the ASPREE Neuro sub-study to establish the prevalence of micro-bleeds in study participants before they commence study treatment. Early results of these scans (one year follow-ups) show that participants appear to have increased micro-bleeds. Due to the nature of the ASPREE study it is not yet clear if these people are taking low-dose aspirin or not.

## Cognitive Neuroimaging

The Cognitive Neuroimaging Team provides support for all human research studies at MBI (e.g. electroencephalography (EEG), transcranial magnetic stimulation (TMS), and oculomotor measurements). In the last year the team updated and replaced a lot of equipment. The new EEG setup is now fully operational, and a new exercise bike has been installed for research into the influence of activity on brain plasticity. The team also continued the development of combined MRI and TMS.

During 2013, the team supported more than 20 new cognitive neuroimaging studies. The majority of new studies utilised the 3T MRI scanner and the simultaneous recording facilities using ocular motor-MRI and EEG-MRI techniques. Many of the studies were conducted in collaboration with research colleagues from MICCN. The range and diversity of cognitive neuroimaging facilities available at MBI was expanded in 2013 through the acquisition and installation of:

- a Cambridge Research Systems BOLD 3D LCD monitor;
- a stand-alone TMS and neuro-navigational system;
- an MRI-compatible auditory stimulus delivery system; and
- a full suite of MRI and non-MRI physiological monitoring systems including ECG, respiration, galvanic skin response and electrical nerve/muscle stimulation.

In co-operation with the MBI administrative staff, the Clinical Research Imaging and

the Image Analysis teams, significant improvements were made to the technical support for researchers using the human cognitive neuroimaging facilities. These improvements included:

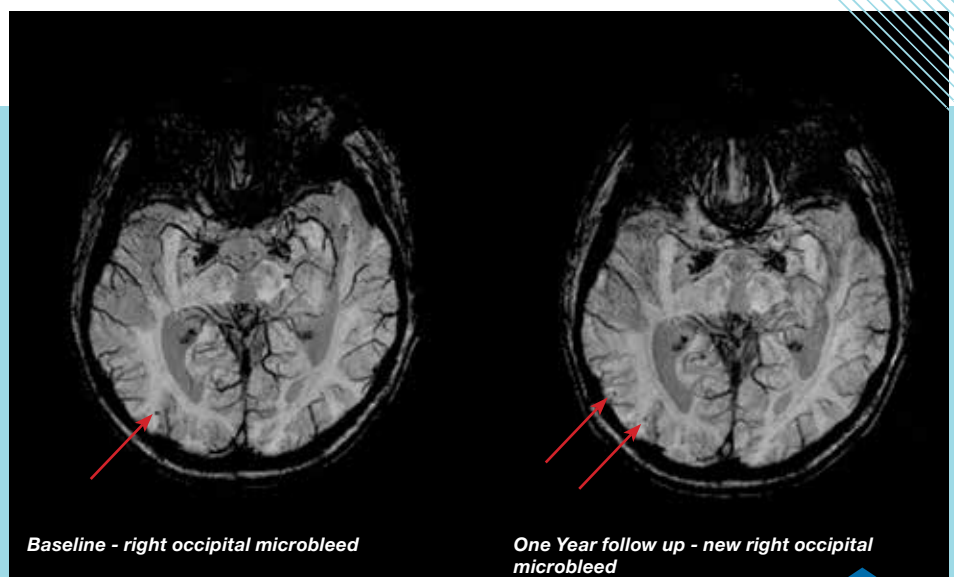
- the establishment of a ticketing system for technical and experimental support requests;
- provision of training protocols for setup and operation of the facilities; and
- the refinement of standardised booking and usage procedures.

During 2013 the expanding demand for and ongoing development of the cognitive neuroimaging facilities substantially improved the capacity to support large scale neuroimaging studies, including the Genetics of Cognition study from MICCN to examine the link between functional brain activity during cognition and single nucleotide polymorphisms of dopaminergic genes.

During 2014 the Cognitive Neuroimaging team continued to work closely with other MBI teams to develop expertise in advanced human neuroimaging techniques, including:

- multiband functional MRI (MB fMRI) recording that improves the acquisition speed of functional imaging up to ten-fold;
- novel analysis methods for the analysis of fast fMRI recordings;
- application of advanced causal modelling of brain processes; and
- the provision of training and support for these techniques for MBI users.

In a parallel study, MBI researchers have applied a known imaging technique – Quantitative Susceptibility Mapping – to show blood vessels in the brain. QSM aims to take into account the small variations in magnetic field within the human body (including the brain), caused by magnetic substances (such as iron in the blood) and thus correct the distortions observed when using traditional MRI. This advance has subsequently (in 2015) been combined with SWI (via mathematical filters) to automatically generate three-dimensional maps of the cerebral veins, without the need for a contrast injection.



**SWI used to detect microbleeds (black spots, indicated by red arrows) in the elderly. Typical scans are shown above. Baseline scan is on the left. One year follow-up is on the right, with the appearance of a new microbleed highlighted.**

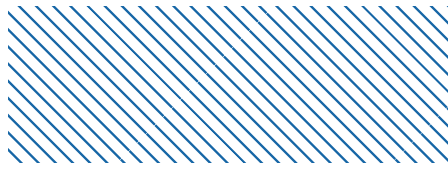
# Summary of Research

## The influence of group membership on neural processes when harming others

Pascal Molenberghs, Ayushi Gupta

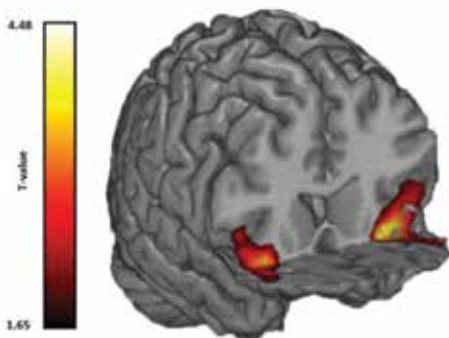
The lateral orbitofrontal cortex (IOFC) often shows increased activation in moral situations involving intentional harm and unjustified violence. Previous brain imaging studies have illustrated that cultural stereotypes can be automatically activated even when a perceiver does not personally endorse them. Neural correlates implicated in social behaviour are not only influenced by social context but also by group membership, and thus respond differently to ingroup and outgroup members. This functional MRI study investigated if group membership influences IOFC activity and levels of guilt felt in situations of unjustified and justified violence.

Dr. Pascal Molenberghs and Hons student Ayushi Gupta (Monash Institute of Cognitive and Clinical Neurosciences, School of Psychological Sciences) conducted a study to investigate: (1) how IOFC activity is associated with actively making the decision to harm others (in situations of both unjustified and justified violence) and the feelings of potential guilt associated with this process, and (2) how these decisions and underlying neural processes in the IOFC are influenced by racial group membership of the target. The protocol design was based on a study performed in the USA, where participants were required to imagine that they were a police officer and instructed to make quick shoot/don't shoot decisions in response to images of armed and unarmed targets by different racial groups (Caucasian and African-American). As a result, situations of justified violence (shooting an armed



target) and unjustified violence (shooting an unarmed target) were generated. Targets of Non-Muslim and Muslim appearance were incorporated (rather than Caucasian and African-American) to better represent the influence of group-membership in an Australian context. Images were presented to participants during functional MRI scans on the Siemens 3 Telsa MRI scanner at Monash Biomedical Imaging to assess the Blood Oxygen Level Dependent (BOLD) response as a measure of brain activity.

The findings show that IOFC activation is associated with moral situations that include not only intentionally harming others, but also when the self is harmed. These findings highlight the important roles of context and agency and their relationship with IOFC activity in moral dilemmas. The behavioural results also showed that participants felt less guilt when harming the outgroup compared to ingroup in situations of justified violence, indicating the potential presence of a more subtle form of prejudice - aversive racism (racists who believe they are non-prejudiced yet subconsciously harbour negative feelings towards another race). The results provide further insight into understanding societal problems like prejudice and racism. Consequently, by increasing people's awareness of such biases and their influence on moral decision making, they may help reduce racial bias and prejudice in society.



**When participants in the study shot an unarmed target (unjustified violence) vs. an armed target (justified violence), there was significant more activation in left and right IOFC. The same area was also more active when participants got killed themselves (not shooting an armed target) vs. a situation in which they survived (not shooting an unarmed target). These results suggest the IOFC responds to situations in which people feel guilty about their actions.**

## Imaging Methods and Analysis

During 2013 the Imaging Analysis team members were involved in both clinical research and preclinical projects at MBI. The ASPREE Neuro study that commenced in late 2013 was the stimulus for improving the informatics and imaging analysis platforms at MBI. The image management system (DaRIS, Distributed and Reflective Information System) was migrated to a new powerful computing platform and methods were developed to further integrate the image management and image analysis tools. Techniques for the analysis of multiple T1-weighted structural images from new MRI sequences (MP2RAGE) were developed in cooperation with collaborators from CSIRO and France.

The Australian National Data Service (ANDS) multi-modal kidney imaging project, a collaboration with the Department of Anatomy and Developmental Biology and the Monash eResearch Centre, was successfully completed in early 2013. In co-operation with the preclinical imaging research team, new imaging analysis tools and methods were developed for the segmentation and quantification of atherosclerosis plaques and for the detection of magnetically labelled stem cells *in vivo* in animal models.

In 2015, the Imaging Methods and Analysis Team made progress in the development of novel MRI acquisition and analysis methods. A method that calculates the oxygen extraction fraction ratio from quantitative susceptibility maps has been developed. Non-fourier encoded MRI methods have been introduced to accelerate the image acquisition.

Through collaboration with Forschungszentrum Jülich in Germany during 2015, the team has established novel quantitative imaging methods. Water content mapping is a method that quantifies water percentage in local tissues of the brain. These newly established methods are being used for cohort studies in the clinical research and neuroscience projects. Another major project in 2015 was the installation of the new MR-PET scanner. The imaging analysis team provided expert input to the tender for the scanner selection and assisted with preparations for the operation of the new scanner.

## Preclinical Imaging

In 2013 new Preclinical Imaging projects commenced in the cardiovascular and neuroscience fields in collaboration with users from departments across Monash University and the Australian Regenerative Medicine Institute (ARMI). Diffusion tensor and T1/T2-weighted MR imaging sequences were used in the development of longitudinal imaging protocols to investigate pathophysiological changes in disease states including stroke, diabetes and heart failure.

Ultrahigh field MR scanner sequences were combined with synchrotron phase-contrast and micro-angiography imaging approaches at the Australian Synchrotron for functional imaging in the same animal models. A significant number of pilot studies were performed to establish proof of principle data for funding applications. Stem cell tracking studies involving the development of novel MR contrast agents were applied to *in vivo* animal model studies. In addition, computed tomography (CT) X-ray imaging attracted a number of non-biological studies, including visualisation of pore structures in geological samples and research into flow simulation in rock samples.

In 2013 a collaborative effort with ARMI, the Preclinical Imaging research team investigated the cells and molecules important in heart repair. The team focused on the role of fibroblasts in maintaining the normal operation (homeostasis) of the heart and how a transcription factor impacts myofibroblast generation following cardiac injury. Cardiac cine-scans were performed in transgenic mice before and after myocardial infarction to examine how cardiogenic genes regulate fibroblast activity and the remodelling of the heart wall during the early repair process.

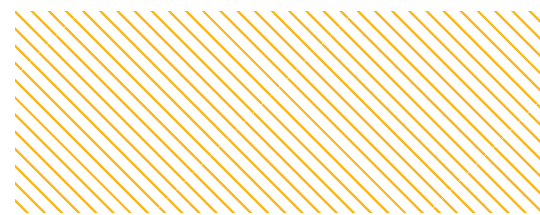
In 2014 new projects commenced in the fields of cardiovascular science, neuroscience, metabolic control and nanoparticle contrast agents. Collaborations spanned multiple departments across Monash University, the Australian Regenerative Medicine Institute, the Ritchie Centre for Baby Health Research (Monash Health) and RMIT University. The Preclinical Imaging Team concentrated on the development of protocols for longitudinal imaging of animal models to investigate pathophysiological changes in stroke and heart failure, and also fundamental studies of the development of fetal brain vasculature. CT imaging was used frequently for materials studies and an *in vivo* PET-CT study of metabolic regulation in mice was commenced.

During 2015 the MBI Preclinical Imaging Team extensively utilized the 3T MRI to

image sheep with intervertebral spinal damage. In another collaboration with biologists and engineers at Deakin University, the team measured antibody targeted iron nanoparticle binding at the sites of fat accumulation in the arteries of rats with heart disease. In a parallel study researchers at the Monash Clayton campus and at the Baker IDI Institute used copper-64 labeled antibodies and the PET-CT scanner located at AMREP to image plaques in mice with heart disease.

The team combined their expertise in MRI, PET and CT with that of the imaging scientists at the Australian Synchrotron to undertake a study to investigate renal oxygenation using the 9.4T small animal MRI and the X-ray source and micro-CT at the Imaging and Medical Beam Line (IMBL). The study anatomically mapped small renal arteries and veins in a rodent model. Researchers from Grenoble in France used the 9.4T MRI to measure tumour volumes and recovery following irradiation with the synchrotron medical X-ray beamline. The small animal PET- SPECT-CT was also used to measure murine femurs and quantify lung tumor sizes in a mouse model.

Throughout 2015 the Preclinical Imaging Team provided support to complete development of the MBI gas hyperpolariser system. The system successfully produced xenon-129 and helium-3 gas for use as contrast agents for lung MRI with the first projects planned to commence in 2016.



## Kidney Imaging

**Michael Eager, Qi-zhu Wu, David Barnes, John Bertram, Luise Cullen-McEwen, Victor Puelles, James Armitage, Kevin Bennett (University of Hawaii), Norbert Gretz (University of Heidelberg) Lucinda Hillard, James Pearson, Roger Evans, Bill Mulley, David Nikolic-Paterson, Peter Kerr, Nicholas Ferris, Parnesh Raniga**

A persistent theme within the Pre-Clinical Imaging Team has been kidney imaging. In 2011, MBI combined multi-modal kidney imaging techniques (combining nanoscopic, microscopic and mesoscopic imaging instruments) to realise a novel outcome – ultra-high resolution imaging of glomeruli (the functional filtering element of the kidney) – and thus advance diagnosis and treatment of kidney disease. In 2012 this was further advanced with computer programs developed to count glomeruli in optical microscope images as well as images obtained from 9.4T MR. In 2013 and 2014, the team made further strides forward, developing MR-based imaging techniques that could one day obviate the need for biopsies (a comparatively more painful, lengthy and costly process). In 2015 this project became a key component of the MBI-Siemens collaboration. This later work also involved the Clinical Imaging Team.

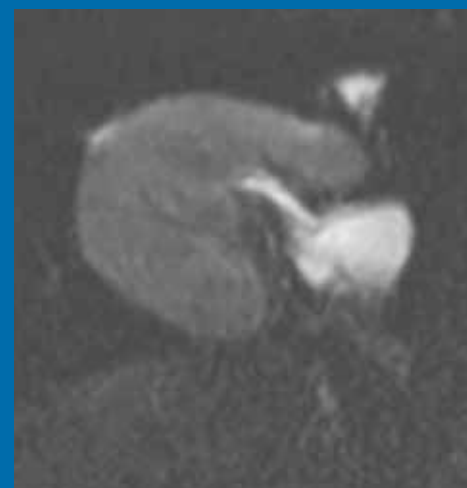


**Diffusion-weighted imaging of Transplant Kidney: The new multi-element RF transmit chain increases signal:noise ratio and decreases artefacts, particularly in diffusion-weighted imaging of the body. It is hoped that this will allow more robust measures of transplant kidney health.**

**Transverse EPI images of transplant kidney (b=0)**



**Standard RF Transmission**



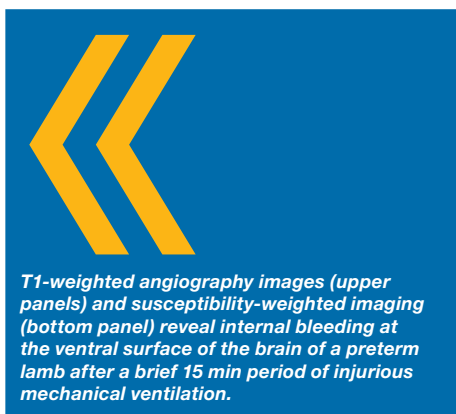
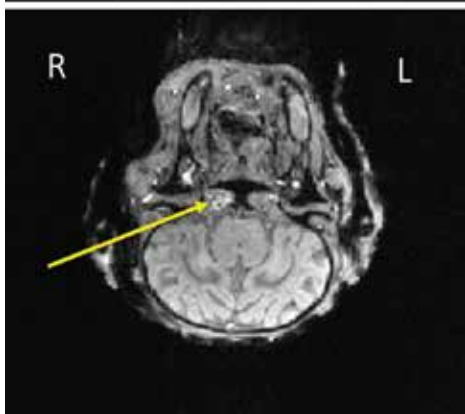
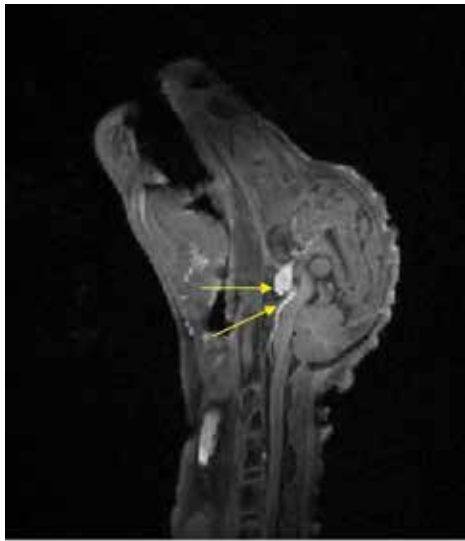
**'ZOOMit' two-element RF Transmission**

## Towards a better understanding of ventilation induced brain injury in the preterm baby

**Graeme Polglase (Ritchie Centre), Dr Michael de Veer (MBI), Dhafer Alahmari**

Lung development and maturation are relatively late events in fetal development of many mammals including humans. Consequently, preterm birth presents a physiological challenge for the neonate as the poorly developed lungs are unable to provide the oxygen requirements of the newborn. Therefore, many of these infants require mechanical ventilation at birth. Although life-saving, the lungs are easily injured by mechanical ventilation. Moreover, the birth transition is also a period of unstable blood flow in the neonate as it is removed from the large supply of blood within the placenta. Fluctuations in cerebral blood flow in the immature preterm baby have now been shown to cause ischemia and microbleeds in the more vulnerable brain regions. In the intensive care units preterm babies are not routinely scanned like adults who present with suspected neurological damage. Hence, the extent of brain injury and long term consequences of such injuries in preterm babies has largely gone unnoticed. Dr Graeme Polglase of the Ritchie Centre at the Hudson Institute of Medical Research is leading a multidisciplinary team that investigates

the impact of haemodynamic changes on the development of brain injury in lamb models of preterm delivery. His team of perinatal physiologists is working with Dr Michael de Veer of the Monash Biomedical Imaging preclinical team and jointly supervised PhD student Dhafer Alahmari to investigate the impact of injurious ventilation and inflammation on brain function with MRI and MR spectroscopy protocols in sedated lambs following preterm delivery. Furthermore, in these studies this team is now investigating the efficacy of routine and novel interventions, including stem cell therapy, that have the potential to reduce brain injury. Utilising the preclinical capabilities at MBI node for large animal imaging Graeme's team is revealing how chronic inflammation worsens brain injury in preterm lambs. Their approach examines the occurrence of microbleeds (Figure 1. T1 angiography sequence) and changes in metabolites and neuronal activity through spectroscopy and diffusion tensor imaging shortly after birth in animals with or without ventilation procedures, which until recently were the standard resuscitation procedure for very preterm babies. The ability to investigate which factors drive brain injury in preterm babies and evaluate novel therapies using clinical MR scanners is an important research translation outcome facilitated by the MTRP.



## Preclinical PET/CT imaging facility at AMREP

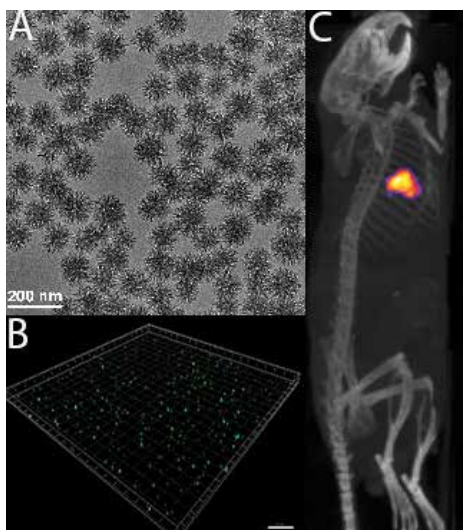
**Christoph Hagemeyer, Karen Alt (NanoBiotechnology Lab, Australian Centre for Blood Diseases, Monash University), Paul Donnelly (Bio 21, The University of Melbourne) and Frank Caruso (Department of Chemical and Biomolecular Engineering, University of Melbourne).**

MBI equipment extends to AMREP (Alfred Medical Research and Education Precinct) at the Alfred Hospital in Prahran, where a Mediso NanoPET-CT scanner is located, and operated jointly by MBI, AMREP Animal Services and Baker IDI.

The research of Dr Alt and A/Prof Hagemeyer focuses on biotechnology and nanotechnology. In collaboration with A/Prof Donnelly at Bio21, the team have been studying platelets, a cell that plays an essential role in thrombosis as well as inflammation. Using a specific antibody against activated platelets, and site-specific bioconjugation and click chemistry (Bio Click) they have generated a novel imaging tool applicable not only for PET-CT but also for fluorescence imaging (Alt et al. *Angew Chem*). The PET tracer is under clinical development for human use by the Australian Biotech company Clarity Pharmaceuticals. In another collaboration with Clarity as well as the US based Biotech RCT (Research Corporation Technologies), the researchers also investigated a novel antibody platform (ABDURINS™ Scaffold Libraries) for cancer imaging (Ullman et al *PLoS One*). ABDURINS™ combine long circulation times (due to their engineered CH2 domain) with a smaller size compared to full monoclonal antibodies, allowing superior tumour penetration (up to 150x higher) of this exciting new class of biologics.

In a separate piece of work, collaboratively conducted with Prof Caruso at the University of Melbourne, the researchers tested a novel nanoparticle system made out of the FDA-approved material PEG (Polyethylene glycol). Using quantitative PET-CT analysis on the Mediso scanner, they determined the distribution of different sized particles in vivo and found that small 100 nm PEG particles have unprecedented long blood circulation times (Figure). This work was published in the leading journal *ACS Nano* (Cui et al.) and named the most important paper of 2015 from the ARC Centre of Excellence in Convergent Bio-Nano Science and Technology.

*100nm PEG particles. A) Transmission electron microscopy image of highly monodisperse particles, B) Super resolution fluorescence microscopy image, C) Preclinical in vivo PET-CT imaging 12h post injection. Pure PEG particles circulate freely so only the blood pool in the heart chambers is visible, with no uptake in liver, lung or spleen. This system has the potential to become a versatile platform for molecular imaging and drug delivery.*



## Linked Laboratories

In early 2013 Professor Murat Yucel and Associate Professor Alex Fornito established the Brain and Mental Health (BMH) laboratory at MBI. The goal of BMH is to understand the principles and mechanisms of human brain function in order to uncover the causes of mental illness. Later in the same year Associate Professor Naotsugu Tsuchiya established the Monash Neuroscience of Consciousness Research Laboratory (MoNoC), with the goal of understanding the neuronal basis of our subjective conscious experience. The research activities of the two laboratories are summarised below.

### Brain and Mental Health Laboratory

The Brain and Mental Health Laboratory aims to understand the principles and mechanisms of human brain function in order to uncover causes and treatments of mental illness. BMH research activities primarily use brain imaging and other tools from cognitive neuroscience to understand human brain structure and function in health and disease. We use advanced technologies to personalise and fast-track the translation of new scientific knowledge into simple, effective, safe and accessible interventions. The BMH team has a diverse range of expertise, with particular strengths in structural, functional, diffusion and spectroscopic MRI, EEG, TMS, PET, graph theory and network science, and clinical neuropsychology, as well as translational research.

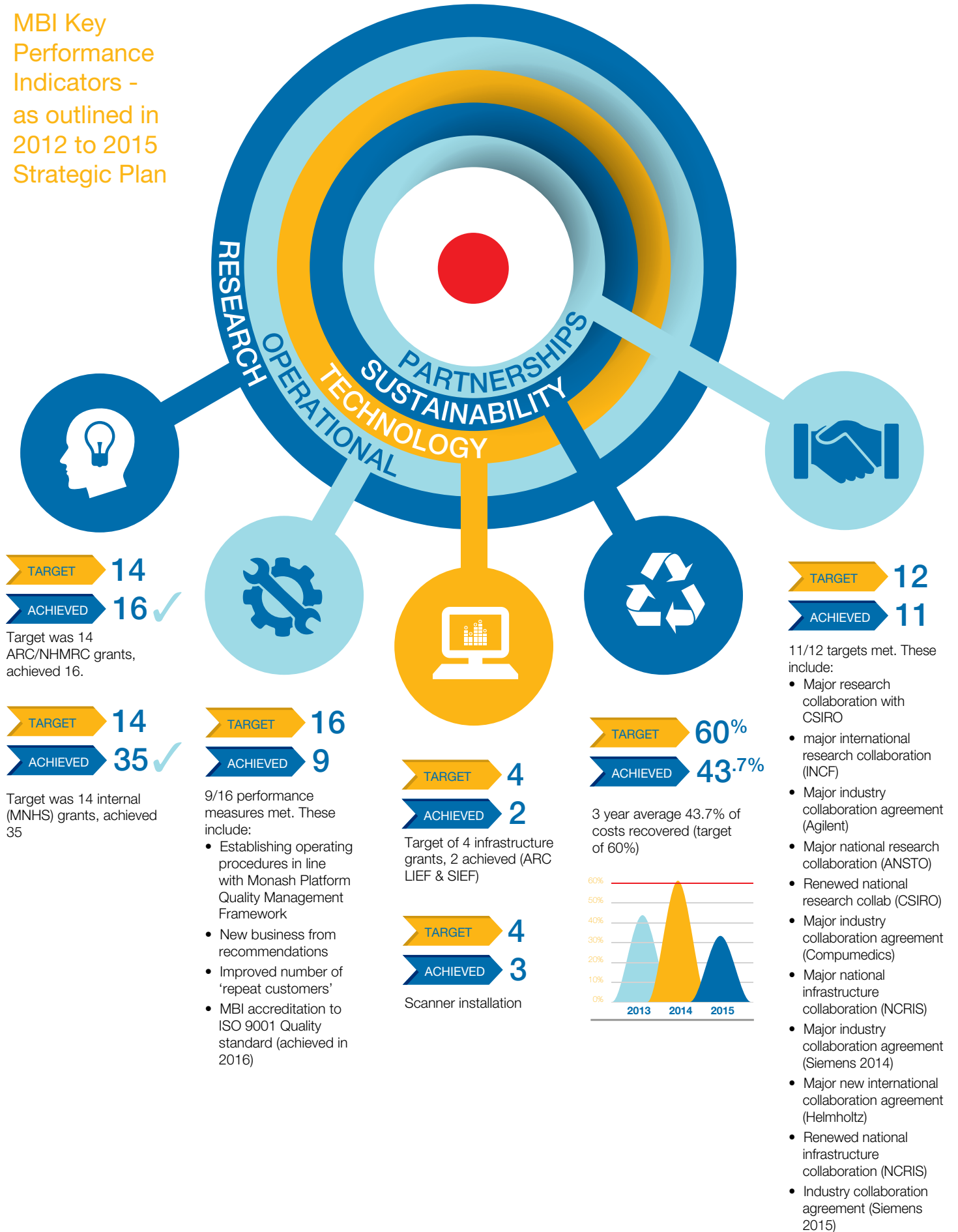
### Monash Neuroscience of Consciousness (MoNoC) Research Laboratory

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

- Consciousness itself - developing the theory of consciousness and empirically testing it, revealing the boundary condition of conscious and non-conscious processing;
- Attention - the relationship between consciousness and attention; and
- Biological motion processing - how does the perception of social motion stimuli depend on attention, and individual differences.

# Key Performance Indicators

MBI Key Performance Indicators - as outlined in 2012 to 2015 Strategic Plan



During the establishment of MBI, the Director worked with the Office of the Vice Provost (Research and Research Infrastructure) to develop a strategic plan, which encompassed much of what was possible in biomedical imaging. Five years on and there is much to celebrate, in terms of achievements against the strategic objectives and associated KPIs. However, there are also opportunities to further refine the focus of activities and shape the future direction of MBI.

For the coming five years, the overall vision of MBI remains the same – to (continue to) be an international leader in the development and application of biomedical and molecular imaging research technologies to improve human health and wellbeing.

The overall strategy to achieve this vision includes specific activities to enhance the excellence, international, enterprising (industry and end user engagement) and inclusiveness (diversity) of the communities using the MBI research facilities and expertise, across four broad themes:

## Excellence

- Recruit nationally and internationally outstanding biomedical imaging researchers to Monash & MBI by creating new joint appointments with the faculties of Engineering (Electrical Engineering & MIMÉ) and Medicine (SPS & MICCN);

- Implement an expanded Non-Human Primate imaging research program through the joint appointment of a Non-human Primate (NHP) imaging scientist with Biomedicine Discovery Institute & Australian Regenerative Medicine Institute;
- Lead the National Research Infrastructure Capability (NRIC) imaging research infrastructure proposal for molecular imaging and/or ultrahigh field MRI by forming and leading a national Biomedical and Molecular Imaging Capability (BMIC),
- Broaden engagement with other Monash Faculties that are not current users of biomedical imaging by approaching the Faculty Deans and organise workshops with nominated leaders from each faculty; and
- Developing the future imaging science workforce by providing advanced training for graduate students by defining PhD projects that are advertised and promoted annually.

## International

- Build collaborative links to Germany through the Helmholtz Association with support from Australian-German Research Foundation and participate in the next generation BrainPET2 project through the exchange of staff and students with Helmholtz (Juelich).

## Enterprising

- Work through Biomedical Materials Translational Facility (BMTF) User Group to build collaborations between CSIRO, MBI and to initiate CSIRO/MBI/MHTP biomaterials translational projects;
- Establish new key industry partnerships in molecular imaging by submitting at least one ARC Linkage Project application with industry partners annually;
- Establish a cardiology diagnostic imaging service with Monash Heart (Monash Health) by negotiating the access and establishing the clinical service arrangements.

## Inclusive

- Lead the establishment of an advanced post-graduate training program in molecular imaging by applying for an ARC Industry Transformation Research Centre (ITRC).



Epilepsy and Clinical Applications of MultiModal NeuroImaging and a two-day course on the Simultaneous Acquisition of EEG/fMRI for Cognitive and Clinical Neuroscience.

MBI also hosted a Cognitive and Imaging genetics workshop, the opening of the 4th Australian Cognitive NeuroScience (ACNS) Annual conference, and the 2013 Victorian Biomedical Imaging Capability (VBIC) Network meeting.

MBI hosted part of the inaugural European Molecular Biology Laboratories (EMBL) Australia PhD Course, bringing together up to 60 high-achieving first and second year PhD students from around the world.

MBI hosted six high school students under the Growing Tall Poppies Work Experience Program. The students worked closely with researchers to observe fMRI studies, and perform analyses on the resulting data. They then prepared presentations and posters to communicate the findings. MBI staff also presented to high school students during a VESKI student visit.

## 2012

MBI was officially opened in May, 2012, by the Minister for Innovation, Services and Small Business, Louise Asher with dignitaries including the Monash University Vice Chancellor, Professor Ed Byrne, and the Dean of the Faculty of Medicine, Nursing and Health Sciences, Professor Christina Mitchell.

MBI hosted, Simulate and Visualise, New World Technologies for Real World Outcomes, a workshop forming part of the Innovation Workshop Series presented by the South Eastern Melbourne Innovation Precinct.



## 2014

We hosted a number of research workshops including Information and Communication Technology (ICT) for Life Sciences Forums: Brain Structure, Brain Dynamics and Brain Initiatives: Cross currents in Neuroscience presented by Dr Partha Mitra, Cold Spring Harbor Laboratory, and The Human Connectome Project: Progress & Prospects, presented by Prof David C. Van Essen, Washington University, A Neuroanatomy Workshop: The organisation of the fore brain: new concepts based on gene expression during development, presented by Professor Charles Watson, Curtin University.

MBI hosted an Imaging Informatics Workshop (in conjunction with MASSIVE), to highlight projects that had been undertaken in data acquisition, collection and management, computing infrastructure, analysis, and visualisation of imaging data, and Interactive Brain Function Workshop: Multi-modal approaches to



## 2013

MBI hosted four days of training courses, in conjunction with the Melbourne based company Compumedics, a world leader in electroencephalography (EEG) recording equipment. The courses covered Modal Analysis of NeuroCognitive Brain Function,



understand brain function” with keynote speaker Dr David Leopold from NIH/NIMH, USA, jointly with ARC Centre of Excellence for Integrative Brain Function (Brain Function CoE).

We also hosted delegations from the USA National Science Foundation (NSF) to assess international research on the computational aspects of biomedical imaging, and tours for visiting academics including Professor Warwick Anderson, CEO of the National Health and Medical Research Council.

## 2015

MBI hosted delegates from the Chinese Academy of Sciences in Australia to participate in the Australia China symposium on neuroscience; and a delegation from the University Teknologi Petronas, Malaysia.

MBI held numerous talks throughout the year from national and international visitors, in conjunction with Brain Function CoE, including Dr Christoph Mathys, Welcome Trust Centre for Neuroimaging, University College London, Dr Christopher Witte, LeibnizInstitut für Molekulare Pharmakologie, Berlin, and Dr Barry Richmond, National Institute of Mental Health, NIH. Transforming visual stimuli into meaning: learning reward values and ranking them.

MBI and CIBF jointly hosted three grade six students undertaking an inquiry project to understand how the brain works. The students produced a multimedia project, which was shared with other schools at a public exhibition.

## 2016

In May, 2016, MBI launched Australia’s only research-dedicated MR-PET scanner, which was established with support from the Science and Industry Endowment Fund and Siemens Healthcare.

## Ongoing

Each year since opening in 2012, MBI has hosted students from the John Monash Science School, in addition to Monash

University undergraduates, including third year students in the Bachelor of Behavioural Neurosciences, and sessions on careers and opportunities in research, for the third and fourth year Bachelor of Radiography and Medical Imaging students.

In 2012, 2014 and 2015, MBI has held courses on the application of Matlab for researchers in psychology, psychophysics, cognitive neuroscience, neuroscience and related fields.

MBI continues to provide support an Early Career Researcher led program, allowing students within MBI, BMH and MoNoC to attend seminars and workshops on a range of professional development topics.

## Media

### Print

Several news stories from researchers utilising MBI Facilities appeared in *The Age*, including an article about development of the visual pathway in the brain by Associate Professor James Bourne from the Australian Regenerative Medicine Institute, Monash University, and an article by Monash University neuroscientist Professor Murat Yücel on research into the use of virtual reality technology to treat addictive behaviours such as problem gambling.

Prof Gary Egan and Dr Rachel Nowak published a piece in *The Australian* entitled “Getting our heads around brain research”.

### TV

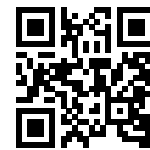
*Catalyst, ABC - The Science of Meditation – can it really change you?, 7 June, 2016*

From infamous criminals, to powerful corporations, to some of the world’s most successful athletes, meditation has never been so popular. But can it really make you smarter, happier and healthier? New research shows that it can affect the body as well as the mind, slow down the aging process, and even alter the structure of the brain. Dr Graham Phillips embarks on an eight week meditation course and undergoes a raft of rigorous brain tests and scans, to find out if the ancient art lives up to the current hype.



*Catalyst, ABC – Honey bees and lavender, 5 April, 2016*

Reacting quickly in an emergency depends increasingly on security cameras to recognize faces. We have special regions of the brain dedicated to the task of face recognition and constantly do it without effort or a second thought. But for computers and security systems it’s more difficult. In a bid to improve surveillance the technology that could one day save lives, by recognising a known terrorist for instance, scientists are studying how bees see the world.



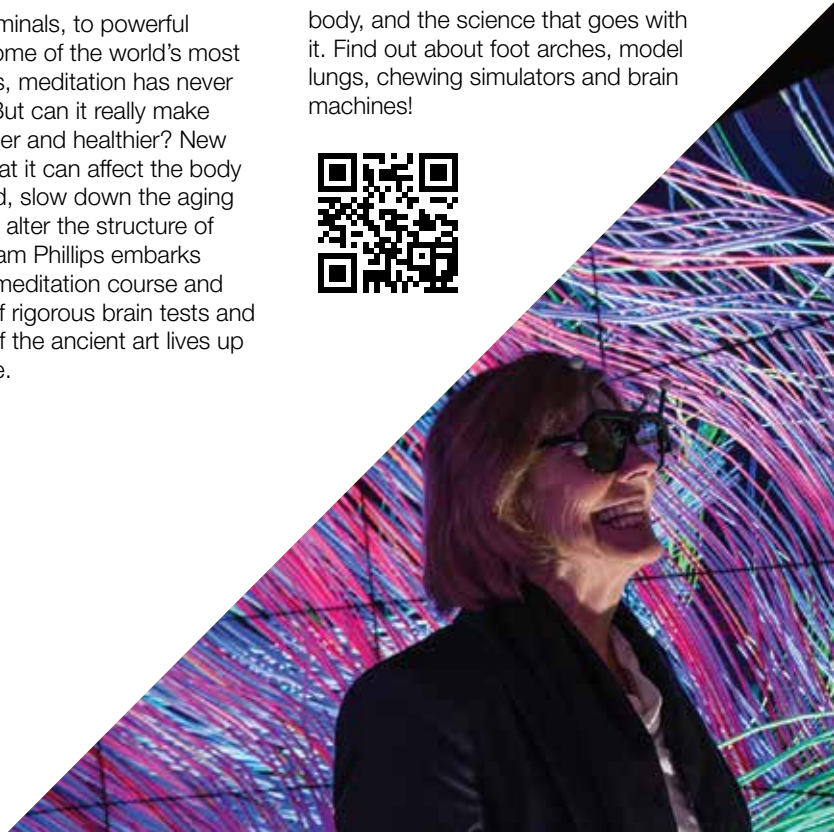
*Living with the enemy, SBS – 2 October, 2014*

For fifty years marijuana has been Australia’s most popular illegal drug; seven million of us have tried it, and more than two-and-a-half million smoke it every day.



*SCOPE, Channel Eleven – 29 May, 2014*

Body Science: Tell anybody and everybody about this episode of SCOPE that is all about the BODY! We discover the human body, and the science that goes with it. Find out about foot arches, model lungs, chewing simulators and brain machines!



MBI has fostered relationships with key industry partners, including Siemens Australia, Bioscan and Agilent Technologies. More recently, MBI has formed a collaboration with Helmholtz Association.



The Australian Regenerative Medicine Institute (ARMI) provided contributing funds to the establishment of MBI. They have also contributed equipment (the Vevo1200) in 2013.



From 2012 to 2014 the Australian Synchrotron housed the PET-CT scanner. The Australian Synchrotron has also provided collaborative support to researchers performing multi-modal studies using the Imaging and Medical BeamLine and equipment at MBI.

## 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 from MMC operate the MRI scanner and liaise with clinical researchers from the University.

## SIEMENS

MBI and Siemens Australia collaborate on a number of research projects in the field of MRI, Computed Tomography and Molecular Imaging. The creation of the joint Monash Siemens Collaboration Management Committee has enabled the provision and coordination of an internal competitive grants scheme, as well as the identification of linkage and fellowship grant opportunities for additional research or commercial seed funding investments. During 2012 the first collaborative projects were undertaken between Siemens and researchers from the Department of Chemistry, and from the Department of Electrical and Computer Engineering, Monash University.

During 2013 four new collaborative projects were undertaken between Siemens and researchers from MBI and Monash University.

Five key projects were undertaken in 2014 as part of the Cooperative Agreement. Three of these focussed on the development, optimisation and validation of new or existing MR scanner sequences. One study uses a ZOOMit technique to produce extremely high resolution images, which are used at MBI to investigate rejection of kidneys in transplant patients, and to investigate mechanism to correct visual impairment. In 2014 the collaboration was deemed a success, and extended for a further year.

The projects continued in 2015 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) the ZOOMit study.



## Agilent Technologies

In 2012, Agilent identified Monash University as a key research partner to work with in the Australian biomedical imaging research sector. MBI provides the opportunity within Monash University for collaborative biomedical imaging projects with Agilent, and the relationship has developed into a vital source of innovation for the development of new biomedical imaging technologies. Agilent outlined a number of research and development areas of high importance, and their interest to work with MBI in the Australian research sector. Monash University is also considered a key alliance partner for Agilent to work with across the life science and in chemical analyses, particularly in spectroscopic and imaging technologies. It was expected the Agilent and Monash University partnership would generate new opportunities for future areas of collaboration, potentially including the Agilent 'Thought Leader Program'. However, in 2013 Agilent discontinued production of its MRI preclinical imaging systems changing the nature of the collaboration with MBI.

Despite the setback of 2013, Agilent made the decision to continue to work closely with MBI regarding machine maintenance and servicing. Agilent also provided funding for three key projects. Two of these were undertaken in the area of stem cell tracking. These projects will allow the development of techniques to assess how stem cells travel through the body, and whether they reach the organs where they are required (intended). One study specifically assesses the role for stem cells in the repair of brain injury, whilst the other focuses on the type of stem cell, and uptake throughout the body. The third study aims to develop a new series of techniques, which will allow optimal cardiac imaging in rodent models.



In 2012, Bioscan and Monash entered a research and development collaboration for projects based on the preclinical CT, PET and FLECT imaging modalities. Bioscan has established MBI as a Centre of Excellence in Bioscan's primary business area of molecular imaging. The Centre of Excellence acknowledges Monash University's standing as a preeminent university in biological research, particularly in biomedical, preclinical and translational research, and was a key factor for the decision by the partners to enter into a three-year research and development collaboration agreement.

## Helmholtz

In 2015, a Letter of Intent was signed between Monash University and Helmholtz Forschungszentrum Jülich to collaborate in the field of hybrid MR-PET and ultra high field (human) functional MRI. The partners have commenced discussion towards the formation of a German-Australia Centre for Advanced Bioimaging in the area of simultaneous MR-PET and intend to exchange staff in order to promote knowledge exchange and develop a training site for PhD students and new simultaneous MR-PET applications.

Professor Jon Shah has taken a dual appointment across the two institutions and was recently awarded a three year Helmholtz Innovation Fund grant to develop a next generation Brain PET scanner. The technology development project includes Siemens AG (Germany) and Monash University as an international partner, and is scheduled to commence in 2016.

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



Collaboration with MASSIVE (Multimodal Australian Sciences Imaging and Visualisation Environment) began in 2012. MASSIVE has provided MBI with hardware, software and expertise to support computational imaging (particularly in relation to advanced brain imaging research). A key collaborative project involving MBI (and its equipment) and MASSIVE has been the Characterisation Virtual Laboratory (CVL). The CVL integrates neuroimaging analysis software components with neuroinformatics tools along with neuroimaging databases and analysis workflows. Significantly, the resources also integrate data capture at the machine with analysis in the cloud. This means imaging researchers using MBI equipment have their data stored directly in the cloud (where they can also perform analysis using a standard desktop

computer), rather than needing to take their data with them on a portable storage device (e.g. hard drive, flash drive, CD or DVD) and subsequently analysing their data using a more sophisticated computing system.

Another achievement of this collaboration was the creation of highly immersive, ultra-high definition tractography images (in collaboration with the Monash University Immersive Visualisation Platform) for use in the CAVE2 (a large scale virtual reality environment that enables interactive exploration of digital data).

More recently (2015), MASSIVE and MBI have worked closely together to integrate Australian neuroscience datasets with international neuroscience datasets in participation with the INCF.



Through collaboration between the Monash eResearch Centre (MeRC) and MBI, the Monash neuroscience and imaging community is highly connected and supported by high performance online computing environments. All primary data generated by MBI instruments is safely and securely managed in the Monash Research Cloud (R@CMon). The Monash neuroimaging community is one of the biggest user cohorts on the MASSIVE HPC systems with nearly a quarter of projects on these systems have a neuroscience focus. Most recently this led to MASSIVE being included in a special neuroscience high performance computing (HPC) infrastructure session at ISC, the preeminent European HPC conference, presenting alongside two initiatives: the European Human Brain Project, and the US BRAIN initiative.

MeRC and MBI have co-operated to support significant national collaborations. The ARC Centre of Excellence in Integrative Brain Function (CIBF) is an associate partner in the MASSIVE partnership, together with CSIRO, the Australian Synchrotron, ANSTO and the ARC Centre of Excellence in Advanced Molecular Imaging. Together with MeRC, MBI is a participant in flagship national

eInfrastructure initiatives, including the Characterisation Virtual Laboratory, and the Research Data Services Image Publication project. With MBI and the Brain and Mental Health Laboratory as the primary users, MASSIVE hosts the Australian data mirror of the Human Connectome Project.

In partnership with MeRC and MASSIVE, MBI is leading Australian participation in international neuroinformatics initiatives. Monash University represents Australia in the International Neuroinformatics Coordinating Facility (INCF) and is leading efforts to coordinate national and international neuroinformatics eInfrastructure initiatives.

The cooperation between MBI and MeRC is also helping biomedical and cognitive neuroscience researchers interact with their data using the Monash Immersive Visualisation Platform (MIVP). One of the initial MIVP projects has developed comparative visualisation software that allows the Monash-led Image-HD project to visually explore the data from the project cohorts.



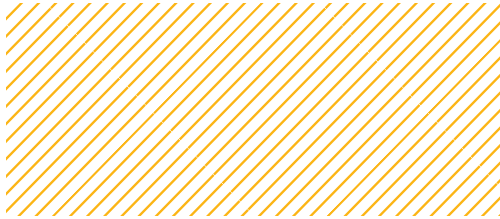
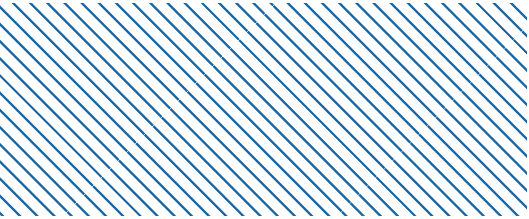
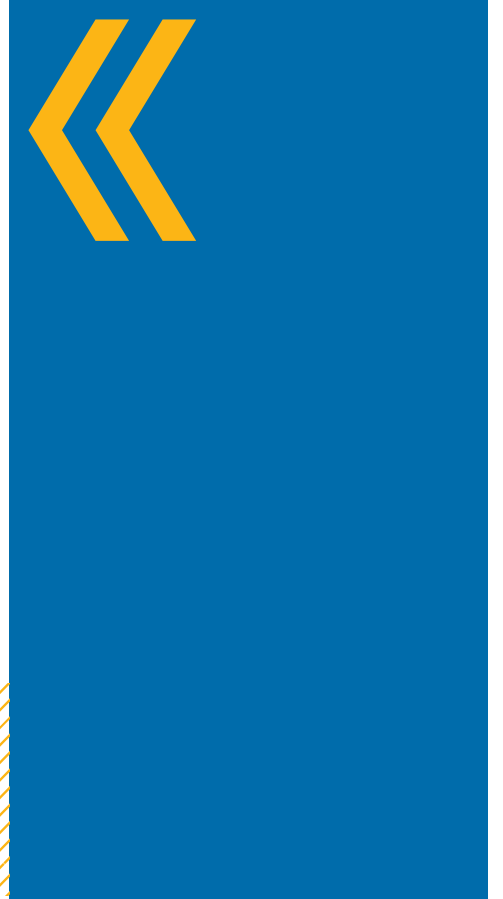
The formation of VBIC and the establishment of MBI are inextricably linked – VBIC funding included cash support for Monash University to establish MBI. The funding covered some of the equipment located at Blackburn road, as well as significant upgrades, transforming the site from a disused office suite into a biomedical imaging research facility.

Therefore, developments at MBI have been in tandem with VBIC and have directly contributed to VBIC's success. Although not the applicant for the initial funding of VBIC, Monash University (and therefore MBI) performed much of the administration of VBIC activities; hosting the VBIC Business Manager and also the VBIC website, providing the Chair of the Coordination Committee and supervising the VBIC Business Manager.

As a member of VBIC, MBI has contributed to major VBIC initiatives including:

- A training package for researchers to perform non-clinical scans on normal volunteers (as task usually restricted to radiographers)
- Development of guidelines and associated form for patient screening in research-dedicated MRI facilities
- Creation of a guide to the reporting of incidental findings
- A white paper and subsequent recommendations in MRI quality control and quality assurance

The formation and operation of VBIC (including contributions from MBI) have demonstrated to the (national) biomedical imaging community, the Victorian Government and partners alike the ability and value of state-wide collaboration on infrastructure of research significance.



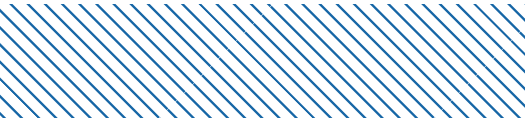
MBI has been a member of the Australian National Imaging Facility (NIF) since MBI was established in 2010. In 2012 (as part of VBIC developments), MBI commissioned the PET-SPECT-CT, which became MBI's NIF flagship instrument.

NIF is an NCRIS (National Collaborative Research Infrastructure Scheme) facility, and has also received funding via EIF (Education Investment Fund). Beyond inclusion in NIF and the associated increase in research profile, MBI has benefited from involvement in NIF via funding for equipment () as well as funding for Facility Fellows – highly trained/skilled research staff with expertise in the use of specific imaging equipment (e.g. MRI and/or PET-CT etc). Each year of participation in NIF, MBI has received partial financial support for 2-3 Facility Fellows (head count) focused on eResearch/ Informatics and MR imaging respectively.



The collaboration formed with CSIRO was initiated in 2011 (as part of VBIC) where CSIRO supported research staff. This collaboration has continued since, and over that time CSIRO-MBI collaborations have focused on:

- Developing imaging protocols on the 3T MRI for a sub-study of the ASPREE (Aspirin Preventing Events in the Elderly) (2011 – 2013)
- Ex vivo and in vivo MRI atlas of the common marmoset brain (2011 – 2013)
- Biomedical Materials Translation Facility (MR-PET) (2014 to present).



## Biomedical Materials Translation Facility

The Biomedical Materials Translation Facility (BMTF) was established in 2015. However, significant work was undertaken in 2013 and 2014 in terms of application development (2013) as well as project planning (2014). Funded through the Science Industry Endowment Fund (SIEF), MBI played a significant role bringing together the CSIRO and the Monash Health Translation Precinct. The experienced staff at MBI were crucial to the inclusion of biomedical imaging in the application and procurement of a MR-PET imaging system as part of the project.

Throughout the second half of 2015 MBI underwent renovations to accommodate the MR-PET as well as a hot lab. In early 2016 the machine was installed and commissioned, going live for first use in February 2016.



Australian Research Council  
Centre of Excellence for  
Integrative Brain Function

Led by Monash University (MBI specifically), the Australian Research Council Centre of Excellence for Integrative Brain Function (CIBF) aims to understand how the brain interacts with the world. The project is quite a large collaborative effort (especially when compared with other ARC Centres of Excellence). It includes 6 collaborative institutions – University of Melbourne, University of Queensland, Australian National University, the University of Sydney and the University of New South Wales – as well as a further 12 (mostly international) partner institutions – from Europe, North America and Asia.

MBI hosts CIBF staff essential to much of the operational and administrative functions. This is in addition to CIBF-funded research staff. The CIBF provides an opportunity for MBI-based researchers to participate in one of Australia's leading neuroscience research centres, connected to some of the best neuroscience (and neuroscientists) in the world.

Opportunities provided to date include:

- Research symposia hosted at MBI by CIBF researchers
- International scientist visits to MBI
- MBI researchers (funded by CIBF) attending national conferences
- MBI researchers (funded by CIBF) organising national conferences



Monash University (in collaboration with the University of Melbourne and their respective computational facilities – MASSIVE and VLSCI) established the Victorian Node of the INCF in 2012. The International Neuroscience Coordinating Facility (INCF) was established in 2006 by the Organisation for Economic Development (OECD) to develop and maintain databases and computational infrastructure for neurosciences. A key role of the INCF – and therefore its member organisations – is the development of international software tools and standards of importance to the neuroscientific research community.

MBI's Director, Professor Gary Egan, played a major role in the (highly) unusual scenario of a state (rather than a country) becoming a member organisation of the INCF. This unique arrangement was facilitated by the high standing within which MBI (and Victoria) holds in the international neuroscience community.

In 2015 the node administration transitioned from Victoria (Monash University and the University of Melbourne) to Australia, via the involvement of the Australian Research Council (ARC) Centre of Excellence (CoE) for Integrative Brain Function (CIBF). As the lead entity in the CIBF MBI played a key role in this transition, bringing the rest of Australia into the INCF fold. This transition coincided with Australia hosting the INCF International Congress (in Cairns in August 2015).

The aims of the Victoria/Australian INCF node have been to:

- Support the Australian neuroscience community in its use of supercomputing facilities (such as MASSIVE and VLSCI)
- Develop neuroimaging data management and analytic tools
- Develop a program in clinical neuroinformatics research



From 2012 – 2014 the computational bioimaging hub of the Life Sciences Computational Centre (part of the Victorian Life Sciences Computation Initiative, VLSCI) was based at MBI. During that time the hub provided computational, imaging and informatics expertise to MBI staff and others accessing the MBI facility via funding of key computational experts at MBI.



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**MONASH** University  
Biomedical Imaging

# Grants to MBI users

2012

Project Title	Funding Body
Hyperpolarised gas functional lung and molecular imaging	Australian Nuclear Science and Technology Organisation (ANSTO)
How do we become aware of stimuli in our spatial environment? Award: Fellowship	Australian Research Council (ARC)
When should we stop trusting the senses? Perceptual decision making under ambiguity	Australian Research Council (ARC)
The neuroscience of group membership and its effects on action perception and empathy.	Australian Research Council (ARC)
The neuronal basis of visual consciousness: how brain rhythms control the doors of perception	Australian Research Council (ARC)
Enhancing learning capacity and academic outcomes using novel game technology in primary school children with developmental disabilities	Australian Research Council (ARC)
Optimising bubble continuous positive airway pressure (CPAP) for preterm infants	Australian Research Council (ARC)
Does Rho-kinase activation contribute to actin-myosin dysregulation in the diabetic heart?	Australian Synchrotron (Synchrotron Light Source Australia Pty Ltd)
Evaluation of coronary endothelial function in a diet-induced model of atherosclerosis in mice	Australian Synchrotron (Synchrotron Light Source Australia Pty Ltd)
The Use of Non-Invasive Brain Stimulation to Improve Social Relating in Autism Spectrum Disorders	Brain & Behavior Research Foundation
Victorian Biomedical Imaging Capability (VBIC)	CSIRO
Understanding the effect of preterm birth on brain blood flow and subsequent brain injury.	Foundation for Children
Regulation of myelination in intrauterine growth restriction: identification of potential therapeutic targets	Foundation for Children
UNDERSTANDING THE RELATIONSHIP BETWEEN CHILDHOOD OBESITY AND OBSTRUCTIVE SLEEP APNOEA	Heart Foundation of Australia
Cord blood stem cells to reduce brain injury in the newborn	Inner Wheel Australia
Revealing functional connectivity between distant brain areas that support higher cognitive functions through exploration of simultaneous multi-electrode recordings	Japan Science and Technology Agency
A Study to Evaluate the Safety and Efficacy of Different Formulations of STRO-3+ Immunoselected Allogeneic Mesenchymal Precursor Cells on the Repair and Reconstitution of the Extracellular Matrix	Mesoblast
Gait analysis as a biomarker for early FXTAS identification in male fragile X premutation carriers	National Fragile X Foundation
From the synchrotron to the clinic: a novel functional lung imaging technology	National Health & Medical Research Council (NHMRC)
A role for the pulvinar nucleus in visual cortical development and plasticity	National Health & Medical Research Council (NHMRC)
Being born small is not good for the heart: early detection of cardiovascular risk	National Health & Medical Research Council (NHMRC)

Funding Scheme	Amount awarded	Investigators
Australian Nuclear Science and Technology Organisation - ARC Linkage Infrastructure - Equipment & Facilities (LIEF) - Project - grant	0.00	Francis Thien, Ian Brereton, The University of Queensland, Gary Cowin, The University of Queensland, Gary Egan, Graham Galloway, The University of Queensland, Stuart Hooper, Bruce Thompson, Wai-Tung Lee, Partner Investigator (PI), Australian Nuclear Science and Technology Organisation (ANSTO), Philip Robinson, Partner Investigator (PI), Murdoch Childrens Research Institute
ARC Discovery Early Career Researcher Award (DECRA) 2013 - Fellowship Salary component	210,813.00	Pascal Molenberghs
ARC Discovery Projects 2013	117,377.00	Jakob Hohwy, Peter Enticott, Uta Frith, Partner Investigator (PI), University College London
ARC Discovery Projects 2013	118,555.79	Pascal Molenberghs
ARC Discovery Projects 2013 - (ICA) International Collaboration Award component	489,000.00	Nao Tsuchiya, Jerome Maller, Brett Foster, Partner Investigator (PI), Stanford University, Kana Takaura, Partner Investigator (PI), RIKEN Brain Science Institute (BSI)
ARC Linkage Projects 2012	315,535.00	Kim Cornish, Kirsten Ellis, Kylie Gray, Jefferson Harcourt, Darren Hocking, Kevin McIntosh, Partner Investigator (PI), Torus Games Pty Ltd
ARC Linkage Projects 2012	87,476.00	Timothy Moss, Andreas Fouras, Stuart Hooper, Marcus Kitchen, Graeme Polglase, Amy Tatham, Partner Investigator (PI), Fisher and Paykel Healthcare
Australian Synchrotron - International Access Program	9,800.00	James Pearson
Australian Synchrotron - International Access Program - grant	9,800.00	James Pearson
NARSAD - Brain & Behaviour Research Foundation - Young Investigator Award 2012	54,180.00	Peter Enticott
CSIRO - Contract	250,000.00	Gary Egan, Qentin Churches, CSIRO Materials Science & Engineering, Simon James, Australian Synchrotron (Synchrotron Light Source Australia Pty Ltd), John McNeil, Olivier Salvado, CSIRO, Victor Streltsov, CSIRO Materials Science & Engineering, Qi Wu
Financial Markets Foundation for Children	154,592.00	Graeme Polglase, Kelly Crossley, Mary Tolcos
Financial Markets Foundation for Children- grant	142,578.00	Mary Tolcos, David Walker, Euan Wallace
National Heart Foundation 2013 Grant-in-Aid	129,110.00	Rosemary Horne, Sarah Biggs, Margot Davey, Michael Ditchfield, Gillian Nixon, Matthew Sabin, Murdoch Childrens Research Institute, Lisa Walter
Inner Wheel Australia Inc - Research Grant	62,960.00	Graham Jenkin, Michael Fahey, Suzanne Miller, Euan Wallace, Mark Kirkland, Associate Investigator (AI), Deakin University, Tamara Yawno, Associate Investigator (AI)
Japan Science and Technology Agency (JST)-Japan - Contract	142,237.69	Nao Tsuchiya
Mesoblast Limited - Contract	761,425.00	Graham Jenkin
National Fragile X Foundation - Rosen/Weingarden Summer Fellowship Research Fund	2,521.00	Claudine Kraan, Kim Cornish, Darren Hocking, La Trobe University
NHMRC Development Grant 2013 - grant	859,797.00	Marcus Kitchen, Andreas Fouras, Stuart Hooper, Brendan Jenkins, David Parsons, Women's and Children's Hospital, Adelaide, Karen Siu, David Spanswick, Neil Watkins, Graeme Zosky, Telethon Institute for Child Health Research
NHMRC Project Grant 2013	817,358.10	James Bourne, Gary Egan, David Leopold, National Institutes of Health (NIH)
NHMRC Project Grant 2013	469,024.23	Stephanie Yiallourou, Sarah Hope, Rosemary Horne, Euan Wallace

# Grants to MBI users

2012

Project Title	Funding Body
Dopamine, frontal-subcortical circuits and risk for schizophrenia	National Health & Medical Research Council (NHMRC)
Personality, attachment and neurocognitive function in stalking and intimate partner violence: towards a better understanding of treatment models	National Health & Medical Research Council (NHMRC)
A longitudinal neuroimaging study investigating reorganisation of cerebellar-cerebral networks in Friedreich ataxia	National Health & Medical Research Council (NHMRC)
Cognitive Neuroscience of Error Processing	National Health & Medical Research Council (NHMRC)
The pathophysiology of septic acute kidney injury	National Health & Medical Research Council (NHMRC)
Neural dysfunction in chronic cough	National Health & Medical Research Council (NHMRC)
Protecting the brain from external factors at pre-term birth	Rebecca L. Cooper Medical Research Foundation Ltd
Fast Iterative Image Reconstruction for Improved Parallel and Dynamic-Parallel MRI	Siemens Ltd

2013

New therapeutic approaches for the treatment of obesity	Australian Academy of Science
ARC Centre of Excellence for Integrative Brain Function	Australian Research Council (ARC)
Defining the pathways of developmental brain injury, for a healthy start to life.	Australian Research Council (ARC)
Mapping, understanding and manipulating the human brain connectome with MRI	Australian Research Council (ARC)
Cognitive neuroscience of spatial asymmetry: behaviour, genes and brain imaging	Australian Research Council (ARC)
The comparative physiology of oxygen delivery to the kidney	Australian Research Council (ARC)
Understanding complex networks of connections in the primate cerebral cortex	Australian Research Council (ARC)
Controlling the spatial distribution of targeting ligands on dendrimer surfaces as a means of dictating cellular recognition and fate	Australian Research Council (ARC)

	Funding Scheme	Amount awarded	Investigators
	NHMRC Project Grant 2013	617,481.13	Alex Fornito, Chad Bousman, The University of Melbourne, Vanessa Cropley, The University of Melbourne, Dennis Velakoulis, The University of Melbourne, Andrew Zalesky, The University of Melbourne
	NHMRC Project Grant 2013	0.00	Mairead Dolan, James Ogloff, Julie Stout
	NHMRC Project Grant 2013	732,161.58	Nellie Georgiou-Karistianis, Andrew Churchyard, Louise Corben, Murdoch Childrens Research Institute, Martin Delatycki, Murdoch Childrens Research Institute, Gary Egan
	NHMRC Project Grant 2013	638,972.10	Mark Bellgrove, Tarrant Cummins, Hugh Garavan, University of Vermont, Robert Hester, The University of Melbourne
	NHMRC Project Grant 2013	163,078.00	Roger Evans, James Pearson
	NHMRC Project Grant 2013	40,000.00	Michael Farrell, Stuart Mazzone, Partner Investigator (PI), The University of Queensland
	Rebecca L. Cooper Medical Research Foundation	22,000.00	Graeme Polglase, Kelly Crossley, Timothy Moss, Mary Tolcos
	Siemens Ltd - Contract	35,000.00	Jingxin Zhang
		<b>7,452,832.62</b>	
	Australian Academy of Science - German-Australian Mobility call 2013-2014	15,000.00	Michael Cowley
	ARC Centre of Excellence 2014	20,000,000.00	Gary Egan, Ehsan Arabzadeh, Australian National University, Michael Breakspear, Queensland Institute of Medical Research, Marta Garrido, The University of Queensland, Ulrike Grunert, University of Sydney, Michael Ibbotson, The University of Melbourne, Arthur Lowery, Paul Martin, University of Sydney, Jason Mattingley, The University of Queensland, George Paxinos, The University of New South Wales, Steven Petrou, The University of Melbourne, Peter Robinson, University of Sydney, Marcello Rosa, Pankaj Sah, The University of Queensland, Efstratios Skafidas, The University of Melbourne, Greg Stuart, Australian National University, Mathew Diamond, Partner Investigator (PI), Scuola Internazionale Superiore di Studi Avanzati (International School for Advanced Studies), Sean Hill, Partner Investigator (PI), International Neuroinformatics Coordinating Facility (INCF), Viktor Jirsa, Partner Investigator (PI), Centre National de la Recherche Scientifique (National Organisation for Academic Scientific Research), G Johnson, Partner Investigator (PI), Duke University, David Leopold, Partner Investigator (PI), National Institutes of Health (NIH), Troy Margrie, Partner Investigator (PI), University College London, Henry Markram, Partner Investigator (PI), Ecole Polytechnique Federale de Lausanne (Swiss Federal Institute of Technology Lausanne), Partha Mitra, Partner Investigator (PI), Cold Spring Harbor Laboratory, Joseph Movshon, Partner Investigator (PI), New York University, Keiji Tanaka, Partner Investigator (PI), RIKEN Brain Science Institute (BSI), Jonathan Victor, Partner Investigator (PI), Weill Cornell Medical College
	ARC Discovery Future Fellowships 2013 - Fellowship component	755,164.00	Suzanne Miller
	ARC Discovery Future Fellowships 2013 - Fellowship component	747,400.00	Alex Fornito
	ARC Discovery Future Fellowships 2013 - Fellowship component	969,219.00	Mark Bellgrove
	ARC Discovery Projects 2014	183,787.00	Roger Evans, Michelle Kett, James Pearson
	ARC Discovery Projects 2014 - (ICA) International Collaboration Award component	560,000.00	Marcello Rosa, Partha Mitra, Partner Investigator (PI), Cold Spring Harbor Laboratory
	ARC Linkage Projects 2013	999,081.00	Christopher Porter, Benjamin Boyd, Nigel Bunnett, Lisa Kaminskis, Erica Sloan, David Owen, Partner Investigator (PI), Starpharma Pty Ltd

# Grants to MBI users

2013

Project Title	Funding Body
Development of new systems for the commercial collection , processing and storage of adipose stem cells.	Australian Research Council (ARC)
Rho-kinase modulation of actin-myosin dynamics in the diabetic heart	Australian Synchrotron (Synchrotron Light Source Australia Pty Ltd)
Salt-sensitive hypertension effecton coronary blood flow in insulin resistant Goto-Kakizaki rats	Australian Synchrotron (Synchrotron Light Source Australia Pty Ltd)
A Prospective Registry Study in a Global Huntington's Disease Cohort (Enroll-HD)	CHDI Foundation, Inc.
The C-Shuttle Glovebox from Biospherix	Collier Charitable Fund
Ambulatory core body temperature collection system	Collier Charitable Fund
Formulation of a Mineralocorticoid retinal injection	Department of Economic Development, Jobs, Transport and Resources (VIC)
New approaches to the prevention and treatment of Musculoskeletal DiseaseAward: Fellowship	National Health & Medical Research Council (NHMRC)
Cerebrovascular diseases and Brain Ageing - a program of research into novel mechanisms, risk prevention and innovative health care deliveryAward: Fellowship	National Health & Medical Research Council (NHMRC)
Restoring vision with a wireless multi-electrode cortical device: towards commercialisation	National Health & Medical Research Council (NHMRC)
Equipment supporting animal experiments in the collaborative Engineering/Medicine laboratories	National Health & Medical Research Council (NHMRC)
Blackrock 'Cerebus' 128 channel data acquisition system for electrophysiology	National Health & Medical Research Council (NHMRC)
Exploring the neuropathophysiology of autism spectrum disorders	National Health & Medical Research Council (NHMRC)
Fibromyalgia: Investigating the prefrontal cortex and its role in novel treatment approachesAward: Fellowship	National Health & Medical Research Council (NHMRC)
Characterising and modulating corticostriatal connectivity in schizophrenia.Award: Fellowship	National Health & Medical Research Council (NHMRC)
Development of folding in the fetal cerebral cortex - identifying fundamental mechanisms and their susceptibility to disruption in normal and abnormal pregnancy	National Health & Medical Research Council (NHMRC)
The role of central haemodynamics in Type 2 Diabetes Mellitus-related brain disease	National Health & Medical Research Council (NHMRC)
A combined PET-fMRI study of frontostriatal dysfunction in first episode psychosis	National Health & Medical Research Council (NHMRC)
Birth weight, adult weight and podocyte depletion.	National Health & Medical Research Council (NHMRC)
Functional Neurogenesis in the Injured Neocortex of the Nonhuman Primate	National Health & Medical Research Council (NHMRC)
What role do cerebral hypoxia and sleep disruption play in the neurocognitive effects of paediatric sleep disordered breathing?	National Health & Medical Research Council (NHMRC)
The genetics of ADHD: role of rare variants	National Health & Medical Research Council (NHMRC)
Facilitating the Physiological Transition at Birth in Term and Pre-Term Neonates	National Institutes of Health (NIH)

	Funding Scheme	Amount awarded	Investigators
	ARC Linkage Projects 2013	786,803.00	Graham Jenkin, Euan Wallace
	Australian Synchrotron - International Access Program - grant	5,800.00	James Pearson
	Australian Synchrotron - International Synchrotron Access Program	8,600.00	James Pearson
	CHDI Foundation, Inc. (USA) - Contract	150,000.00	Andrew Churchyard, Nellie Georgiou-Karistianis, Julie Stout
	Collier Charitable Fund - Equipment Grant	3,500.00	Caroline Gargett
	Collier Charitable Fund - Equipment Grant	2,853.00	Sean Cain
	Department of Business and Innovation (DBI),Victoria - Business Research and Development Voucher - Grant	31,800.00	Benjamin Boyd
	NHMRC Clinical - Career Development Fellowship (CDF) 2014 Level 2	447,840.00	Anita Wluka
	NHMRC Clinical - Career Development Fellowship (CDF) 2014 Level 2	447,840.00	Velandai Srikanth
	NHMRC Development Grant 2014	1,515,357.93	Jeffrey Rosenfeld, Lauren Ayton, The University of Melbourne, Peter Blamey, Bionics Institute, Jefferson Harcourt, Erol Harvey, Swinburne University of Technology, Arthur Lowery, Marcello Rosa
	NHMRC Equipment Grant 2013	2,500.00	Andreas Fouras, Stuart Hooper, Nicolas Plachta
	NHMRC Equipment Grant 2013	80,000.00	Marcello Rosa, Sofia Bakola, Gary Egan, Alex Fornito, Leo Lui, Nicholas Price, Ramesh Rajan, David Reser, Nao Tsuchiya, Hsin Yu (Hsin-Hao Yu)
	NHMRC Industry - Career Development Fellowship (CDF) 2013 Level 1	59,045.00	Peter Enticott
	NHMRC Peter Doherty Biomedical Fellowship (Australia) - Early Career Fellowship (ECF) 2014	327,523.74	Bernadette Fitzgibbon
	NHMRC Peter Doherty Biomedical Fellowship (Australia) - Early Career Fellowship (ECF) 2014	304,596.00	Nigel Rogasch
	NHMRC Project Grant 2014	533,568.00	David Walker, Joanne Britto, Florey Neuroscience Institutes, Gary Egan, Leigh Johnston, The University of Melbourne, Mary Tolcos
	NHMRC Project Grant 2014	863,538.00	Velandai Srikanth, David Bruce, The University of Western Australia, Gerald Muench, University of Western Sydney, Thanh Phan, James Sharman, The University of Tasmania, Amanda Wood
	NHMRC Project Grant 2014	677,209.75	Alex Fornito, Vanessa Cropley, The University of Melbourne, Shona Francey, Orygen Youth Health, B Harrison, The University of Melbourne, Christos Pantelis, The University of Melbourne, Paul Thomas, Royal Brisbane and Women's Hospital
	NHMRC Project Grant 2014	728,416.00	John Bertram, James Armitage, Mary Black, Wendy Hoy, The University of Queensland
	NHMRC Project Grant 2014	935,558.00	James Bourne, Tobias Merson, Kaylene Young, University of Tasmania
	NHMRC Project Grant 2014	537,670.00	Rosemary Horne, Sarah Biggs, Margot Davey, Gillian Nixon, Lisa Walter
	NHMRC Project Grant 2014	630,853.00	Mark Bellgrove, Mauricio Arcos-Burgos, Australian National University, Tarrant Cummins, Simon Easteal, Australian National University, Zariah Hawi, Florence Levy, Sydney Children's Hospital, Alasdair Vance, The University of Melbourne
	National Institutes of Health (NIH) - Studies in Neonatal Resuscitation (ROI) PAR-11-222	1,644,657.00	Stuart Hooper, Andreas Fouras, Marcus Kitchen, Timothy Moss, Graeme Polglase

# Grants to MBI users

2013  
2014

Project Title	Funding Body
Investigate whether cardiac gating might improve our ability to detect neural activity in the locus coeruleus and raphe nuclei in brain-stem, ventrolateral preoptic nucleus in hypothalamus and	Siemens Ltd
Neurogenesis in the injured nonhuman primate neocortex	Stem Cells Australia
Early HD Research Study	University of California, Davis
Invariant NKT cells as the link between brain injury and susceptibility to infections	Alberta Innovates Health Solutions
Interventional repetitive transcranial magnetic stimulation treatment for fibromyalgia	Arthritis Australia
Cognitive Compensation in Ageing	Australian Research Council (ARC)
Dissecting the neural substrates of spatial attention	Australian Research Council (ARC)
Effects of intermittent hypoxia in the aging diabetic heart's circulation	Australian Synchrotron (Synchrotron Light Source Australia Pty Ltd)
Start Up tasks for larger project aimed at preparing the HD-CAB (Cognitive Assessment Battery) for Clinical Trials	CHDI Foundation, Inc.
COREFEAR - Functional wiring of the core neural network of innate fear	European Research Council
The prevalence and neural substrates of theory of mind deficits following stroke: A neuroimaging investigation	Heart Foundation of Australia
Bionic Vision Device (Gennaris) Clinical Trial	Marc and Eva Besen
Visuomotor integration in the medial parietal cortical areas	National Health & Medical Research Council (NHMRC)
Bronchopulmonary Dysplasia - A Regenerative Medicine Approach	National Health & Medical Research Council (NHMRC)
Dissecting the central organisation of cough neural networks	National Health & Medical Research Council (NHMRC)
Reducing morbidities in preterm growth restricted neonates.	National Health & Medical Research Council (NHMRC)
A novel treatment for ischemic stroke: preclinical assessment in the nonhuman primate	National Health & Medical Research Council (NHMRC)
Neural circuits for active vision in the primate cerebral cortex	National Health & Medical Research Council (NHMRC)
ASPREE- NEURO; aspirin and cerebral microhaemorrhages	National Health & Medical Research Council (NHMRC)
Delivering nanoparticles to prevent rupture of unstable arterial plaques	National Health & Medical Research Council (NHMRC)
NHMRC Research Fellowship	National Health & Medical Research Council (NHMRC)
Strategic partnership for the development of novel therapeutics for Diabetes and Obesity. Oregon Health & Science University (OHSU) - Novo Nordisk - Monash Obesity and Diabetes Institute (MODI)	Novo Nordisk Pharmaceuticals Pty Ltd
Determining the mechanisms underlying increased morbidity and mortality in growth restricted preterm babies	Philanthropy, ANZ Trustees
Brain-immunity axis in stroke	Rebecca L. Cooper Medical Research Foundation Ltd
Teva Pride - Placebo Controlled Study - Huntington Disease TV7820-CNS-2002	Teva Pharmaceuticals USA
Perform biomarker assays	University of Tasmania

	Funding Scheme	Amount awarded	Investigators
	Siemens Ltd - Contract	48,000.00	Gary Egan
	Stem Cells Australia - SCA Strategic Research Fund grant	50,000.00	James Bourne
	University of California, Davis, USA - Contract	117,278.00	Julie Stout
		35,170,457.42	
	Alberta Innovates Health Solutions via University of Calgary	100,000.00	Connie Wong
	Arthritis Australia - Grant in Aid	10,000.00	Bernadette Fitzgibbon, Paul Fitzgerald, Emma Guymmer, Kate Hoy, Geoffrey Littlejohn
	ARC Discovery Early Career Researcher Award (DECRA) 2015 - Fellowship Component	375,936.00	Sharna Jamadar
	ARC Discovery Projects 2015	354,700.00	Mark Bellgrove, Redmond O'Connell, Partner Investigator (PI), Trinity College Dublin, The University of Dublin
	Australian Synchrotron - International Access Program - grant	5,400.00	James Pearson
	CHDI Foundation, Inc. (USA) - Contract	17,806.00	Julie Stout
	European Research Council - FP7 - Grant via the European Molecular Biology Laboratory	339,081.74	James Bourne, Claire Warner
	Heart Foundation - Future Leadership Fellowship	450,000.00	Pascal Molenberghs
	Marc and Eva Besen - Research Donation - 2014	1,000,000.00	Jeffrey Rosenfeld
	NHMRC Project Grant 2015	644,931.55	Marcello Rosa, Sofia Bakola, Konstantinos Chatzidimitrakis, UNKNOWN, Patrizia Fattori, Universita di Bologna (University of Bologna)
	NHMRC Project Grant 2015	465,784.50	Rebecca Lim, Daniel Chambers, The University of Queensland, James Pearson, Euan Wallace
	NHMRC Project Grant 2015	100,000.00	Michael Farrell, Stuart Mazzone, Partner Investigator (PI), The University of Queensland
	NHMRC Project Grant 2015	665,517.25	Graeme Polglase, Beth Allison, Atul Malhotra, Suzanne Miller, Arvind Sehgal
	NHMRC Project Grant 2015	739,154.00	James Bourne, Stephen Strittmatter, Yale University
	NHMRC Project Grant 2015	613,472.00	Marcello Rosa, Jude Mitchell, Salk Institute for Biological Studies
	NHMRC Project Grant 2015	956,185.50	John McNeil, Michael Bailey, Amy Brodtmann, Gary Egan, Nicholas Ferris, Stephanie Ward
	NHMRC Project Grant 2015	462,283.82	Christoph Hagemeyer
	NHMRC Senior Research Fellowship Level A (SRFA) 2015	611,645.00	James Bourne
	Novo Nordisk - Contract	3,682,772.00	Michael Cowley, Mark Sleeman
	ANZ Charitable Services - Medical Research & Technology in Victoria grant	24,875.00	Graeme Polglase, Beth Allison, Graham Jenkin, Atul Malhotra, Suzanne Miller, Arvind Sehgal
	Rebecca L. Cooper Medical Research Foundation - grant	22,000.00	Connie Wong
	Teva Branded Pharmaceutical Products R & D, Inc, USA via Stout Neuropsych Pty Ltd - Contract	306,927.00	Julie Stout
	University of Tasmania - Contract - 2013	120,588.00	Bing Wang
		12,069,059.36	

# Grants to MBI users

2015

Project Title	Funding Body
Predicting the course of cognitive and psychiatric decline in Huntington's Disease	Australian Huntington's Disease Association
Biomarker assays for Calcium Study - PINP biomarker analysis	Australian Institute of Sport
Understanding and implications of formation of lipid nanostructures in milk	Australian Research Council (ARC)
Consciousness in the predictive mind	Australian Research Council (ARC)
Mapping cognitive impulsivity through online testing	Australian Research Council (ARC)
Targeting coronary dysfunction in diabetic heart failure	Australian Synchrotron (Synchrotron Light Source Australia Pty Ltd)
Preventing coronary dysfunction in hypertensive insulin resistant rats with PKC inhibition	Australian Synchrotron (Synchrotron Light Source Australia Pty Ltd)
Assessing GABAergic dysfunction in the prefrontal cortex of people with schizophrenia	Brain & Behavior Research Foundation
Career Development Grant	Cerebral Palsy Alliance
Distinguished Researcher Award	Cerebral Palsy Alliance
Does postnatal administration of amnion epithelial cells (AECs) improve the structure and function of the neurovascular unit in preterm IUGR lambs?	Cerebral Palsy Alliance
Reducing brain injury by improving postnatal management of asphyxiated neonates at birth.	Cerebral Palsy Alliance
The use of 3D bioreactors for expansion of stem cells for clinical use	Cytomatrix Pty. Ltd.
The David Winston Turner Endowment Fund (DWTEF) Project for OCD and Addiction ResearchAward: Donations	David Winston Turner Endowment Fund
Podocyte loss, podocyte adaptation, and the development of diabetic nephropathy	Diabetes Australia
Improving the cardiovascular transition at birth in compromised preterm infants.	Heart Foundation of Australia
Novel Strategies to improve stroke outcome	Heart Foundation of Australia
Endothelial progenitor cells from umbilical cord blood: a novel therapy for improving cerebrovasculature to reduce neonatal brain injury	Heart Foundation of Australia
Connectomics based models for prediction of atrophy propagation in Huntington's disease	Hereditary Disease Foundation
Translational discovery laboratory for brain mechanisms of food choice and obesity	Ian Potter Foundation
Smart insulin delivery with glucose responsive nanomaterials	Juvenile Diabetes Research Foundation
Novel strategies to improve stroke outcome	National Health & Medical Research Council (NHMRC)
Reducing perinatal lung, heart and brain injury in preterm infants - from bench to the clinic.	National Health & Medical Research Council (NHMRC)
NHMRC Equipment Grant - Expansion of the MMI Confocal & Multiphoton Imaging System for Intravital Physiology, Anatomy and Developmental biology	National Health & Medical Research Council (NHMRC)
Mapping Brain Network Interactions in Neurodegenerative Disorders of the Subcortex	National Health & Medical Research Council (NHMRC)
The potential of cord blood stem cells to reduce neuroinflammation	National Health & Medical Research Council (NHMRC)
Improving perinatal outcomes.	National Health & Medical Research Council (NHMRC)

	Funding Scheme	Amount awarded	Investigators
	Australian Huntington's Disease Association (NSW) Inc Research Grant	55,000.00	Govinda Poudel
	Australian Institute of Sport -Contract Engagement of Service Provider - 2015	8,275.00	Bing Wang
	ARC Discovery Projects 2016	522,900.00	Benjamin Boyd, Adrian Hawley, Partner Investigator (PI), Australian Synchrotron (Synchrotron Light Source Australia Pty Ltd)
	ARC Discovery Projects 2016	373,000.00	Jakob Hohwy, Felix Blankenburg, Partner Investigator (PI), Freie Universitat Berlin (Free University of Berlin), Sid Kouider, Partner Investigator (PI), Ecole Normale Supérieure, Anil Seth, Partner Investigator (PI), University of Sussex
	ARC Linkage Projects 2015 - Australian Postgraduate Salary	272,664.00	Antonio Verdejo-Garcia, Mark Bellgrove, Dan Lubman
	Australian Synchrotron - International Access Program - grant	5,400.00	James Pearson
	Australian Synchrotron - International Synchrotron Access Program	2,800.00	James Pearson
	Brain & Behavior Research Foundation - NARSAD Young Investigator Grant	95,320.00	Nigel Rogasch
	Cerebral Palsy Alliance Research Foundation - Career Development Grant	50,000.00	Mary Tolcos
	Cerebral Palsy Alliance Research Foundation - Career Development Grant	100,000.00	David Walker
	Cerebral Palsy Alliance Research Foundation - Project Grant	134,722.00	Suzanne Miller, Graham Jenkin, Rebecca Lim, Atul Malhotra, Graeme Polglase, Margie Zakhem
	Cerebral Palsy Alliance Research Foundation - Project Grant	123,395.00	Graeme Polglase
	Cytomatrix Pty Ltd - Contract	931,500.00	Graham Jenkin
	David Winston Turner Endowment Fund - Donation 2015	5,250,000.00	Murat Yucel
	Diabetes Australia Research Program (DARP) - 2016 General Grant	58,020.00	John Bertram, Jinhua Li, David Nikolic-Paterson, Victor Puelles Rodriguez
	Heart Foundation - Future Leadership Fellowship	175,000.00	Graeme Polglase
	Heart Foundation - Future Leadership Fellowship	520,000.00	Connie Wong
	Heart Foundation - Postdoctoral Fellowship	0.00	Courtney McDonald
	Hereditary Disease Foundation USA - Fellowship	153,293.00	Govinda Poudel
	The Ian Potter Foundation - Medical Research Grant	50,000.00	Antonio Verdejo-Garcia
	Juvenile Diabetes Research Foundation (JDRF) - Program Award	1,877,608.12	Christoph Hagemeyer
	NHMRC Biomedical - Career Development Fellowship (CDF) 2016 Level 1	0.00	Connie Wong
	NHMRC Biomedical - Career Development Fellowship (CDF) 2016 Level 2	463,652.00	Graeme Polglase
	NHMRC Equipment Grant 2015	34,485.00	James Bourne, John Bertram, Ian Harper, Christophe Marcelle, James Pearson
	NHMRC Peter Doherty Biomedical Fellowship (Australia) - Early Career Fellowship (ECF) 2016	314,644.00	Ian Harding
	NHMRC Peter Doherty Biomedical Fellowship (Australia) - Early Career Fellowship (ECF) 2016	294,644.00	Courtney McDonald
	NHMRC Program Grant 2016	6,115,355.00	Stuart Hooper, Euan Wallace, Peter Davis, Partner Investigator (PI), The Royal Women's Hospital

# Grants to MBI users

2015

Project Title	Funding Body
Cardiovascular effects of enhanced leptin signalling	National Health & Medical Research Council (NHMRC)
Selective modulation of corticostriatal functional circuitry using TMS-fMRI	National Health & Medical Research Council (NHMRC)
Better targets and drugs for improving stroke outcome?	National Health & Medical Research Council (NHMRC)
Novel targeted PEG nanoparticles for cancer treatment and monitoring	National Health & Medical Research Council (NHMRC)
Optimising non-invasive ventilation at birth for preterm infants	National Health & Medical Research Council (NHMRC)
Correlation of structure and function in the brain in Multiple Sclerosis: is fingolimod neuroprotective?	Royal Melbourne Hospital Neuroscience Foundation
Vaccinex Signal HD Study	Stout Neuropsych Pty Ltd
Teva Legato - Placebo Controlled Study - Huntington Disease TV5600-CNS-20007	Teva Pharmaceuticals USA
To attend the IEEE International Symposium on Biomedical Imaging: From macro to Nano (ISBM), Prague, Czech Republic in April 2016	The CASS Foundation Limited

2016

Modelling hereditary kidney disease using induced pluripotent stem cells: determining genetic mechanisms and developing novel targeted therapies	Alport AIRG-France
Attention training for children with an autism spectrum disorder	Department of Industry, Innovation and Science (Comm)
The effects of ELO water in vitro and in vivo	Elo Water
Enabling cell based, breakthrough capabilities to find cures for diseases affecting mothers and children	Ian Potter Foundation
To attend the 16th World Congress on Pain, Yokohama, Japan, 26 September to 30 September 2016 and to attend refresher courses on 25th September	Ian Potter Foundation
Quantitative simultaneous MR-PET imaging of dementia	National Chung Hsing University
Remote assessment of cognition in Huntington's disease: Assessing day-to-day variability and relationship to sleep and physical	National Health & Medical Research Council (NHMRC)
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	National Health & Medical Research Council (NHMRC)
Identification of the cardiovascular effects of treatment of lean and obese mice with two test compounds alone and in combination	Novo Nordisk A/S
Visiting International Professor of RUHR University Research School PLUS	Ruhr-Universitat Bochum (Ruhr University Bochum)
Better quality of life for cancer patients through early e-health program	Victorian Cancer Agency

*Grants awarded to Chief Investigators of projects active at MBI during 2012-2016, whose funding applications were facilitated by access to MBI facilities. Raw data provided by Monash Research Office.*

	Funding Scheme	Amount awarded	Investigators
	NHMRC Project Grant 2016	1,200,972.00	Michael Cowley, Tony Tiganis
	NHMRC Project Grant 2016	757,545.70	Alex Fornito, Nigel Rogasch
	NHMRC Project Grant 2016	1,085,972.00	Connie Wong, Michael Hickey, Christopher Sobey
	NHMRC Project Grant 2016	606,979.00	Karen Alt, Brett Paterson, The University of Melbourne
	NHMRC Project Grant 2016	551,934.00	Stuart Hooper, Peter Davis, The Royal Women's Hospital, Marcus Kitchen, Arjan Te Pas, Leiden University
	Royal Melbourne Hospital Neuroscience Foundation - Contract	150,000.00	Joanne Fielding
	Vaccinex, Inc - Stout Neuropsych Pty Ltd - Contract	220,008.00	Julie Stout
	Teva Branded Pharmaceutical Products R & D, Inc, USA via Stout Neuropsych Pty Ltd - Contract	241,349.00	Julie Stout
	The CASS Foundation - Travel Grant	3,500.00	Govinda Poudel
		22,799,936.82	
	Grant	145,671.00	Sharon Denise Ricardo (Sharon Ricardo), Laura Perin, Partner Investigator (PI), University of Southern California, Marco Prunotto, Partner Investigator (PI), University of Geneva, John Frederick Bertram (John Bertram), Partner Investigator (PI), Andrew Laslett, Partner Investigator (PI), CSIRO Future Manufacturing Flagship
	Department of Industry, Innovation and Science (DISS) - Innovation Connections Grant - Entrepreneur's Programme	118,076.00	Kim Marie Cornish (Kim Cornish), Kirk Hannah, Avexa Limited
	Elo Water - Grant	49,349.00	Christoph Hagemeyer
	Ian Potter Foundation - Medical Research Grant	420,000.00	Graham Jenkin
	The Ian Potter Foundation - Travel Grants	1,800.00	Melita Giummarra
	Reignwood Cultural Foundation - Grant	814,545.44	Zhaolin Chen, Gary Egan
	Demential Collaborative Research Centres (CRC) Project Grants	49,074.00	Julie Stout
	NHMRC Principal Research Fellowship (PRF) 2017	763,845.00	Murat Yucel
	Novo Nordisk A/S, Denmark - Contract	420,561.00	Michael Cowley, Stephanie Simonds
	RUHR University Research School Plus - Visiting International Professor Fellowship	18,309.00	Jakob Hohwy
	Victorian Cancer Agency - Health Services Research	299,981.00	Terence Haines, Helen Truby, Catherine Elizabeth Huggins (Catherine Huggins), Paul Cashin, Liang Low, Monash Health, Helena Frawley, Cabrini Health, Maryanne Silvers, Associate Investigator (AI), Monash Health, June Savva, Associate Investigator (AI), Monash Health, Judy Bauer, The University of Queensland
		3,101,211.44	<b>YTD</b>
		80,593,497.66	<b>TOTAL</b>



# MONASH University

## Biomedical Imaging

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