It has been my pleasure to Chair the Advisory Board of the ARC Centre of Excellence in Cognition and its Disorders over the past eight years. On behalf of the Board members, may I congratulate the Centre members for their outstanding achievements over the life of the Centre. The final year of operation continued to build on the established strengths of the Centre, with public engagement activities, such as the Work Experience Program, the Public Lecture Series, the Discoveries and Impact Showcase, and the international exchange schemes to build research capacity in Australia.

Educational outreach continued as a major focus for the Centre, continuing the Work Experience Program with two sessions supporting over 20 high school students, who participated in a week of hands-on cognitive science lessons, and a small research project presenting their findings at the end of the week. The Centre is to be commended on its commitment to supporting the next generation of cognitive science researchers. The series of five Public Lectures this year shared topics relating to the Centre with over 800 attendees, on topics such as, memory and emotion, reading remediation strategies, grammar and meaning, empathy and morality, and increased end-user representation in autism spectrum disorder research.

The Student and Postdoc Exchange Schemes provided eight Centre members with the opportunity to visit leading research centres and/or laboratories, to benefit their research training, and to increase the expertise and capacity of future Australian research. The institutions that members visited included Centre members at the Department of Psychology, Royal Holloway, University of London, UK and the School of Psychological Science, The University of Western Australia, along with external collaborators at the School of Psychology and Neuroscience, University of St. Andrews, UK; the School of Psychology, Yale University, USA; Department of Psychology, Wellesley College, USA; School of Human Movement and Nutrition Sciences, The University of Queensland; and the Division of Neuroscience and Experimental Psychology, The University of Manchester, UK.

As the Centre operations wrap-up, it is timely to reflect on the role of the CCD Advisory Board and to make a few comments on their behalf. As a Board, we had a strong engagement and participation not only from representatives of our partner universities but also a number of key organisations such as Dementia Australia; Speech Pathology Australia; Autism Spectrum Australia; the Renwick Centre, Royal Institute for Deaf and Blind Children and Learning Difficulties Australia. We also benefitted from strong industry representation through Cochlear Limited. While I won’t list all the names of our Board members here, I would like to specifically thank Rob Ramjan AM, CEO at One Door Mental Health for his contributions, particularly stepping in as acting Chair.

As an Advisory Board we monitored the Centre’s progress, and advised on matters such as end-user engagement, risks and potential mitigation strategies and outreach activities. Our job was made very easy as the Centre Director, Stephen Crain, and the Chief Operations Officer, Lisa Yen, were highly engaged and proactive. One of the rewarding aspects of serving on the Board was getting to hear about the research programs, their discoveries and impacts. What was really compelling about the five programs was their high level of multidisciplinary collaboration and integration across the research programs and nodes.

There were some challenges for this Centre due to the somewhat artificial boundaries of medical and dental research in Australia. We completely understand the context and rationale for the protection of funding for certain areas, however, genuine multidisciplinary research with the potential for impact on health should continue to be strongly supported across funding bodies.

On behalf of the Board, I would like to say thank you for the opportunity to serve on the Advisory Board. Stephen Crain together with Lisa Yen, are to be complimented for leading the ARC Centre of Excellence in Cognition and its Disorders, and providing opportunities for research findings and capacity building in cognitive science in Australia.

Professor Laurent Rivory
I am pleased to present the final Annual Report for the ARC Centre of Excellence in Cognition and its Disorders (CCD). As difficult as it is to come to the end of operations of the CCD, we can all take heart in how much has been accomplished during the life of the Centre. These achievements were recently summarised at the Discoveries and Impact Showcase and at our 2018 Annual Workshop. As I said at both events, the research programs that have been built at the CCD will endure through ongoing and future research activities by Centre members, as well as through the careers of students and postdocs who were trained at the CCD. The five CCD research programs, Belief Formation, Language, Memory, Person Perception and Reading, were initially chosen because they are well understood from a theoretical point of view and because Australia has outstanding researchers in these areas. Research conducted by Centre members in the five research programs has informed the assessment and interventions for a range of cognitive disorders, including dyslexia, specific language impairment, autism, dementia and schizophrenia.

I begin this year’s report by extending congratulations to the winners of the CCD Student Exchange Scheme - Laura McLaughlin Engfors, Chris Hewitson, Rosalind Hutchings and Siddharth Ramanan who visited Wellesley College, USA; The University of Queensland, The University of Western Australia, and The University of Manchester, UK. Congratulations are also extended to our early career researchers winners of the CCD Postdoc Exchange Scheme - Dr Ryan Balzan, Dr Yong Zhi Foo, Dr Robert Ross and Dr Clare Sutherland who visited Royal Holloway, University of London, UK; University of St Andrews, UK; Yale University, USA; and Wellesley College, USA.

As this is the final Annual Report, I want to take the opportunity to say what an honour it has been for me to serve as Director of an ARC Centre of Excellence. ARC Centres of Excellence are prestigious research hubs which bring together experts from across the nation and overseas to work in collaboration to extend Australia’s international standing in areas of national priority. The CCD brought together an extensive network of Australian and international research institutions. The central node of the CCD was Macquarie University, with additional nodes at The University of Sydney and at The University of Western Australia. There were Centre members from two other Australian institutions, University of New England and The University of New South Wales. In addition, ten international partner institutions were associated with the CCD in 2018. These were the INECO Foundation, Argentina; LWL University Hospital, Ruhr University Bochum, Germany; Royal Holloway, University of London, UK; Tel Aviv University, Israel; The University of Kansas, USA; The University of Hong Kong, Hong Kong, The University of York, UK; University College London, UK; University of East Anglia, UK; and University of Oxford, UK. In 2018, there were 130 visitors to the CCD with 69 international visitors from 20 countries.

By every measure, the ARC Centre of Excellence in Cognition and its Disorders has been a thriving international research centre. There are two hallmarks of a world-class research centre in cognitive science. First, it is a place where, at any given time, there are so many research activities, talks, lab meetings, reading groups, visitors and events, that no one can possibly go to everything. Second, it should provide ample resources for both basic research as well as for translational research. From its inception, the CCD offered unique opportunities for interdisciplinary and international collaborative research in the study of cognition and its disorders as well as for studies directed towards assessment and treatment.

In 2018, the CCD had 21 Chief Investigators, 11 Partner Investigators and 214 Associate Investigators. The CCD provided training and research support for 156 students, including 15 Honours students, 21 Masters students, and 120 PhD students. In addition, the CCD celebrated 39 graduations and supported 11 postdoctoral fellows across the five programs of research. The Centre provided a series of internal funding opportunities designed to provide collaborative opportunities and increase the research capacity of Australia in cognition and its disorders. We prioritised funding to ensure we were able to train and support our students and postdocs as well as to provide support for research by other Centre members. To this end, the CCD developed the Student and Postdoc Exchange Schemes, the Cross Program Support Scheme and Neural Markers Training Scheme. We continued to fund these schemes even in our final year.

One of the most successful initiatives of the Centre was the Cross Program Support Scheme which was introduced in 2012. This scheme supported 38 projects over the life of the centre, involving 190 Centre members, including Chief Investigators, Partner Investigators, Associate Investigators, and students. The results of the research projects funded by this scheme were published in 20 journal articles, with another 19 articles under review or in preparation. Research findings of projects supported by the scheme were presented at 57 conferences and were instrumental in 12 successful grant applications. The Centre also supported the Neural Markers Training Scheme as a vehicle for enhancing the expertise of Centre members in various experimental research methods, such as magnetoencephalography (MEG), MRI, EEG, and eye-tracking. The Neural Markers Training Scheme supported 16 projects, extending the skill sets of 53 Centre members.
Also attesting to the quality of the CCD is the number of Centre members who have been named as Fellows of learned societies in Australia. Two Centre members are Fellows of the Australian Academy of Science (Coltheart, Simmons), eight are Fellows of the Academy of the Social Sciences in Australia (Barner, Castles, Coltheart, Crain, Demuth, Lipp, Nickels, Rhodes) and one is a Fellow of the Australian Academy of the Humanities (Sutton). Centre members have also been named to several learned societies outside Australia, including one Fellow of the Global Young Academy (Rich), one Fellow of the British Academy (Coltheart), three Fellows of the Association for Psychological Science (Lipp, Rhodes, Thompson), one Fellow of the British Psychological Society (Rastle), and one Fellow of the Royal Society of Arts (Rastle).

As a Centre Director, I could not have wished for more congenial guidance and support than I received from the three leadership groups that were responsible for the governance of the CCD; the Advisory Board, the Scientific Committee and the Research Management Committee, including the Program Leaders. Every decision by each of these groups was reached by consensus, after thoughtful and open discussion. Each member of these leadership groups played an important role in helping to create the kind of culture that fosters research excellence. I also extend thanks to the professional staff at each of the nodes of the CCD. The CCD’s outstanding professional staff provided invaluable support to researchers, postdocs and students, as well as offering so many Centre initiatives, such as the Annual Workshop, Centre grant schemes, and travel support. The important contribution by the leadership teams and professional staff are clearly reflected in comments by Centre members. Here are some representative examples of these comments:

"It has been a privilege to be affiliated with the CCD", Partner Investigator

"It’s been such an exciting and productive centre and I am humbled to have been part of it - so many of my HDR students and post-docs have benefitted enormously because of the intellectual environment. It’s wonderful to see them thrive", Chief Investigator

"The intellectual and financial support that I have received from the CCD as a student and early career researcher has allowed me to develop a research program of national and international relevance, and to become an independent researcher", Associate Investigator

"The CCD has been instrumental in launching my career, and I am very grateful to be part of this wonderful, collaborative scientific community!", Associate Investigator

To conclude, I would like to extend my sincere thanks to the students, postdocs, research assistants and Centre members who have contributed to the CCD. As a result of your efforts, the CCD leaves behind a strong and lasting legacy for cognitive science in Australia and around the world. It has been a privilege to serve as Centre Director. It is fitting to follow my report with a graphical summary of some of the impressive achievements across the life of the Centre.

Professor Stephen Crain
CENTRE ACHIEVEMENTS

35 Chief | Partner Investigators

>16 Postdocs per year

19 Participating Organisations

120 Workshops + Events

>280 Graduations

>120 Work Experience Students

~1600 Publications

80 Conversation Articles

130 Centre Projects | Grants

>1000 Visitors

~45,000 Website Hits per year

>1800 Media Hits
GOVERNANCE | MANAGEMENT

The Director, Professor Stephen Crain, was responsible for scientific leadership and strategic direction. The Chief Operations Officer, Dr Lisa Yen, was responsible for the operational management of the CCD. The Research Management Committee included the Director, the Chief Operations Officer, and the Program Leaders. This Committee was responsible for the Centre’s goals, policies and performance indicators. The progress, future directions and outreach activities of the CCD were reviewed by an international Scientific Committee composed of eminent scholars in cognitive science, and by an Advisory Board with representatives from academia and key community/advocacy organisations.

ADVISORY BOARD

Professor Laurent Rivory
Chair
Pro Vice-Chancellor (Research)
The University of Sydney

Dr Trevor Clark
National Director, Aspect Research and Senior Education Consultant
Autism Spectrum Australia

Professor Peter Davies
Senior Honorary Research Fellow
The University of Western Australia

Dr Lorraine Hammond
President
Learning Difficulties Australia

Professor Simon Handley
Executive Dean, Faculty of Human Sciences
Macquarie University

Susan McCarthy
General Manager, Services
Alzheimer’s Australia NSW

Professor Philip Newall
Professoral Fellow|Conjoint Professor
Renwick Centre, Royal Institute for Deaf and Blind Children

Associate Professor Jim Patrick AO
Senior Vice President and Chief Scientist
Cochlear Limited

Mr Rob Ramjan AM
Chief Executive Officer
One Door Mental Health

Professor Leanne Togher
Communication and Speech Disorders
The University of Sydney

Professor Yukio Otsu
Institute of Cultural and Linguistic Studies
Keio University, Japan

Professor Daniel Schacter
Department of Psychology
Harvard University, USA

Professor Ovid Tzeng
Institute of Linguistics
Academia Sinica, Taiwan

RESEARCH MANAGEMENT COMMITTEE

Professor Stephen Crain
Director
Program Leader | Language
Department of Linguistics
Macquarie University

Professor Anne Castles
Deputy Director
Program Leader | Reading
Department of Cognitive Science
Macquarie University

Associate Professor Robyn Langdon
Program Leader | Belief Formation
Department of Cognitive Science
Macquarie University

Associate Professor Romina Palermo
Co-Program Leader | Person Perception
School of Psychological Science
The University of Western Australia

Professor Olivier Piguet
Program Leader | Memory
Brain and Mind Centre
The University of Sydney

Professor Gillian Rhodes
Program Leader | Person Perception
School of Psychological Science
The University of Western Australia

Dr Lisa Yen
Chief Operations Officer
Department of Cognitive Science
Macquarie University

SCIENTIFIC COMMITTEE

Emeritus Professor Noam Chomsky
Department of Linguistics
The University of Arizona, USA

Emeritus Professor Michael Kopelman
Institute of Psychiatry, Psychology and Neuroscience
King’s College London, UK

Professor Jason Mattingley
Queensland Brain Institute and the School of Psychology
The University of Queensland
BELIEF FORMATION

The Belief Formation Program investigates the processes that underpin how we perceive reality, generate beliefs, monitor and evaluate evidence, and adopt and revise beliefs when needed. Disruptions to these processes can cause psychotic symptoms (e.g., delusions and hallucinations) that characterise psychiatric illnesses such as schizophrenia, and present in other clinical conditions (e.g., dementia). Our aim has been to develop cognitive and neural models of these symptoms across diagnostic categories, advance understanding of related non-clinical phenomena, develop and evaluate psychological treatments, and examine social influences and consequences. We thank our researchers, collaborators, and students and provide an overview of some of our major research themes across the years of the Centre.

Biological and environmental risk factors for developing psychotic mental illness

Childhood trauma is a well-established risk factor for developing psychosis, with known effects on the developing brain. Associate Professor Melissa Green and colleagues have been investigating the associations between childhood trauma exposure and social cognitive processes, as well as facets of ‘schizotypy’ in people with schizophrenia and bipolar disorder. Schizotypy refers to a set of cognitive and behavioural characteristics that represent risk for schizophrenia in the general population. We recently showed that adults reporting a history of childhood trauma had higher levels of schizotypy, especially suspiciousness, relative to those who were not exposed to trauma, regardless of whether they had a psychiatric diagnosis (Quidé, Cohen-Woods, O’Reilly, Carr, Elzinga, & Green, 2018). Trauma-exposed individuals also showed more significant problems with social cognition, lending some support to the idea that early life trauma-exposure may impact the development of brain functions, potentially increasing vulnerability for psychosis via social cognitive disturbances that give rise to paranoia and suspiciousness. However, the mechanisms by which these processes impact brain function remain to be understood. One proposal is that early life trauma-exposure sets off a cascade of biological processes related to immune function, with long-term impacts on brain development. We have recently found that trauma-exposed cases with schizophrenia show higher levels of pro-inflammatory cytokines, relative to non-exposed cases. These results are being followed up to determine the epigenetic markers of trauma-exposure, and their relation to heightened inflammatory responses and aberrant brain function in people with schizophrenia and bipolar disorder.

New directions in cognitive science: The science of the self

In order to interact with the world around us, our brains monitor the way we control our actions (sense of agency) and track our bodies in space (body representation). In healthy people, this usually occurs unremarkably. However, these normal aspects of self-monitoring can be disturbed in disorders such as schizophrenia (i.e., when individuals have problems tracking the causes of their actions) and eating disorders (i.e., when individuals have problems tracking the body’s spatial dimensions). To capture and compare these various aspects of self-representation, Dr Vince Polito, Dr Regine Zopf and colleagues have built upon earlier work developing the Sense of Agency Rating Scale (Polito, Barnier, & Woody, 2013) and more recent investigations of the link between body and agency (Zopf, Polito & Moore, 2018) to develop a new multidimensional model and measure of self-representation. The research investigated how these tools can be used to characterise multiple aspects of self-representation in contexts and disorders with altered action monitoring (e.g., hypnosis and schizophrenia) and body representation (e.g., virtual reality and chronic pain). Another research stream developed new paradigms based on immersive virtual reality that allow us to manipulate and measure how the body’s spatial dimensions are tracked, and how this tracking might be disrupted leading to distortions of perceived body size and shape. These lines of research contribute to our theoretical understanding of self-representation, and have the potential to highlight new possibilities for identification and remediation of disturbances in clinical disorders. CCD investigators established the Science of the Self Network, an interdisciplinary association of researchers in this area, to coordinate regular scientific meetings and workshops.
The innovative use of hypnosis to study delusions

Since the CCD began, our symptom-focussed research aiming to develop cognitive and neural models of delusions has been guided by the ‘two-factor’ approach developed by Associate Professor Robyn Langdon, Emeritus Professor Max Coltheart and colleagues. According to this approach, two distinct questions need to be answered in order to explain any delusion. First, why does a delusional person generate an implausible belief content in the first place? Second, why does a delusional person fail to revise their belief in response to counter-evidence and rational counter-argument? Testing this theory by studying clinical delusions in the laboratory is difficult. To meet this challenge, we pioneered the use of hypnosis to create temporary, hypnotic analogues of different delusions (Barnier, Cox, Connors, Langdon & Coltheart, 2011). Recently, we published a study that represents the culmination of this line of research drawing upon a decade of theoretical and clinical work on the neuropsychology of delusions and combined different methods, and research expertise in a strong cross-disciplinary team (Coltheart, et al., 2018). Our team used non-invasive brain stimulation methods to identify a region of the right frontal cortex that is critical for belief evaluation and which is temporarily disrupted during the hypnotic state and more permanently damaged in clinical delusional cases.

Studying clinical delusions and non-clinical ‘troublesome’ beliefs

Our early clinical studies applying the two-factor approach mentioned above had focussed primarily on single cases of mono thematic delusions with seemingly fantastic belief content (e.g., Capgras delusion, the delusional belief that a loved one has been replaced by a visually similar impostor). We aimed to show that people who profess such beliefs are not so different from the rest of us by discovering the first-factor disruptions to basic cognitive processes (e.g., for identifying familiar faces) that distort these individuals’ experiences and explain the generation of their delusions. Later, we began to study shared delusions, or cases of ‘folie à deux’ (Langdon, 2013). The so-called ‘secondary’ (person) in these cases experiences no disruptions to basic cognitive processes that would explain the generation of the shared delusion; instead, they simply come to accept what the ‘primary’ (usually a person of influence) tells them. Since this is precisely how we acquire most of our beliefs about the world, we began to examine other socially transmitted non-clinical, yet sometimes ‘troublesome’, beliefs (e.g., conspiracy theories). Professor Ryan McKay and colleagues continue to study other prominent beliefs seen in society today: Does God exist? Are genetically modified foods safe? Did Trump collude with the Russians? (e.g., Tappin, van der Leer & McKay, 2017). Different biases shape the beliefs we entertain about these questions and how we gather and evaluate evidence. We continue to uncover the psychological, social and evolutionary causes of these biases and examine their consequences.

Translating knowledge into treatments

Since the CCD began, our team of investigators have responded to queries from clinicians about the use of cognitive behaviour therapy (CBT) to target specific delusional themes. We have also collaborated with clinicians to develop and evaluate new programs to treat the causes of delusional thinking, help people who experience hallucinations, and remediate the social-cognitive deficits that promote persecutory delusions and cause poor social functioning in schizophrenia. In one research stream, Professor Steffen Moritz, Dr Ryan Balzan and colleagues have been adapting and improving Metacognitive Training (MCT), a group-based program developed originally to reduce delusional severity in people with schizophrenia by planting ‘seeds of doubt’ and encouraging critical reflection (e.g., Balzan, Moritz & Schneider, In Press). In collaboration with Professor Martin Brüne and other colleagues, Moritz and Balzan have been evaluating an individually administered version of MCT for psychotic patients. MCT has also been adapted to treat other, non-psychotic disorders (e.g., obsessive-compulsive and borderline personality disorders) and is currently being adapted to treat the unrealistic, sometimes delusional beliefs about body image, weight and shape that are seen in Anorexia Nervosa.

Selected key publications


Discoveries about language development in typically developing children

Researchers in the Language Program investigated the nature of language development in children from 2- to 13-years-old, exploring the acquisition of language contrasts in sound patterns, in word formation, in sentence structure and in sentence interpretation, both in typically developing children and in children developing bilingually. The findings of our studies have provided a much more comprehensive understanding of preschoolers’ language abilities in each of these domains, and the factors that influence development over time. Professors Stephen Crain and Rosalind Thornton, and Dr Loes Koring were invited to provide a critical assessment of the biolinguistics approach to celebrate the 50th anniversary of Eric Lenneberg’s foundational work (Crain, Koring, & Thornton, 2017). Fifty years ago, Lenneberg’s The Biology of Language advanced a new approach to language acquisition, now called the ‘biolinguistics’ approach. Although Lenneberg’s proposal was mostly based on impressionistic observations, there is now much experimental research on the acquisition of language. Professor Noam Chomsky comments, “Crain, Koring and Thornton develop a comprehensive and careful comparison of the two major approaches to language acquisition, the biolinguistic and usage-based approaches, and identify critical issues on which they differ in their predictions. They then demonstrate that experimental studies of language acquisition uniformly rule in favor of the biolinguistics approach [...]. A very valuable contribution to the study of the nature of human language and how it is uniformly acquired.”

Another long-standing issue in child language is why children are delayed in their use of the syllabic plural allomorph –es, as in bus+es (Brown, 1973). It was unclear until now whether the delay was due to the lack of a grammatical representation (e.g., taking the ‘s’ at the end of bus as a marker of the plural (Berko, 1958)), or due to articulatory problems in producing fricative-schwa-fricative sequences, or because this form of the plural requires an unstressed additional syllable at the end of the word. An elicited imitation study indicated that both allomorphy and utterance position influence the use of plural morphology: 2.5-year-olds had more problems in general producing syllabic plurals as compared to segmental plurals (e.g., cot+s), and that these problems were especially acute for words in utterance medial position (Mealings, Cox, & Demuth, 2013).

Discoveries about language development in children with specific language impairment

Our research on typically developing children was used as a benchmark for studies of children with language impairments. Professor Rosalind Thornton extended the biolinguistic approach to language impairment in children (e.g., Thornton, Rombough, Martin, & Orton, 2016). This work was conducted in collaboration with two speech pathologists as co-authors (Martin & Orton) and published in a special issue of First Language, dedicated to Professor Heather van der Lely. The experimental findings support the view that children with specific language impairment (SLI) have the same innate capacity to acquire language as typically developing children, but their language growth is considerably slower (i.e., delayed but not fundamentally different). Understanding the delays in using plurals in typically developing children led to a study demonstrating a delay in the comprehension and production of syllabic plurals by 5-year-old children with SLI (Tomas, Demuth, & Petocz, 2017).
Discoveries about the brain mechanisms involved in language processing

Language and memory have traditionally been studied as separate constructs that are supported by distinct networks of brain structures. However, recent work by researchers in the Language Program and others, suggests that current models of the language network may have to be expanded to include the hippocampus - an integral component of the memory system. Unfortunately, the hippocampus has long been considered inaccessible to non-invasive electrophysiological measurements because of its deep location. Associate Professor Blake Johnson and colleagues ran a set of experimental studies demonstrating that the human hippocampus can be measured non-invasively using magnetoencephalography (Pu, Cornell, Cheyne, & Johnson, 2017). In these studies, human participants played a video game in which they navigated through a virtual maze, analogous to a spatial memory task that activated the hippocampi of rodents. The first finding was that activation of the hippocampus in humans was strongly correlated with how well participants performed on the maze task. Two subsequent studies applied ‘deep source imaging’ to language processing. Results showed hippocampal activation when participants read semantically incongruent sentences whereas no hippocampal response was seen with syntactically incongruent sentences. Taken together, the findings open a new window for non-invasive studies of the human hippocampus and lay the foundation for future studies which incorporate the hippocampus as a crucial component of the language apparatus.

Providing effective diagnosis and treatment for adults with aphasia

Our research in aphasia has taken a cognitive neuropsychological approach. Professor Lyndsey Nickels and colleagues used the convergence of evidence from people with acquired language disorders, such as post-stroke aphasia and primary progressive aphasia, and from people without language impairment. One of the main goals of our research was to address significant issues pertaining to the effective treatment of individuals with aphasia. Our focus has been on research that identifies the most functional stimuli to choose for treatment, in order to ensure the optimal translation of research findings to enhance the communication skills of this patient population. Our studies resulted in publications that give speech pathologists clear guidance on how best to identify functionally relevant items for aphasia therapy. Currently, two major experimental designs are used in single case studies to assess treatment interventions in individuals with aphasia. Advocates of these designs contend that they achieve adequate ‘experimental control’ (i.e., they can be used to determine whether an improvement seen in a participant following treatment can be uniquely attributed to that intervention and not to any other factors, such as a placebo effect). We identified several critical limitations of one of the single case-study designs and pointed out problems that plague commonly used statistical techniques in both designs (Howard, Best, & Nickels, 2015). The published research offers a new statistical technique that overcomes many of these problems and provides easily implemented examples to ensure that the new statistical technique can be successfully applied in future studies.

Discoveries about the brain structures recruited in music and language

Our recent studies suggest that music and language, distinct in so many obvious ways, may be tethered together by shared cognitive resources. Professor Bill Thompson and colleagues investigated the relationship between language and music sensitivity to emotional speech (e.g., tone of voice) in individuals with congenital amusia, a disorder characterised by difficulties in perceiving and remembering music. Participants with amusia had difficulty understanding emotional speech, with decoding rates for some emotions up to 20% below than that of matched controls. These participants also reported difficulty understanding emotional prosody in their daily lives. The findings support the idea that the human brain recruits the same mechanisms in generating emotional responses to music and to the sounds of language. This supports theories that contend that music and language have a common evolutionary origin (Thompson, Marin, & Stewart, 2012). The published research led to follow up studies on peoples’ emotional responses to sound. One study found that human emotions closely track changes in the acoustic environment. This also provides evidence for the view that a single acoustic ‘code’ underlies our perception of emotional signals in music, speech and environmental sounds (Ma & Thompson, 2015).

Selected key publications


MEMORY

The richness and variety of the work arising from the Memory Program demonstrates how dynamic research on this topic remains, with continuing discoveries more than 60 years after the seminal report of the importance of the hippocampus in human memory. Research in the Memory Program is articulated around three main aims: to develop models of human memory; to understand the brain bases of memory processing; and to translate research findings into real life applications. The first aim primarily involves investigations of memory in healthy and clinical populations across the lifespan, and also focuses on understanding the interactions between memory and other cognitive processes, including emotion, language, or executive function. The second comprises investigations that use novel neuroimaging techniques, such as MRI, EEG and MEG to identify structural and functional brain organisations that are associated with relevant memory processes. Finally, the third focuses on the translational aspects of our research (i.e., how can we use the findings arising from our research to real life situations). Here, we want to develop methods of learning interventions, novel tests, and electronic applications that can improve the lives of individuals experiencing changes or difficulties with their memory.

Researchers in this program have tackled these aims through five main streams of research: paediatric, ageing, dementia, focal lesions and neuroimaging. The findings featured here showcase the breadth of research carried out by the Memory Program over the years, as well as highlighting the potential translational impact of findings that have clinical relevance, either for our understanding of brain disorders or because of their applicability in clinical settings and interventions.

Memory deficits in children

This program explored the facets of memory deficits that children experience during their developmental years. In this project, Dr Michael Gascoigne and colleagues focussed on children with idiopathic epilepsy (Gascoigne, Smith, Barton, Webster, Gill, & Lah, 2014). They demonstrated that children with temporal lobe epilepsy experience disturbance of memory that is not captured by standard memory tests. Indeed, the research showed that these children have difficulty consolidating new memories over long periods of time (hours, days, weeks). This memory perturbation has considerable implications for the development of cognitive functions and the acquisition of knowledge during childhood and impact on school, and academic performance. Subsequent research demonstrated that the severity of these deficits was also related to other cognitive processes such as working memory and attention capacity. These findings also have implications regarding teaching and learning strategies for children with epilepsy.

Memory and aging

Research by Dr Celia Harris and colleagues has demonstrated that the richness of the interactions within dyad members (couples), promote and boost memory performance or hamper it, depending on the strategies used (Harris, Barnier, Sutton, & Savage, In Press). Positive strategies include cueing, repetitions and providing a positive environment to the tasks. In contrast, disagreement between partners and correcting partners will result in less collaborative performance, although this may not impact on final performance. Again, this approach shows that communications among individuals take many forms which are not captured when only measuring the amount of information (i.e., how much) is generated. These different reminiscing styles are likely to have implications for the psychological wellbeing of partners, and will also be relevant if one of the partners experiences pathological changes in memory (e.g., in the context of mild cognitive impairment or the onset of dementia).
Memory function in frontotemporal dementia and Alzheimer’s disease

Accuracy in the diagnosis of dementia during life remains suboptimal. While decline in cognition can be reasonably easily identified these days, understanding how this decline relates to the underlying pathology, and therefore the type of dementia, remains fraught with difficulty. This is due, in part, to the number of different pathologies that can cause dementia. It is also related to the fact that many clinical features, such as memory deficits, are present in many syndromic presentations. Historically, memory deficit has been associated with Alzheimer’s disease. However, Professor Olivier Piguet and colleagues have demonstrated that disturbance of memory is also found in frontotemporal dementia, a dementia type which is as common as Alzheimer’s disease in people aged < 65 years. In addition, this disturbance is, in some instances, as severe as that seen in Alzheimer’s disease. Importantly, the biological causes for these memory deficits are different in these two dementia syndromes. This study identified the brain regions that are commonly affected in these two types of dementia, as well as those that are affected specifically in one dementia and not the other (Irish, Piguet, Hodges, & Hornberger, 2014). These findings will provide a roadmap for the development of future memory tests that can target these brain regions specifically. Inaccurate or delayed diagnosis has important implications for the management of individuals with dementia and the type of interventions (pharmacological and non-pharmacological) that are suitable or relevant.

In addition to providing an early and accurate diagnosis, one of the many challenges in dementia research is to determine the rate of disease progression. One important stream of research in the Memory Program has been to develop analysis methods of neuroimaging data to identify patterns of change in the grey and white matter of the brain with disease progression across different dementia syndromes (Landin-Romero, Kumfor, Leyton, Irish, Hodges, & Piguet, 2017). This study is one example of this approach. In the future, we anticipate being able to identify disease specific progression maps related to these different pathologies. We also plan to combine multiple imaging modalities, such as volumetrics, tractography, structural connectivity and functional connectivity, which will provide an integrated landscape of the changes affecting brain networks with dementia, including memory networks. These maps will also be used as neuroimaging biomarkers which can potentially be used to measure the efficacy of drug trials or clinical interventions.

Extended memory networks

This study demonstrates how clinical populations can inform our understanding of human cognitive processes (in this instance, memory) and identify the specific contributions of brain regions to these processes (Tu, Miller, Piguet, & Hornberger, 2014). Here, Dr Sicong Tu and colleagues tested patients with rare small lesions in the thalamus (medial-dorsal nucleus) due to a stroke. This revealed an important role for this brain region in the encoding of novel verbal and visual information. Specifically, it demonstrated that a portion of the thalamus is critical for the consolidation of novel memories. In other words, this part of the brain plays a critical role in making sure we remember information, not just after seeing it but over longer periods of time. This type of investigation with clinical populations provides information about how memory systems are organised in the human brain in a way that cannot be accessed using other methods, such as functional neuroimaging in healthy individuals which can identify the regions involved in a particular cognitive process, but not the specific roles of each region.

Selected key publications


PERSON PERCEPTION

The Person Perception Program investigates how we extract, process and use information about other people. These abilities are critical to guiding everyday social interactions. Subtle cues to identity, gender, ethnicity, age, attractiveness, emotional state and focus of attention are effortlessly read from the face, body and voice. The focus of our research is on understanding the perceptual, cognitive, neural and evolutionary mechanisms underlying this impressive expertise, how these mechanisms emerge through development, and how these mechanisms might develop and function differently in people with neurodevelopmental disorders.

Discovering crucial mechanisms for person perception

A fundamental aim of the program has been to discover which perceptual mechanisms enable children and adults to make judgements about faces. Taking face identity recognition as an example, at least two mechanisms are important: holistic and adaptive coding (Engfors, Jeffery, Gignac, & Palermo, 2017). Adaptive coding alters the operation of perceptual systems in response to changes in experience. Adaptation can produce striking perceptual aftereffects, but it can also be very useful. We have argued that it updates face norms, which represent average properties of our diet of faces, allowing the visual system to efficiently code the distinctive information that we need to recognise faces. Two lines of evidence reviewed recently highlight the functional role of adaptation in face recognition ability (Rhodes, 2017). First, face adaptation is reduced in a diverse range of clinical populations with impaired face recognition. Second, people who adapt more readily to new faces are better at recognising faces and their expressions. These discoveries raise further important questions, such as whether we can learn to adapt more to faces, and if so, whether this could improve recognition of faces in social and forensic settings.

Specifying the role of expertise in person perception

Typically, recognition of other-race faces is poorer than recognition of own-race faces. This ‘other-race effect’ can have devastating consequences. For instance, a high proportion of wrongfully imprisoned people who were later exonerated by DNA evidence were convicted on the basis of misidentification by other-race eyewitnesses. In contrast to these real-world cases of complete failure to recognise other-race people, the other-race effect found in the lab is generally relatively small. To investigate this apparent paradox, we took an individual differences approach and found considerable variability in the size of individuals’ other-race effects (Wan, Crookes, Dawel, Pidcock, Hall, & McKone, 2017). Importantly, we identified a new group (approximately 8% of the population) who were so poor at other-race face recognition, that they met the criteria for clinical-level impairment, (i.e., they were ‘face-blind’ for other-race faces). The risk factors for other-race face blindness included having low contact with people from the other-race and being at the lower end of the normal range for own-race face recognition. However other-race face-blindness was not associated with applying less effort for other-race than own-race faces. This discovery answers a central theoretical question as to whether poorer performance with other-race faces is primarily due to expertise or to motivational biases (e.g., prejudice), and highlights a critical role for experience. The fact that nearly 1 in 10 people are very poor at recognising other-race faces also has major implications for everyday life, not only for the important case of eyewitness testimony, but also for everyday social interactions, where some people will struggle to recognise acquaintances and colleagues from an unfamiliar race.
Developing cognitive models of facial first impressions

Court-room decisions can be affected by facial first impressions, whether or not they are accurate reflections of the person. We also rely on facial first impressions, of a person’s trustworthiness, attractiveness and capability, to judge strangers’ traits when browsing photos online.

Yet, these first impressions can vary as much based on changeable characteristics of the photo shown, as on the face itself. We compared two important changeable cues to facial impressions: emotional expression and photographic viewpoint (Sutherland, Young, & Rhodes, 2017). Critically, the emotional expression displayed affected impressions as much as the identity of the person did. The effect of viewpoint was minor, although it interacted with emotional expression to modify impressions. For example, people thought that angry faces looked less trustworthy when they were seen facing forwards, than when seen in profile.

We theorised that the viewpoint of the face conveys the social importance of the emotion, so that forward-facing photos suggest that the emotion is being directed at the viewer. Forming stronger impressions of people facing you might be adaptive: for example, someone who is angry with you may pose an immediate threat. Our work has helped lead a new research direction in the field, with the goal of understanding how changeable and potentially misleading photographic characteristics can modify many different aspects of face perception.

Understanding disorders of person perception

Atypical person perception is a feature of many disorders. In some disorders, such as prosopagnosia, it is the primary characteristic, whereas in others, such as autism, it can exacerbate difficulties during social interactions. We have had the opportunity to investigate how aspects of person perception break down across many disorders, including autism, congenital cataracts, congenital prosopagnosia, eating disorders, schizophrenia, social anxiety, mania, psychopathy, Parkinson’s, frontotemporal dementia, Williams and Downs syndromes, age-related macular degeneration, and epilepsy, often as part of Centre cross-program collaborations.

Here we provide two examples of this research. First, we hypothesised that critical adaptive processes were less flexible in autistic people, causing them to see the world in a truly different way (Pellicano, Rhodes, & Calder, 2013). We discovered that adaptive mechanisms for coding the important facial cue of gaze direction were atypical in autistic children, showing that the mechanisms coding gaze are indeed less flexible in autism. These results were central to our proposal that autism is associated with atypicals in flexible perceptual processing, and in particular, of prediction (Pellicano & Burr, 2012). This work has since been recognised by major scholars of autism and cognitive neuroscience more broadly as a serious and important challenge to conventional accounts in both the methodology employed (i.e., computational, experimental and psychophysical methods) and in its substantial results.

Second, a popular idea in the scientific literature is that psychopaths have problems recognising when other people are upset. The theoretical interest in this idea has generated many individual studies of emotion recognition in psychopathy, which our meta-analysis drew together in the most comprehensive review of this issue to date (Dawel, O’Kearney, Mckone, & Palermo, 2012). A key finding was that deficits in emotion recognition were not confined to fear and sadness, in fact, they were also evident for happiness. This finding caused a major shift in the literature. Our meta-analysis also provided the first cumulative evidence that emotion recognition deficits in psychopathy are cross-modal, that is, there are deficits in recognising others’ emotions from vocal and postural cues, as well as from facial expressions. This evidence is important because it implicates neural regions that are involved in emotion processing at a broad level, and fits with other evidence that atypical amygdala functioning may be core to psychopathy. These novel contributions to the evidence base have had high impact across the psychological, medical and legal literatures.

Selected key publications


The Reading Program draws on detailed theoretical and computational models of reading to investigate skilled reading, learning to read, and reading disorders. Fundamental to our approach is the proposition that reading is a complex learned skill, involving the coordinated operation of a number of different cognitive processes. All of these processes must be functioning normally in order for reading to be normal, and impairments in any one of these processes will result in a particular profile of reading disorder. We apply cognitive models to the understanding of reading disorders that are seen in children learning to read (developmental dyslexia) and also to those seen in formerly skilled readers after brain damage (acquired dyslexia), and, in both cases, we use them to inform the development of treatment options. In the following sections, we focus on just a few research highlights from each of our major research aims that showcase the types of research achievements by the Reading Program.

Models of skilled reading and learning to read

There is a substantial legacy of detailed theoretical and computational modelling of reading within the Reading Program. At the commencement of the CCD in 2011, we already had available to us the Dual Route Cascaded (DRC) computational model, developed by Emeritus Professor Max Coltheart over the preceding two decades (Coltheart, et al., 1993, 2001). This model is a full computational implementation of the processes involved in reading aloud, which most notably distinguishes between those reading processes required for reading new, unfamiliar words (the nonlexical route) and those required for reading known, familiar words (the lexical route). The model has been extremely successful in simulating a wide range of basic phenomena in reading, and in accounting for several different patterns of reading disorder.

However, one key feature of the DRC model was lacking at the commencement of the CCD: the model did not learn. This limited the usefulness of the model for addressing some basic questions about learning to read. Therefore, we set as a key aim of the Reading Program to build a version of DRC that had a learning component, and one that was consistent with current psychological theory. Of course, learning to read is extremely complex, involving honing multiple cognitive subskills, and developing a computational model of the acquisition of all of these processes at once would not be viable. Hence, we focussed on one key learning process: the self-teaching mechanism. This is the mechanism by which children who already have basic nonlexical decoding skills, and who are encountering novel printed words in texts, learn to read these new words without direct instruction from a teacher. The result of our work is ST-DRC: a computational model of the self-teaching hypothesis based on the DRC model of reading, published this year in the major journal *Cognitive Science* (Pritchard, Coltheart, Marinus, & Castles, 2018). This model represents a major legacy of the CCD, providing a rich theoretical and computational learning framework for the next generation of reading researchers.

Cognitive processes underlying learning to read

As noted, reading is a complex learned skill. Children are not born with the facility to read, but rather must apply a range of basic perceptual, cognitive, and linguistic processes to the task of acquiring this skill. The Reading Program has sought to uncover these basic underlying processes, and to understand how they are applied to the task of learning to read.

Of our many discoveries over the life of the CCD, we highlight here just two. First, we have made major inroads in understanding the relationship between oral vocabulary and learning to read. It is well established that children with larger oral vocabularies, who know the pronunciations and meanings of many words, tend also to be better readers, but the cognitive mechanism supporting this link has not been well understood. We have developed and found evidence for a new theory of this mechanism, which proposes that oral vocabulary supports reading acquisition from the earliest possible
point in time, before written words are seen. In a training study, and using eye movements to record looking times during silent reading, we found that when a child knows the pronunciation and meaning of a word, and they have some knowledge of how sounds in spoken words map onto written letters, they form an expectation about the spelling of that word. This spelling expectation then supports children’s reading of the word the first time it is seen in print. Our paper reporting on these spelling expectations, which we refer to as ‘orthographic skeletons’, has recently been published in a top journal, Developmental Science (Wegener et al., 2018).

Second, we have explored in detail the nature of the association between paired-associate learning (PAL) and reading acquisition. PAL is a dynamic measure of the ability to learn new links between two items (e.g., learning that the symbol $\bigcirc$ is called “vay”). In experimental learning studies, we have found that PAL ability is associated with success in learning new written words, and that it predicts this learning above and beyond nonlexical decoding ability, and existing written word knowledge (Wang, Wass & Castles, 2017). The results suggest that PAL may be one of the underlying mechanisms of written word learning, facilitating the connection between the phonology and the written representation of a word.

Another major legacy of the Reading Program has been to bring the latest knowledge on learning to read together into a single paper that is accessible to educators and the broader public (Castles, Rastle, & Nation, 2018). The paper, “Ending the Reading Wars: Reading acquisition from novice to expert”, was recently published in the high impact journal Psychological Science in the Public Interest, and has already had more than 52,000 downloads. This paper also generated significant media attention and has been the subject of a number of podcasts and a front-page feature in the UK Times Education Supplement.

Understanding and treating reading disorders

Central to the activities of the Reading Program has been to apply our models of reading and learning to read to understanding the basis of different kinds of reading and spelling disorders, and developing and testing targeted treatments. One example of the application of this theory-driven approach is the identification of a new form of developmental dyslexia in English: letter position dyslexia. Our models specify that successful word reading involves not only identifying each letter within the word but must also identify their correct position. Otherwise, a reader will have no way of differentiating between the words *pat*, *tap*, and *opt*, for example. While this process is clearly important, little research has explored how it operates, or whether there is variation in how well it is acquired. We developed a targeted test of letter position processing, which required children to read anagram words such as *slime*/*smile*, *nerve*/*never* and *pirates*/*parties*. Use of this test identified children who struggled specifically with this aspect of reading, even though they performed within normal range on all other measures, which we published in the prominent journal, Neuropsychologia (Kohnen, Nickels, Castles, Friedmann, & McArthur, 2012). Identification of this profile has stimulated new research directions examining the underlying causes of this difficulty and determining optimal treatment methods.

We have also been active in applying rigorous experimental methods to testing the veracity of proposed cures or treatments for dyslexia. One notable example of this is the Dyslexie font. This font has been proposed to make reading much easier and more fluent for individuals with dyslexia. By conducting a carefully-designed study with a range of controls, we have been able to demonstrate that, although all readers, including those with dyslexia, read the Dyslexie font slightly faster than other fonts, this benefit is attributable entirely to the increased spacing between the letters in the words. If letter spacing is increased similarly in other standard fonts, such as Arial, the same advantage occurs. This finding, published in the journal Dyslexia (Marinus et al., 2018) received widespread media attention, and provides one of many examples of translation of research into practice by the CCD Reading Program.

Selected key publications

Reasoning, memory and beliefs: Using hypnosis and TMS to facilitate or inhibit rational thought and belief bias

Stephanie Howarth, Vince Polito, Amanda Barnier, Max Coltheart, Simon Handley (Macquarie University), Dries Trippas (Max Planck Institute for Human Development, Germany), Paul Sowman and Andrea Salins

Limited knowledge and misheld beliefs can reduce our ability to make rational judgements. Quick decisions based on what we remember or believe, rather than careful evaluation of available information, lead to bias and error. This is known as the ‘belief bias’ effect. People can overcome belief bias and make rational judgements but this requires ability and motivation to critically evaluate the knowledge and beliefs that conflict with presented information. Similarly, Emeritus Professor Max Coltheart’s ‘two-factor theory’ of delusions suggests that it is a failure of deliberative evaluation that prevents individuals overcoming their delusional (e.g., biased) beliefs. This project aims to integrate reasoning, memory and belief research in order to better understand the role of beliefs in rational thinking.

We are simultaneously running three experiments that modify the influence of beliefs, two of which use suggestion through hypnosis and one that uses transcranial magnetic stimulation (TMS). Experiment 1 inhibits knowledge or beliefs via a hypnotic agnosia suggestion which should inhibit knowledge/beliefs in the content of the stimulus, facilitate critical thinking, and reduce the belief bias effect. We have collected data on 34 participants so far and preregistered a target number of 40 participants. Experiment 2 aims to facilitate (or inhibit) critical thinking processes through hypnotic suggestions that shift an individual’s perspective to either a more logical or a more intuitive form of reasoning. We have collected data from 15 participants so far and have preregistered a target number of 25 participants. (Note: our target population for Experiment 1 and 2 are comprised of highly suggestible individuals, for whom hypnotic suggestion is effective in modifying behaviour - approximately 10% of the population). Experiment 3 will use TMS to the right dorsolateral prefrontal cortex (DLPFC) to disrupt belief evaluation and critical thinking, thereby increasing the belief bias effect. We have pre-registered a target number of 25 participants.

Talking to read, reading to talk

Saskia Kohnen, Wendy Best and Lyndsey Nickels

On average, two children in a class of 30 have dyslexia, developmental language disorder, or both. These neurodevelopmental disorders can have severely negative impacts on academic outcomes, mental health and job opportunities. In this study, we investigated the reading abilities of 20 children with word finding difficulties, a subset of those with developmental language disorder. As a group, these 20 children showed poor irregular word reading and poor reading of nonwords. In contrast, the group’s reading comprehension score was in the average range. Our findings are not consistent with previous studies where children with word finding difficulties were found to have difficulties with reading comprehension but not with reading words. Interestingly, at the individual level, we found that five children did not show any word or nonword reading difficulties at all, while nine children showed difficulties with both word and nonword reading.
reading, four only nonword difficulties, and one child only word reading difficulties. In terms of their reading comprehension, we found that 13 out of the 18 children tested scored within the average range. The remaining five children’s scores indicated difficulties with reading comprehension. This work demonstrates that there is a lot of individual variability in the reading skills of children who have difficulties in a very specific aspect of their spoken language (word finding). Our findings show that group averages can obscure important individual differences. We are currently investigating individual children’s reading profiles together with their spoken language skills within models of language processing in order to understand if there are principled relationships that predict some of this variability.

Executive control and error monitoring of pronunciation during reading aloud in stuttering

Ivan Yuen, Nicholas Badcock, Paul Sowman and Kirrie Ballard

Stutterers demonstrate different neural activation patterns when reading aloud compared to normally fluent speakers. In particular, they display hyperactivation of the brain’s right hemisphere. The dominant interpretation attributes this pattern to a failure in normal development of hemispheric specialisation for language. Recent work challenges this hypothesis by demonstrating that in the youngest stutterers, abnormal lateralisation is not evident. This supports an alternate hypothesis that abnormal hemispheric lateralisation in stuttering is reactive. The current project addresses the hypothesis that over-activation of the right hemisphere in stuttering represents over-learned recruitment of executive control mechanisms related to error monitoring. The research used an innovative paradigm combining phonetic analysis with functional transcranial doppler ultrasound (fTCD) to assess the engagement of language neural substrates in response to monitored versus non-monitored errors during reading. Two groups of 5- to 10-year-old children (typically developing as controls and a group of children who stutter) were tested. As expected, the fTCD results indicated left lateralised activation for the typically developing children. When cognitive load was increased during error monitoring, they exhibited a balanced bilateral activation. This represents over-learned recruitment of executive control mechanisms related to error monitoring.

The dominant interpretation attributes this pattern to a failure in normal development of hemispheric specialisation for language. Recent work challenges this hypothesis by demonstrating that in the youngest stutterers, abnormal lateralisation is not evident. This supports an alternate hypothesis that abnormal hemispheric lateralisation in stuttering is reactive. The current project addresses the hypothesis that over-activation of the right hemisphere in stuttering represents over-learned recruitment of executive control mechanisms related to error monitoring. The research used an innovative paradigm combining phonetic analysis with functional transcranial doppler ultrasound (fTCD) to assess the engagement of language neural substrates in response to monitored versus non-monitored errors during reading. Two groups of 5- to 10-year-old children (typically developing as controls and a group of children who stutter) were tested. As expected, the fTCD results indicated left lateralised activation for the typically developing children. When cognitive load was increased during error monitoring, they exhibited a balanced bilateral activation. This represents over-learned recruitment of executive control mechanisms related to error monitoring.

Learning from our mistakes: What error patterns and their neural correlates tell us about word relearning in semantic dementia

Sharon Savage, Lyndsey Nickels, Nora Fieder, Ramón Landín-Romero and Leonie Lampe

Semantic dementia is a progressive condition which has a devastating impact on language and communication. Word retraining programs provide patients with the opportunity to rebuild lost words, however, the process of relearning is not well understood. Recent questions have been raised regarding the problem of overgeneralisation, that is, misapplying target words to other objects, and how learning is supported by the brain, particularly in patients with severe deficits. Therefore, the objective of this project was to extend knowledge regarding both positive and potentially negative consequences of word relearning and explore the neural mechanisms involved. In doing so, the research aimed to provide insights both at a practical level, of informing intervention methods to deliver direct benefit to patients, as well as a theoretical level, by increasing understanding of semantic and episodic memory systems.

To address these objectives, our international team of investigators from the Memory and Language programs have been working collaboratively to conduct in-depth analyses on the verbal responses of nine word-retraining participants. Each of the 1,796 responses generated have now been re-coded to determine the frequency of specific error types, including the misapplication of trained words. When comparing the prevalence and pattern of naming errors made by individuals both prior to training and following a four-week intervention, no evidence was found for a significant rise in the misuse of trained words when attempting to name the untrained items. Furthermore, the rate of overgeneralisations of trained words to untrained words at post-intervention appears low, ranging from 0 to 4.7% of responses across the nine individuals. No relationship was apparent between the rate of overgeneralisation and an individual’s degree of semantic impairment. By contrast, all participants showed significant improvements in naming the trained words, indicating an overall beneficial response to treatment. This shows clearly for the first time, that not only are there positive effects for items which are trained, but there is no detrimental impact on other, untrained vocabulary. The final step in this research is to complete the longitudinal analysis of grey and white matter to identify correlates of naming accuracy and errors, thereby identifying the brain structures which support word retraining outcomes. Neuroimaging data is currently being pre-processed and quality-checked. Statistical modelling of brain-behaviour associations is also underway.
When bilingualism meets biliteracy: The role of morphological knowledge in spoken language in learning to read

Hua-Chen Wang, Nan Xu Rattanasone, Katherine Demuth, Miao-Ling Hsieh (National Taiwan Normal University, Taiwan), Kenneth Forster, Luan Li and Anne Castles

In Australia, 25% of the population is bilingual, with Mandarin being the most common language after English. However, we know little about how learning two languages affects one’s ability to learn to read. This project combines expertise from the Language and Reading Programs to uncover how language abilities affect learning to read. As an important language ability, morphological awareness is positively associated with reading ability. For example, knowing that ‘ed’ can be attached to a verb to change its meaning, allows individuals to recognise these same morphemes in reading. However, it is less clear whether children use their morphological knowledge when learning to read new words. Furthermore, it is unknown whether bilingual children use morphological knowledge in the same way as monolingual peers when learning to read, particularly given that studies have found that Chinese-English bilinguals have difficulty acquiring English morphology.

We tested 30 monolingual and 31 Chinese-English bilingual children. We compared novel word learning either with the stem word plus its morphological variation (e.g., vack, vacks, vacking, vacked) or pure repetition (e.g., vack x 4).

The results showed that children learn novel written words better in pure repetition than when they are presented with morphological variation. In addition, although Chinese-English bilingual children have weaker morphological knowledge compared to English-monolinguals, they learned the novel words equally well. The findings suggest that morphological knowledge does not affect learning to read new words. This project enhanced cross program collaboration as the investigators on both Reading and Language Programs work closely together. For example, the project idea, experimental design, and results were discussed by all investigators. A test measuring morphological awareness was adapted from one used by Dr Xu Rattanasone and Professor Katherine Demuth for a younger age group.
The effect of visual body size adaptation on multimodal representations of the self

Ian Stephen, Kevin Brooks, Regine Zopf and Vince Polito

Body size misperception affects a large and growing number of young Australians, and has negative health implications including body dissatisfaction, eating disorders, and compulsive behaviours. Recently, Associate Professor Kevin Brooks and Dr Ian Stephen have shown that visual adaptation may provide a mechanism for the development of body size misperception, since exposure to thin bodies causes subsequently-presented average sized bodies to appear fat and vice versa. Further, Dr Regine Zopf and Dr Vince Polito have shown that exposure to unusual body stimuli can affect multiple aspects of self-representation, including beliefs about one’s spatial location and agency across multiple senses.

In this project, we are examining whether visual adaptation affects representations of one’s body outside of vision, and thereby determine if the brain holds high-level representations of one’s body. This research brings together members of the Person Perception, Perception in Action, and Belief Formation teams to:

• determine whether visual body adaptation impacts explicit self-experience;
• determine whether visual body adaptation impacts self-representations of our bodies in the touch domain; and
• determine whether visual body adaptation transfers to representations of our bodies in the proprioceptive (body awareness) domain.
The outcome of impact: Detecting sports concussion with consumer-grade EEG

Paul Sowman, Nicholas Badcock, Wei He, Greg Savage and Jordan Wehrman

This CCD funded project investigated the use of consumer-grade equipment such as the EMOTIV EEG system, a portable gaming system that measures electrical brain activity, to measure concussion in contact sports. It examined whether the EMOTIV can provide a more affordable and convenient alternative to traditional EEG research systems when measuring auditory event-related potentials (ERPs). The data collected provided very important proof of concept and feasibility for larger studies into sports concussion in the future. We followed two Macquarie University rugby teams for the duration of the season, assessing 31 players at multiple points throughout. The project allowed us to engage a PhD student, an MRes student, an Honours student and eight interns from the Centre for Chiropractic at Macquarie University who all contributed to the project. The research has opened up a number of opportunities for funding and collaboration beyond the current project. We have been in recent contact with the Sydney Rays, an Australian Rugby Union team, about working with them next season, as well as Macquarie University AFL teams. In addition to this research, there is now a proposal with Macquarie Health to host a concussion clinic which arose largely through collaborations initiated by this project. Stemming from this research, Associate Professor Paul Sowman was successful in gaining funding from the Australian Defence Force to support a PhD student, and fostered collaboration with the University of Exeter, UK on concussion projects via a cotutelle student.

Electrophysiological markers of sense of agency and body ownership

Vince Polito, Regine Zopf, Paul Sowman, Jon Brock and Alexis Lutherborough

This project funded by the CCD explored physiological markers of alterations in motor responses following hypnotic suggestion, in other words, how hypnosis can affect physical movement production. Participants performed a bimanual load-lifting task, in which they held a weight in one hand and then removed that weight using their other hand. A real-life example of this situation is a waiter holding a tray of drinks and removing one glass. Typically, stability in the tray is maintained via relaxation of the tray-bearing arm immediately preceding the lift. We assessed these anticipatory postural adjustments using physiological measures of arm displacement (using a goniometer) and electromyography. In our study we investigated whether a hypnotic suggestion, based on the features of clinical cases of alien control delusions, would impact postural adjustments. We found no evidence that hypnosis impacted anticipatory postural adjustments. This result has helped to clarify an important theoretical question in hypnosis research. Specifically, our findings are consistent with the view that hypnosis alters only monitoring of actions (Hilgard, 1979) and does not support the view that hypnosis alters processes involved with action production (Bowers, 1992). This investigation enabled an ambitious MRes project, carried out by Alexis Lutherborough and required close collaboration between researchers from the Belief Formation, Perception in Action and Language Programs. As a result of this project, Belief Formation researchers learned new skills in physiological methods and analysis, and Perception in Action and Language researchers learned methods for modelling cognitive disorders using hypnosis.
Investigating the neural mechanisms underlying Bayesian sensorimotor learning using transcranial magnetic stimulation
David Kaplan, Paul Sowman, John Sutton and Chris Hewitson

Because our sensory systems are corrupted by noise, Bayesian theory suggests we should combine prior knowledge with noisy sensory feedback to generate optimal perceptual estimates (e.g., a tennis player should use their previous experience of tennis ball speeds to predict the next ball’s velocity). Despite recent enthusiasm for Bayesian and probabilistic approaches in cognitive science, the supporting behavioural and neural evidence remains surprisingly limited. This is especially true in the context of sensorimotor learning. The aim of this project funded by the CCD was to deepen our understanding of the nature of Bayesian integration during visuomotor learning and to begin to elucidate the neural mechanisms that may be involved. The aim of the first phase of the project was to optimise a previously validated behavioural paradigm (Hewitson, Sowman, & Kaplan, 2018). We found that the mean of a distribution of visual rotations (the prior) learned in a modified visuomotor adaptation task generalises to the opposite, untrained limb only when the imposed visual perturbation is congruent in extrinsic coordinates. In other words, learning that occurs while performing the sensorimotor task with one arm transfers to the other. Despite providing valuable information, the validated study could not rule out rapid new learning with the opposite limb. To address this, we ran a series of experiments to test (1) what information can drive initial learning of the prior and (2) whether the integration of visual likelihood was learned during task performance. To address (1), we ran an experiment in which participants received restricted visual feedback during training in a visuomotor adaptation task and found that participants could successfully learn to compensate for the imposed visual perturbation even when feedback was only shown briefly midway through the reach and no endpoint error feedback was provided, indicating that brief midpoint feedback is a sufficient learning signal for visuomotor adaptation. To address (2), we ran another experiment in which participants learned a distribution of rotations (the prior) during training but were not exposed to a distribution of conditions in which visual feedback reliability was varied (the likelihood). Following training, we tested their ability to integrate information when visual feedback reliability was varied and found that likelihood integration occurs extremely rapidly (within 5 trials), suggesting that task-based learning is not required. Information from these experiments allowed us to test interlimb generalisation in a paradigm where new learning with the untrained limb could be ruled out. We found that, as in the findings reported by Hewitson et al. (2018), Bayesian sensorimotor learning occurs in extrinsic coordinates. These findings help us to deepen our understanding of the nature of Bayesian integration during visuomotor learning and provide a vital foundation for the subsequent TMS experiments which will be conducted in early 2019.

Synaesthesia decoding MEG study
Lina Teichmann, Anina Rich, Thomas Carlson and Tijl Grootswagers

For grapheme-colour synaesthetes, letters and digits evoke a vivid perception of colours. Testing this unusual group of participants is a unique opportunity to gain an insight into how we perceive the world around us. One of the central questions of our research is how synaesthetic colours overlap with colour representations activated by colour perception or colour memory. The goal of the current project was to address this question with a focus on the temporal dynamics of synaesthetic colour activation. Using MEG, we investigated whether there is a common brain representation of colours when evoked by real colours, memory colours, and synaesthetic colours, and whether the colour representation is activated at the same time.

Dissociating attention from decision-making
Denise Moerel, Alexandra Woolgar and Anina Rich

In our daily life, we constantly attend to certain incoming visual information, while ignoring other information. Attention is associated with a behavioural benefit, and neuroimaging studies have shown stronger information coding for attended compared to unattended stimuli in many parts of the brain. However, the temporal dynamics of attention remain poorly understood. This study aimed to investigate the time-course of attention using MEG, specifically, to dissociate the effect of attention from later decision-making processes.

The development of predictive coding in preschool children
Hannah Rapaport, Paul Sowman and Wei He

The preschool years represent a critical period in one’s life for acquiring a wide range of cognitive abilities. Yet to date, little is known about the brain function that underpins this significant cognitive development. This study used MEG to measure brain function in 3- to 6-year-olds. Specifically, we investigated the development of predictive coding - how the brain uses previous experience to generate predictions about future events. Participants listened to a 15-minute sequence of tones, which vary in their predictability and thus elicit different brain responses. This research aimed to contribute to our understanding of early brain development and to serve as an important baseline for studying predictive coding in neurodevelopmental conditions such as autism.

Cortical dynamics of gesture and action naming interaction
Ana Murteira, Paul Sowman and Lyndsey Nickels

Recent studies have shown a close interaction between produced gestures and language processing (i.e., producing gestures helps people organise thoughts or find words). However, debate remains as to how gesture and language are linked, and how perceiving gesture might affect language production. This project aimed to examine the neural dynamics underling gesture processing and the mechanisms by which gesture influences verb naming through MEG. We expect the results will enable a better understanding of how gesture and verb processing systems are integrated. Ultimately, this will contribute to an understanding of how gesture might best be used in the treatment of people with a post-stroke aphasia naming impairment.
The emerging representation of semantic information in MEG
Thomas Carlson and Tijl Grootswagers

At what point in time does semantic information about the visual objects in the world emerge? Previous research using representational similarity analysis and fMRI has shown that higher visual areas in the ventral temporal cortex contain semantic information about visual objects. This work has established ‘where’ in the brain semantic information emerges. However, the fine scale temporal dynamics of the emergence of semantic information remains unknown. Here, we applied representational similarity analysis to MEG to investigate when semantic information for visual objects emerges. In the analysis, we used representational similarity analysis to correlate different models of semantic processing to the neural data. This project will yield deeper insights into processes involved in describing the world around us.

Steady state visual evoked potentials (SSVEPs) and voluntary actions
Simmy Poonian and Amanda Robinson

This project investigated the neural response to voluntary actions and their sensory outcomes using MEG. By manipulating the predictability of sensory effects, we aimed to investigate how the neural activity for action control and sensory processing is influenced by motor expectations and sensory predictions. This research aimed to inform the ways in which we are able to execute, understand and maintain control over our own actions while the sensory world is changing.

Experience based perceptual effect on cortical tracking of hierarchical linguistic structures
David Meng, Yiwen Li, Blake Johnson and Catherine McMahon

This project examined the effects of prior experience with acoustic and linguistic information, on the ability of the brain to track information at different linguistic timescales (i.e., syllable level, phrase level and sentence level). The research aims to provide novel neural markers, using MEG, for objective assessment of speech perception and language processing in cochlear implant recipients as well as evaluating the effectiveness of various rehabilitation programs after cochlear implantation.

Brain oscillations of sequence learning in different motor modalities
Blake Johnson and Erik Chang (National Central University, Taiwan)

In this project we examined how we learn new motor skills - specifically how cognitive processes and neural mechanisms change as we become more and more fluent with novel movement sequences. Using MEG, we compared neural activity between manual movements and speech, and identified crucial factors influencing learning within each modality, as well as the transfer of learning across modalities. The findings of this project will advance our understanding of how novel motor skills are acquired, together with the underlying neural mechanisms of acquisition.
Empathy and Morality: An Interdisciplinary Perspective
14 March | Macquarie University
Hosted by the Belief Formation Program
Invited Speaker
Professor Jean Decety
University of Chicago, USA
Empathy, the ability to perceive and be sensitive to the emotional states of others, motivates prosocial and caregiving behaviours, plays a role in inhibiting aggression, and facilitates cooperation between members of a similar social group. This is probably why empathy is often and wrongly confused with morality, which refers to prescriptive norms regarding how people should treat one another, including concepts of justice, fairness, and rights. Drawing on empirical research and theory from evolutionary biology, psychology and social neuroscience, Professor Decety argued that our sensitivity to others’ needs has been selected in the context of parental care and group living. One corollary of this evolutionary model is that empathy produces social preferences that can conflict with morality. This claim is supported by a wealth of empirical findings in neuroscience and behavioural economics documenting a complex and equivocal relation between empathy, morality and justice. Empathy alone is powerless in the face of rationalisation and denial. It is reason that provides the push to widen the circle of empathy from the family and the tribe to humanity as a whole.

Knowing Autism
20 March | The University of Western Australia
Hosted by the Person Perception Program
Invited Speaker
Professor Elizabeth (Liz) Pellicano
Macquarie University
Autism affects millions of citizens in Australia and across the globe. Despite widespread public interest in autism, autistic people and their families have rarely been actively engaged in the research process. They have largely not been given the opportunity to decide research priorities, shape how an issue is researched, or help draw out practical lessons from research. Many have reported feeling disenfranchised as a result. Developing ways to involve autistic people and their allies, in deciding which topic to research, the way an issue is researched, how it becomes funded, who undertakes the research and so on, is one key way both to rebuild feelings of trust and to ensure that a greater portion of research has a direct and sustained impact on those who need it most.

Autism researchers do not do this enough, and indeed, scientists are often reticent about involving community members in their research. But can non-autistic scientists ever really understand what autistic people and their families need from their research? In this presentation, Professor Pellicano contended that truly understanding autism, ‘knowing autism’, requires both objective and subjective understandings, experiences and expertise, which can be achieved by listening, learning and involving autistic people and their families in research. She has investigated in depth what the autistic community rightly demands of autism research and the major changes that will need to be made to deliver on their expectations.
The Promiscuous Hippocampus: The Role of the Medial Temporal Lobe in the Memory, Perception and Emotion

11 July | The University of Sydney
Hosted by the Memory Program

Invited Speaker
Professor Andrew Yonelinas
University of California, Davis, USA

Our ability to remember the important events that make up our lives is critically dependent on the medial temporal lobe. However, recent work has suggested that different sub-regions within the medial temporal lobe may support distinct mnemonic processes and that they may play important roles in cognitive tasks beyond traditional tests of long-term episodic memory. Professor Yonelinas described work showing that the hippocampus plays a central role in binding together and subsequently recollecting the different aspects that make up an episode or event, whereas other regions such as the perirhinal cortex can support familiarity-based memory discriminations even when recollection fails. In addition, he presented evidence that the hippocampus is involved in supporting short-term memory and even visual perception, when those tasks involve high-resolution or complex bindings. Professor Yonelinas then focussed on the unique role of emotion in episodic memory and showed that the amygdala supports recollection of emotional bindings that exhibit relatively slow forgetting compared to hippocampal bindings. Finally, he examined the effects of acute stress on different medial temporal lobe regions and presented data showing that post-encoding stress can rescue memory from the effects of forgetting by acting as a mnemonic filter.

How Grammar Creates Meaning

8 August | Macquarie University
Hosted by the Language Program

Invited Speaker
Professor Gennaro Chierchia
Harvard University, USA

Humans communicate through language: verbal languages, or sign languages. How do words and sentences or gestures acquire meaning? One way to think about it is to view language as a labelling device: nouns are used as conventional labels for things (e.g., the English noun table is a label for, well, tables) and verbs are labels for actions (e.g. to break labels actions like demolishing, shattering, and the like); and in virtue of these conventional associations, sequences of words can be used to convey facts about the world, or to tell stories. Professor Chierchia promoted a different view of language structure. He proposed that there are two main types of words in language. Words like table or break, which are known as ‘content words’, indeed have primarily a labelling/referential function. But then there are words like or, if, no, even, any, often called ‘function words’. He believes that meaning stems primarily from the latter category of function words. It is in function words that a sort of ‘spontaneous logic’ hides, through which we give shape to our thoughts. So the path is from grammar to meaning via logic. Professor Chierchia illustrated this point by showing how many sentences that are perceived as ‘ill formed’ or ‘grammatical’ owe their marginal status to being logical contradictions (albeit, subconscious ones). This leads to a fairly radical re-thinking of how grammar works.

Optimizing Early Reading Interventions for At-Risk Children

11 September | Macquarie University
Hosted by the Reading Program

Invited Speaker
Professor Robert Savage
University College London, UK

Professor Savage and his team explore the best strategies that can be used to support children who are showing difficulty with developing reading skills in early primary school. They have conducted studies evaluating the effects of specific interventions that might help poor readers to improve their reading skills. English differs from other languages because the same spelling can be pronounced in different ways across different words. The complexity in the relationship between letters and sounds is one of the challenges to early reading skill development. It is thus important to understand how letter-to-sound rules (or grapheme-to-phoneme correspondences) are used by children when reading sentences and passages of text. In this presentation, Professor Savage described a series of intervention studies carried out with grade 1 and 2 at-risk poor readers from regular classrooms in two provinces in Canada. In the first study they explored ‘direct mapping’ of grapheme-to-phoneme correspondences (or letter-to-sound rules) to support children who are having difficulty with their representations in connected texts and the teaching of ‘set-for-variability’ strategies which allow the matching of a spelling pronunciation against a stored word in 199 at-risk poor readers in grade 1. In the second study, of children in grade 2, they explored applications of an approach to reading instruction that seeks the simplest interventions (known as the Simplicity Principle), which taught 94 below average early readers the most beneficial/common letter-to-sound relationships. Both reading intervention studies found measurable improvements in standardised reading tests for the at-risk students. Implications of findings and further programmatic studies were also discussed.
EDUCATIONAL OUTREACH | REGIONAL ENGAGEMENT

The Centre engages with the general public through a wide variety of educational activities for all ages. From international undergraduate visits, to presentations for primary and secondary students, even pre-school children have visited the Centre or had CCD members present in their classrooms. These events give these students the opportunity not only to learn about our research and its impact on society, but also to see the potential career pathways that a STEM degree offers. CCD members also spoke at career days, informational fairs and open days. Through these activities, they have directly reached over 900 students in urban and rural communities, not including the several thousand attendees at public events such as university Open Days and the Sydney Science Festival.

This year, 24 students from Years 10 and 11 participated in the week-long work experience program at the Macquarie University node of the Centre. The Person Perception Program at The University of Western Australia (UWA), also hosted a high school work experience student for four days in January. Additionally, the Centre hosted 50 undergraduate and higher degree students as merit scholars and interns, providing them with the opportunity to fully engage in cognitive science projects.

Since its inception in 2014, over 120 high school students have benefited from CCD work experience programs. Students have had the opportunity to work with researchers from Macquarie University and The University of Sydney nodes, as well as the Person Perception researchers at UWA and clinicians at the Centre for Research in Autism and Education (CRAE), University College London, UK through a program managed by Professor Liz Pellicano. The work experience program at CRAE was specifically designed to provide secondary school students with autism spectrum disorders the opportunity to work in a research team.

FEATURE
High School Work Experience

For the fifth year running, the Centre hosted its highly sought-after work experience program. The number of applications increased each year for the program, reaching a peak this year with over 60 informal inquiries. The Centre received 50 full applications from 24 different schools in New South Wales, South Australia, Queensland and the Northern Territory. The 24 selected students were drawn from 16 schools in New South Wales and South Australia. The gender balance of the successful students reflected the balance in the applications received, with 52% of the female and 48% of the male applicants being offered positions.

During the two, week-long programs in May and August, Centre members from all five programs (Belief Formation, Language, Memory, Person Perception and Reading) volunteered their time to support these students. The program included presentations from researchers about their work, hands-on demonstrations of the latest technology used in neuroscience research, discussions with careers advisors about the different degrees available and post-degree career pathways. The students were also able to experience some aspects of the undergraduate course curriculum. They logged on to the online Delusions and Disorders course in the Department of Cognitive Science, Macquarie University, and learned about different topics covered in the course, such as aphasia, synaesthesia and schizophrenia. Hands-on sessions allowed students to see how cognitive science researchers use technology including ultrasound, transcranial magnetic stimulation (TMS), eye-tracking and magnetoencephalography (MEG) to investigate the inner workings of the brain. Once again, the program included a ‘mini research project’ wherein small groups of students worked as a research team to design and execute a research project. At the end of the week, they presented a summary of their findings to Centre academics.

As it has been in previous years, the feedback was overwhelmingly positive:

“I definitely want to do a science degree now instead of business.” - Eseosa A., Student

“It has influenced me to continue pathways into STEM.” - James P., Student
“Thanks so much for the time and effort you put into supporting our girls when they joined you for work experience and for this generous reference. They had a wonderful learning experience and have benefited greatly from the insights they gained during this time.”

- Margaret S., Careers Advisor

Two of the students contacted CCD members to inquire about working with them for their Year 11 Science Extension projects. One specifically wanted to build upon the mini-research project that the students conducted during the work experience week.

The Person Perception Program also hosted a work experience student in January. The student is interested in a career in neuroscience and spent two days immersed in the Person Perception Program research before spending another two days with the neuroscience group in Biological Sciences at UWA. During her visit, she gained experience in face stimuli manipulation and was introduced to several experimental procedures.

FEATURE
High School Engagement

Beyond the formal high school work experience programs, CCD researchers were also involved in a number of events at high schools. These interactions gave students the opportunity to ask questions about the different research fields and to learn more about careers in the sciences.

This year, CCD researchers were invited to speak at high school events, such as career days and special events. For example, Dr Bianca de Wit spoke to 30 enthusiastic Year 10, 11 and 12 students about pathways into university and careers in cognitive science at the North Sydney Girls High School Careers Day. PhD student Jemma Collova from the Person Perception Program also participated in the Careers Speed Networking day at the St Mary’s Anglican Girls’ School in Western Australia in June. This Year 10 Career Conference was designed to help students appreciate the range of career options available, particularly in the sciences. As part of International Women’s Week in March, Associate Professor Muireann Irish gave an inspirational talk at Auburn Girls High School. She talked with 90 Year 9, 10 and 11 girls about careers in STEM and opportunities available to women in science.

Centre researchers also actively developed resources for high school students based on their latest research findings. Professor Amanda Barnier and six CCD colleagues developed a presentation and information sheets for high school students and parents to help students become more independent and successful in senior school. She has presented the ‘Memory-Hacks for High School’ information at St. Ives High School, Sydney in May and on two occasions to different classes at Epping Boys High School, Sydney in July and August. Her presentation covered how to succeed in school and included practical tips for students and parents based on research into how memory works in the developing brain. She has given the presentation to more than 200 students this year.

FEATURE
Regional Engagement

CCD researchers this year continued their work with indigenous Australian communities in the Northern Territory. In 2018, Professor Katherine Demuth and Associate Professor Mridula Sharma from Macquarie University and the HEARing CRC, along with Professor Gillian Wigglesworth from The University of Melbourne continued investigating the relationship between the hearing of Indigenous children and their performance on early literacy skills. Forty-three local school children, aged 5-11 years, were tested to determine their hearing and auditory processing abilities as well as for their understanding of individual sounds in spoken words (phonological awareness), which is an important precursor to literacy. Preliminary results show that 20% of the participating children had impacted middle ears, and most of the younger children had difficulty completing the pre-literacy skill tasks. The team referred those with ear problems for further appraisal. They plan to build on this work to understand the performance on early literacy skills.

FEATURE
University Engagement

Once again CCD researchers continued to be involved in their respective university communities, participating in events designed for current and prospective university students, such as University Open Days. Centre members were heavily involved with the Macquarie in a Day event in April and the Open Day activities in August held at Macquarie University. These annual events help Year 10 and 11 students understand what it is like to be a university student. At the Macquarie in a Day event, Associate Professor Paul Sowman gave a talk about ‘Hacking the brain’ and demonstrated how electrical stimulators and electromagnets enable researchers to ‘hack’ into the body’s nervous system. He used this approach to show how movements are controlled and how cognition can be altered by external means. Dr Katya Numbers’ presentation entitled, ‘Meddling with your memory’ asked the question, ‘Can you trust your memory?’ She gave an engaging talk about how reliable memory is and how variation in memory is applicable to real-world problems, such as a witness testimony related to a crime. Dr Nicholas Badcock discussed ‘Brain imaging and lateralisations’. He explained the importance of lateralisation in cognitive processes and how researchers determine which parts of the brain are active for different tasks. Over 425 high school students came to the talks on the day. During the Open Day event, eight CCD members engaged with the students through demonstrations of research technology, such as the EMOTIV headset and the Oculus Rift virtual reality headset.
The Centre’s outreach activities have provided numerous opportunities for CCD members to establish and enhance links with stakeholders and the wider community. CCD members have again been involved in science communication events this year such as, several events across National Science Week/Sydney Science Festival in August and in school visits.

CCD members also provided ongoing support and resources to clinicians, educators and other community members through direct consultation, providing updates to professional communities about new developments in research, as well as participation in formal and informal discussions.

This section features a number of highlights, with further information on the participation of individual CCD members in various outreach activities listed in the Community Presentations list (see Outputs section).

**COMMUNITY ENGAGEMENT**

**National Science Week**

CCD members were involved in numerous events as part of National Science Week 2018, including Sydney Science Festival events at the Powerhouse Museum and the Australian Museum, organising and running two ‘A Night of Illusions’ events, and several school visits, as part of the Science in Schools program, for the third year in a row.

Associate Professor Muireann Irish from the Memory Group began the CCD National Science week events with a free lunch-time lecture. She gave a sold-out talk on the neurocognitive mechanisms underlying memory loss in dementia and the potential to use music as therapy for people living with dementia. Her presentation, ‘This sounds like science: Music and memory’, on 9 August was part of a series presented by City Recital Hall and Inspiring Australia (the national strategy for community engagement with the sciences). The presentation was recorded and broadcast through ABC Radio National.

Once again, Dr Vince Polito, Dr Regine Zopf, PhD student Erika Contini and colleagues wowed the public at their ‘A Night of Illusions’ events. This year they had held two events, one at 107 Projects in Redfern, Sydney on 11 August and the other at the New England Regional Art Museum on 25 August in Armidale. They demonstrated a wide range of perceptual illusions, including the physical sensory illusions like the rubber hand illusion, optical illusions like the waterfall effect and the Ebbinghaus illusion (which are apparent motion and apparent size illusions).

On 12 August, researchers from the Child Language Lab had an extensive display at the Sydney Science Festival’s Big Family Science Day at the Powerhouse Museum. Their ‘Brilliant brains: How kids learn language’ exhibit included seven booths, which provided informative, interactive displays to engage children and adults. The booths included demonstrations of ultrasound equipment and games that revealed how people predict the ending of sentences, how children can identify and learn unknown words, and the auditory processing underlying the ‘Laurel’ versus ‘Yanny’ Internet meme. Over 200 people pre-registered, several hundred attended on the day, and 75 children were signed-up by their parents to participate in future studies at the Child Language lab.

Dr Tita Bender also participated in the MAASlive Lates ‘Speed meet scientists’ event at the Powerhouse Museum on 8 August where 38 scientists talked to almost 400 people about research and how important science is to society.

From the 14-17 August, Centre members Drs Bianca de Wit, Nikolas Williams, Nick Benikos, Shwetha Sambasivam, K-lynn Smith and CCD PACE student Talia Burdon were at the Australian Museum Sydney Science Festival giving hands-on demonstrations of the EMOTIV headset and explaining how technology is used in neuroscience research. Over 2,400 high school students attended the event.

For the third year in a row, PhD student Cherie Strikwerda-Brown and Dr Stephanie Wong organised
and ran a Science in Schools visit to Newtown Public School, Sydney as part of National Science Week. On 17 August, they taught Year 5 students about the brain. During the hour-long presentation the students dissected jelly brains to learn about the brain’s structure and function.

COMMUNITY ENGAGEMENT
Pre-school Engagement

The Centre has a strong connection to the local community around Macquarie University. On the 17 August, 20 children from the local Gumnut Cottage pre-school visited the Centre. Eight researchers spent the morning with the children, while they toured the MEG lab and learned about the brain and nervous system through assembling model brains, playing interactive video games and colouring pictures of the brain.

COMMUNITY ENGAGEMENT
An Evening with Robyn Steward

This community event was part of the Autism West Talk Series, and it was supported by Autism West and the Centre. On 22 March, ‘An Evening with Robyn Steward’ was held at The University of Notre Dame in Fremantle. Robyn Steward is an internationally acclaimed autism advocate, mentor, consultant, author and musician. This event provided discussion on the skills to be independent and provided an array of strategies on anxiety, trust, emotion regulation and communication. She is currently working as a research associate at University College London, UK but travels the world teaching people about autism. She is the author of two books that raise awareness about living on the autism spectrum.

COMMUNITY ENGAGEMENT
Phonics Debate and Phonics Roadshow

Reading Program researchers have contributed extensively to the public’s, educators’ and politicians’ understanding of how children learn to read. They have created a series of resources, including open-access papers, public debates and events, that are shaping the discussion around the use of synthetic phonics and implementing the science of reading in the education system.

In June, Professors Anne Castles (Macquarie University), Kathleen Rastle (Royal Holloway University of London, UK), and Kate Nation (University of Oxford, UK) published a paper in the journal, Psychological Science in the Public Interest, entitled ‘Ending the “Reading Wars”: Reading acquisition from novice to expert’. The open access paper has been downloaded more than 52,000 times, and gained huge attention on social media with an Altmetric Attention score above 1,000, suggesting it is placed in the top 99th percentile of outputs of the same age in terms of its impact.

On 31 July, Professor Castles participated in a public debate where speakers argued for and against this proposition: ‘Phonics in context is not enough: Synthetic phonics and learning to read’. The speakers for the proposition were: Professor Castles (Macquarie University), Dr Jennifer Buckingham (The Centre for Independent Studies), and Troy Verey (Marsden Road Public School). The speakers against the proposition were: Professor Robyn Ewing AM (The University of Sydney), Dr Kathy Rushton (The University of Sydney) and Mark Diamond (Lansvale Public School). The debate was hosted by the Australian College of Educators and the Centre for Independent Studies. The opening remarks were given by the Honourable Rob Stokes, MP. Natasha Robinson from the ABC moderated the debate. The debate generated substantial interest from the media (with 6 popular press articles quoting Professor Castles immediately after the debate) and across Twitter under the hashtag #Phonicsdebate. The full debate on YouTube entitled “ACE/CIS Phonics Debate 2018”, has been viewed over 8,700 times since it was filmed.

The Reading Program also hosted a series of four sold-out Phonics Roadshows in October and November. Over 245 people attended the events, which were held in New South Wales on the Central Coast and in Sydney, and in Victoria and South Australia. These free, one-day professional learning courses presented the evidence for explicit phonics instruction and showed how to implement phonics instruction in schools.
COMMUNITY ENGAGEMENT
Frontotemporal Dementia (FTD) Information and Support Day for Carers
This year, Memory Program researchers from the Frontier Research Group held their annual Carers Day as part of the 11th International Conference on Frontotemporal Dementias. The Carers Day was held on 13 November at the International Convention Centre in Sydney. Some of the distinguished speakers included, Professor John Hodges, who provided an overview of FTD, Professor Glenda Halliday, who discussed FTD pathologies, and PhD student Cathleen Taylor-Rubin, who outlined speech and language changes. Over the course of the day, the speakers presented an overview of FTD, information about responding to the impacts of FTD, and insights into FTD research, advocacy and support. The event was very well received with over 200 people attending, including 78 carers, some of whom travelled from interstate. As always, the FTD Careers Day was a valuable opportunity for family members to meet others in a similar situation and hear about the latest research in FTD.

INCLUSIVENESS IN SCIENCE
CCD Inclusive Research Network Program
The CCD Inclusive Research Network (IRN) is a group of academics, professional staff and students who are interested in creating a more inclusive environment in our workplace.

The main objectives are to:
• provide a supportive environment to educate and advocate for inclusive practices in academia;
• communicate current issues regarding equity and diversity in our research communities;
• encourage members to consider active and practical steps for improving equity in our local and global environments.

The IRN hosts monthly meetings, conducts public lectures and shares information to encourage members to consider active and practical steps for improving equity in the local and global environments. The IRN organising committee included Associate Professor Anina Rich, Dr Simmy Poonian, Dr Lisa Yen, Dr K-lynn Smith and PhD student Chris Hewitson. The monthly meeting topics and presenters are listed in Hosted Seminars. The meeting topics across the year included #MeToo; gender equity; work-life balance; recruitment and workplace practices; diversity for Indigenous students and non-traditional backgrounds; and time management. The IRN continued to encourage and promote activism within the broader community.

NETWORKS
Visitors and Tours
The CCD hosts numerous visits to the Centre each year, and this year was no exception. These visitors are a highly valued part of the research culture, as they share their expertise with CCD members and participate in Centre research activities, events and seminars. Across the three nodes, Macquarie University, The University of Sydney and The University of Western Australia, there were 130 visits in 2018, with 69 visiting from 20 overseas countries.

The CCD is actively involved in demonstrations and tours of its world-class research facilities, particularly the KIT-Macquarie Brain Research Laboratory. This year, we hosted 17 customised tours for over 150 domestic and international visitors, including over 60 visitors as part of Cochlear Limited’s Visiting Implant Specialists to Australia (VISTA) program as well as delegations from China, India, Thailand, USA, Latin America, the Middle East and Europe.

I was fortunate enough to become involved with the CCD as part of my Macquarie University undergraduate PACE (Professional and Community Engagement) placement. This placement allowed me to work closely with distinguished team members from the CCD as part of the Sydney Science Festival Week outreach program at the Australian Museum. The outreach involved talking to over 2000 high school students over four days and educating them about cognitive science. The students were shown changes in electrical signals within their brain using an EMOTIV headset (a portable EEG device), as well as visual illusions and information about the brain. Having the opportunity to be involved in an outreach program with the CCD was a truly beneficial experience. It allowed me to see how scientific research can be translated into an accessible format with real-world applications. It is also an extremely rewarding experience bringing scientific education to students in a manner that is exciting and interesting to them. I also thoroughly enjoyed working so closely with researchers and educators involved with the CCD and the first-hand experienced gained was invaluable. My overall PACE experience with the CCD was extremely positive and I would like to thank K-lynn Smith, Bianca de Wit, Shwetha Sambasivam, Nicholas Benikos and Nikolas Williams for the experience and their support.

Talia Burdon
Macquarie University
In the past five years, over 1,000 domestic and international visitors have toured the MEG facilities. These visitors have come from all over the world, including China, Japan, India, the USA, Latin America, the Middle East and Europe, as well as from universities across Australia. Heads of national and international corporations, universities and research institutes (such as executives from the University of Science and Technology (China), Shaare Zedek Medical Center (Israel), the ARC Centre for Nanoscale BioPhotonics, and Cryomech, Inc. (USA)) as well as university groups, such as Cotutelle organisers and Macquarie University Advanced Biology students, have toured the facilities.

Macquarie University academics often have the opportunity to showcase the MEG research through the close relationship with Cochlear Limited, with many of the scientists visiting the facility as part of the Cochlear Limited’s VISTA program. Scientists are typically interested in the advancements in the field of audiology using the MEG and, in particular, the development of the world-first Hearing MEG proto-type, designed to measure brain function in children and adults with hearing devices and Cochlear implants. As an example of this close relationship, in 2016, eight Centre members hosted over 150 conference delegates across two days as part of Cochlear Limited’s Global Research Symposium, a large conference held in Sydney that brought together national and international experts in the field of audiology.

The MEG facility has also hosted international dignitaries, such as the UK Minister of State for School Standards, the Right Honourable Nick Gibb, who toured the MEG as part of this visit to the Centre’s Reading Program in 2017.

The MEG plays a prominent role in CCD outreach to high school students. In 2014, the CCD began a formal week-long ‘Work Experience Program’. The high school work experience program is designed for students in Years 10, 11 and 12, and gives them the opportunity to be immersed in a range of research training activities. Through the program they gain first-hand experience with many aspects of a research career. One of the highlights of the week is an introduction to how the MEG works and the research conducted with the facilities. The students get the opportunity to see the machine in action and see their own brain activity. The program has attracted students from across Australia, including NSW, the ACT, Victoria, South Australia and Western Australia. In total, over 120 high school students have attended the program.

The MEG facilities have also been part of other high school outreach activities. For several years the CCD, in conjunction with Cochlear Limited, hosted high school students from the National Youth Science Forum - Next Steps Program (2013 and 2014). The National Youth Science Forum, sponsored by Rotary International, is a program for Year 12 students who have been selected to participate based on their demonstrated aptitude for, and interest in, science. The aim of the program is to inspire young Australians to consider a future in science. During their time here, the students were given an overview of the Centre, demonstrations of the MEG, and information about pathways to a PhD in cognitive science. Over 100 Year 12 students have participated in this program.
COMMUNITY | STAKEHOLDER | INDUSTRY ORGANISATIONS

Representatives from the following industry, community and peak body organisations have been involved in CCD activities and events throughout the year:

ASSOCIATIONS | SOCIETIES
Alzheimer’s Australia NSW
AUSPELD
Australian Fronto-Temporal Dementia Association
Australasian Society for Philosophy and Psychology
Australasian Society for the Study of Brain Impairment
Australian Science Communicators
Autism Spectrum Australia
Autism West
FIVE from FIVE Alliance
Hunter Dementia Alliance
Learning Difficulties Australia Inc.
Newcastle Neuropsychology Interest Group
Playgroup Australia
Science of the Self
Society for Social Psychology, Wellington, NZ
Speech Pathology Australia
State Specific Learning Difficulties (SPELD) Associations
The Benevolent Society

CLINICAL SERVICES
Ann Chan Speech Therapy Clinic
Beecroft Speech Pathology Services
Benjamin Ng Speech Pathology
BodyMatters Australasia
Carlingford Speech and Language Centre
CasteLeaugh Street Early Learning Centre
Centre for International Language Training
Chatter Box Speech Therapy Clinic
Developmental Paediatrics
Diagnostics, Occupational Therapy and Speech Pathology
Intervention Services
DSF Literacy and Clinical Services
Early Start
Ermington Speech Pathology Services
Gordon Speech Language and Learning Clinic
Gotcha Talking Speech Pathology Services
Great Start Behaviour Services
Kids World Therapy
Learning Links
Macquarie University Reading Clinic
Magdalen Rozsa Speech Pathology Services
Mid North Coast Therapy Group
MultiLit Pty Ltd
Nepean Speech and Occupational Therapy
Plumtree Children’s Organisation
Royal Institute for Deaf and Blind Children
Schafer Neuropsychology
Speak and Write
Sydney Cochlear Implant Centre
Sydney Speech Clinic
Sydney Therapy & Co
The Shepherd Centre
Unity Speech Pathology
Virtually Speaking
Whole Family Health
Wicking Dementia Research and Education Centre

EDUCATION
Abbotsleigh School for Girls
Active Learning International Preschool
Arden Anglican School
Ardtornish Primary School
Australian College of Educators
Bentleigh West Primary School

Blue Haven Public School
Burwood Girls High School
Centre for Independent Studies
Epping Boys High School
Fort Street High School
Galston High School
Gumnut Cottage
Harbord Public School
Hurstville Agricultural High School
Lycée Cendecet, International French School, Maroubra
Marsden Road Public School
Mona Vale Public School
Newtown Public School
North Curl Curl Public School
North Sydney Girls High School
NSW Department of Education
NSW Teachers Federation
Pacific Hills Christian School
Penrith Anglican College
Redlands
Roseville College
SCEGGS
St Agnes Catholic Primary School
St Anthony’s Catholic Primary School
St Catherine’s School
St Ives High School
St Mary’s Anglican Girls School
St Peter’s Girls School
St Seraphim Russian Community School
Sydney Boys High School
Telopea Park Public School
The Hills Grammar School
The Ponds High School
Westmead Christian Grammar School
William Clarke College

GOVERNMENT | INDUSTRY
107 Projects
Art Gallery of New South Wales
Australian Museum
Canberra Health Services
Cochlear Limited
CSIRO
KaRa Minds
Legal Psychology Group Australia
National Acoustic Laboratories
Northcott
NSW Health - Central Coast Local Health District,
Concord Centre for Mental Health, Eastern Suburbs
Mental Health Service, Gosford Inpatient Mental Health
Unit, Liverpool Health District, Metro South Mental
Health Services, South Western Sydney Local Health
District, Western Sydney Local Health District
NSW Hospitals - Concord Hospital, Liverpool Hospital,
Prince of Wales Hospital, Royal Prince Alfred Hospital,
St Vincent’s Hospital, Sydney Children’s Hospital,
Uniting War Memorial Hospital, Westmead Hospital
One Door Mental Health
Powerhouse Museum
Royal Far West
State Library of Queensland
Uniting Care
Veteran Affairs Boston Healthcare System, Boston, USA
VIC Hospitals - St Vincent’s Hospital, The Royal Children’s Hospital
MEDIA | PUBLIC AWARENESS

In 2018, Centre members were extensively involved in the public communication of their research via various media and social media platforms. Over the course of the year, tweets sent from the CCD outreach twitter account (@CCD_Outreach) generated an average of over 26,000 impressions and over 550 profile visits per month. Once again, students and researchers live-tweeted the CCD Annual Workshop (#CCDConf18) and Showcase. A series of 37 news stories were profiled on the CCD homepage, including 28 research feature articles and four member spotlight features. The website received nearly 49,000 visits in 2018.

National and International Media

Media this year saw over 120 Centre member appearances across a variety of media at local, national and international levels. A complete listing of these can be found on the CCD website (News » CCD in the Media). Some highlights of media stories in 2018 include:

- **Long read: What’s so bad about Comic Sans, anyway?** (Marinus, E.) TES. 1 January (Reading Program)
- **Research shows how an extreme ‘visual diet’ can lead to eating disorders.** (Stephens, I.) Brisbane Times. 10 February (Person Perception Program)
- **Practise some digital manners on your daily commute: Start by turning down the volume.** (McAlpine, D., Thompson, W., & Gilliver, M.) 23 February. ABC Radio Australia (Language Program)
- **This strange syndrome causes people to think their loved ones have been replaced by identical impostors.** (Colheart, M.) The Washington Post. 7 April (Belief Formation)
- **Disarming the mind: Reintegrating ex-combatants in Colombia.** (Ibáñez, A.) Nature. 2 May (Memory Program)
- **Death metal: It’s not true that nobody understands the words.** (Thompson, W.) ABC News. 8 June (Language Program)
- **Phonics study hopes to end reading wars once and for all.** (Castles, A.) ABC News. 13 June (Reading Program)
- **Real or crocodile tears? Psychopaths may not know the difference.** (Dawel, A.) ScienceDaily. 3 August (Person Perception Program)
- **Singing triggers memories in those who struggle to remember.** (Baird, A.) ABC News. 12 August (Memory Program)
- **Pickle curiosities: How virtual reality is being used for science as well as gaming.** (Polito, V.) Nine News. 9 September (Belief Formation)
- **Nine News.** 9 September (Belief Formation)

The Centre’s research is in frequent demand with many news organisations approaching members for expert commentary. Additionally, 12 researchers from across all five of the Centre’s programs contributed to the online forum The Conversation including topics on death metal music, online conspiracy theories, autism, frontotemporal dementia and the phonics check.

Social Media

In addition to the CCD Outreach twitter account that was established in 2015 and a CCD member list of 120 twitter accounts, three CCD research groups have a presence on Facebook (Person Perception Program, Macquarie University’s Child Language Lab, and NeuRA Frontier). CCD members also contribute to personal and externally-hosted blogs, such as those listed below:

- **Dr Brocktagon** by Dr Jon Brock (drbrocktagon.com)
- **BishopBlog** by Professor Dorothy Bishop (deevybee.blogspot.com)
- **This Month in Voices**: Voice Hearing Research Update Blog by Associate Professor Simon McCarthy-Jones (thismonthinvoices.wordpress.com)
- **Research Blog**: by Dr Xenia Schmalz (xeniaschmalz.blogspot.com.au)
- **ReadOxford**: by Professor Kate Nation (readoxford.org/blog)

#CelebratingCCD

In the lead up to the end of the Centre, a Twitter campaign was run throughout November and December that profiled a CCD member each morning, providing a brief description of their research and links to their latest work and CCD homepage, as well as a photo. All daily tweets included the hashtag #CelebratingCCD. The celebrations were initially focussed on CCD students and ECRs, with the final week of December celebrating each of the program leaders, ending in a celebration on 31 December of the Centre as a whole.

The total number of #CelebratingCCD tweet impressions across November and December was over 67,000; more than 20% of the overall tweet impressions from @CCD_Outreach from 2018. On average each #CelebratingCCD tweet was seen over 1,100 times, which is a 35% increase on the average tweet impression prior to the campaign. The engagement rate for these tweets, one of the most important social media measurements of impact, was 3.78%, meaning that greater numbers of people were sharing, liking, commenting, or clicking on the links or twitter handles provided in the tweets, compared to the average interaction rate @CCD_Outreach tweets of 1.26%. This is evidence of the impact of this successful campaign.

Newsletters

The Aphasia Research Group of the Language Program and the Reading Program distributed an annual newsletter to their stakeholders including schools, teachers, clinicians, professionals, study participants and parents. The Language Program’s Child Language Lab also distributed a quarterly newsletter. All of these newsletters are available on the CCD website.

Our Neuronauts Brain Science Club provides regular emails highlighting news from across the Centre to its members, which include children and families who participate in the Centre’s research.
RESOURCES | TOOLS

This year the Centre continued to provide support and tools for clinicians, educators and other community members. This support included direct consultation with clinicians and educators, participation in community events and outreach activities, and provision of advice about evidence-based assessment and interventions.

Many of the assessment and treatment tools developed by CCD researchers over the years have been made available via links on the CCD website (Resources » Tools).

Across the life of the Centre, various resources for face recognition testing have been provided including several new tools that were developed by CCD researchers. These include tools designed for use by researchers and for use by the general public. While established tools exist to measure adult face recognition (e.g., the Cambridge Face Memory Test), up until now no such tool existed for use with children. Therefore, CCD researcher Professor Liz Pellicano and her colleagues developed and validated a modified test specifically for children, known as the Cambridge Face Memory Test for Children (CFMT-C). During the test, children are instructed to memorise a series of different (male) faces. They are then given a line-up of two faces and asked to identify which face was one of the faces they had to memorise. The test is sensitive enough to pick up differences in ability between children of different ages (e.g. older children performed much better on the test than younger children). It was also able to detect subtle difficulties in face recognition skills in a group of children on the autism spectrum. The test is available for researchers to download through the CCD website (Resources » Tools).

Also available is the Face Memory Test, another face recognition resource, that was designed to test general face recognition skills and to identify individuals with prosopagnosia (face-blindness). Approximately 1 in 50 adults finds it very difficult to recognise the identity of other people from their face despite having no visual problems or brain injury. This free, online test allows the general public to test their skills and to connect with researchers and other resources if they suspect that they have prosopagnosia.

Facial expression processing is an area of research well studied in clinical populations, but tests for typical populations have been lacking. CCD researcher Associate Professor Romina Palermo and her colleagues developed two new tests. The first test was for expression perception, which required participants to select which one of three faces displayed a different expression. The other test combined the expression perception task with the explicit identification of the emotion portrayed by the faces. In this task, participants needed to select one of six verbal labels (anger, disgust, happiness, fear, sadness, or surprise) for each face. These tests are expected to have wide applicability to future studies investigating facial expression processing in typical adult populations. The full paper is available through the CCD website (Resources » Tools).

The Macquarie Online Test Interface (MOTIf) is another valuable resource that the CCD continued to support in 2018. Developed by the Reading Clinic researchers and their colleagues, MOTIf (www.motif.org.au) is an online platform for administering and scoring reading tests. Over 13,000 people have registered as test administrators for the 14 different available tests and over 27,000 students have participated in testing. The applications include tests for reading comprehension and diagnostic spelling, which include normative data for K-3 students, as well as applications to assess the abilities of people with aphasia (i.e. the inability to understand or produce speech).

This year the Centre has also developed a new free app for iOS called ‘Mental Experiments’ available from the iOS App Store®. This tool allows researchers to build their experiments (with visual stimuli or questionnaires) and collect data from participants using iPads or iPhones.

The CCD Tools website also has a range of assessment tools for researchers to use for social cognition tasks for schizophrenia research; tests of cognitive functions, such as cognitive, memory, language and dementia assessment tests (on iPad), and language tests for aphasia. The site also includes treatment and intervention tools for people with aphasia, schizophrenia, and dyslexia.

Registers

The participant registers continue to be well used by CCD researchers. A variety of registers for people of all ages who are interested in taking part in research are maintained and accessible from the CCD website (Get involved » Participate in Research). These include the CCD Adult Registers, Older Adult Registers (over 65 years of age), the Neuronauts Brain Science Club (for those under 18 years of age) and the Prosopagnosia register. The CCD greatly appreciates the time donated to these research projects by community members. Without their support we would not be able to conduct the various research projects undertaken within our Centre.
CENTRE MEMBERS
<table>
<thead>
<tr>
<th>Year</th>
<th>Chief Investigators</th>
<th>Partner Investigators</th>
<th>Centre Funded Postdocs</th>
<th>Associate Investigators</th>
<th>Postgrad and PhD Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>19</td>
<td>10</td>
<td>15</td>
<td>47</td>
<td>72</td>
</tr>
<tr>
<td>2012</td>
<td>19</td>
<td>10</td>
<td>17</td>
<td>70</td>
<td>111</td>
</tr>
<tr>
<td>2013</td>
<td>19</td>
<td>10</td>
<td>17</td>
<td>97</td>
<td>134</td>
</tr>
<tr>
<td>2014</td>
<td>19</td>
<td>10</td>
<td>13</td>
<td>125</td>
<td>144</td>
</tr>
<tr>
<td>2015</td>
<td>19</td>
<td>12</td>
<td>21</td>
<td>167</td>
<td>175</td>
</tr>
<tr>
<td>2016</td>
<td>21</td>
<td>12</td>
<td>24</td>
<td>193</td>
<td>180</td>
</tr>
<tr>
<td>2017</td>
<td>21</td>
<td>12</td>
<td>21</td>
<td>205</td>
<td>167</td>
</tr>
<tr>
<td>2018</td>
<td>21</td>
<td>11</td>
<td>11</td>
<td>214</td>
<td>154</td>
</tr>
</tbody>
</table>
Chief Investigators

**Professor Amanda Barnier**
BA Macq, PhD UNSW, FASSA
Department of Cognitive Science
Macquarie University

**Emeritus Professor Brian Byrne**
BA USyd, PhD McMaster
School of Humanities, Arts, and Social Sciences
University of New England

**Professor Anne Castles**
BSc ANU, PhD Macq, FASSA
Department of Cognitive Science
Macquarie University

**Emeritus Professor Max Coltheart**
BA USyd, MA USyd, PhD USyd, DSc Macq, FAA, FASSA, FBA
Department of Cognitive Science
Macquarie University

**Professor Stephen Crain**
BA UCLA, PhD UCI, FASSA
Department of Linguistics
Macquarie University

**Professor Katherine Demuth**
BA New Mexico, MA Indiana, PhD Indiana, FASSA
Department of Linguistics
Macquarie University

**Associate Professor Melissa Green**
BA UQ, MLitt UNE, PhD USyd
School of Psychiatry
The University of New South Wales

**Professor John Hodges**
MBBS Lond, MRCP, MD, FRCP, FMedSci, FRACP
Brain and Mind Centre
The University of Sydney

**Associate Professor Blake Johnson**
BSc Alberta, MA SFU, PhD SFU
Department of Cognitive Science
Macquarie University

**Associate Professor Suncica (Sunny) Lah**
BA Zagreb, MSc Macq, PhD Macq
School of Psychology
The University of Sydney

**Associate Professor Robyn Langdon**
BSc DipEd UQ, BA Macq, PhD Macq
Department of Cognitive Science
Macquarie University

**Professor Genevieve McArthur**
BA UWA, PhD UWA
Department of Cognitive Science
Macquarie University

**Associate Professor Laurie Miller**
BSc Westminster, MSc McGill, PhD McGill
Royal Prince Alfred Hospital
The University of Sydney

**Professor Lyndsey Nickels**
BA Reading, PhD Lond, FASSA
Department of Cognitive Science
Macquarie University

**Associate Professor Romina Palermo**
BSc UOW, PhD UWA
School of Psychological Science
The University of Western Australia

**Professor Elizabeth (Liz) Pellicano**
BSc UWA, PhD UWA, MPSych UWA
Department of Educational Studies
Macquarie University

**Professor Olivier Piguet**
BPsych Genève, MA Melb, PhD USyd
Brain and Mind Centre
The University of Sydney

**Professor Gillian Rhodes**
BSc UC, MSc UOA, PhD Stanford, FASSA
School of Psychological Science
The University of Western Australia

**Professor Greg Savage**
BSc Monash, PhD Monash, MSc ClinNeuro Melb
Department of Psychology
Macquarie University

**Professor William (Bill) Thompson**
BSc McGill, MA Queen’s, PhD Queen’s
Department of Psychology
Macquarie University

**Professor Rosalind Thornton**
BA Massey, MIA Tsukuba, MA Yale, PhD UConn
Department of Linguistics
Macquarie University

Partner Investigators

**Professor Wendy Best**
BSc UOL, PGdip Dip CUL, MSc BBK, PhD BBK
Division of Psychology and Language Sciences
University College London, UK

**Professor Dorothy Bishop**
BA Oxon, MPhil IoP, PhD Oxon
Department of Experimental Psychology
University of Oxford, UK

**Professor Martin Brüne**
PhD UMG, Habilitation
Clinic for Psychiatry, Psychotherapy and Preventive Medicine
LWL University Hospital, Ruhr University Bochum, Germany

**Professor Naama Friedmann**
MA Tel Aviv, PhD Tel Aviv
School of Education and Sagol School of Neuroscience
Tel Aviv University, Israel

**Professor William Hayward**
BA UC, MA UC, MSc/MPhil Yale, PhD Yale
Faculty of Social Sciences
The University of Hong Kong, Hong Kong

**Professor Michael Hornberger**
BA UOS, MSc UVienna, PhD UCL
Norwich Medical School
University of East Anglia, UK

**Professor Facundo Manes**
MPhil Cantab, PhD Cantab
Institute of Cognitive Neurology
Institute of Neuroscience, Favaloro University, Argentina

**Professor Ryan McKay**
BSc UWA, MClInPsych/PhD Macq
Department of Psychology
Royal Holloway, University of London, UK

**Professor Kate Nation**
BSc York, PhD York
Department of Experimental Psychology
University of Oxford, UK

**Professor Mabel Rice**
BA UNI, MA UNI, PhD Kansas
Department of Speech, Language and Hearing
The University of Kansas, USA

**Professor Andrew (Andy) Young**
BSc Lond, PhD Warwick, DSc Lond
Department of Psychology
The University of York, UK
Centre Funded Associate Investigators

**Dr Nicholas Badcock**  
BSc UWA, MPsych AppDev/PhD UWA  
Department of Cognitive Science  
Macquarie University

**Dr Nathan Caruana**  
BPsych Macq, PhD Macq  
Department of Cognitive Science  
Macquarie University

**Dr Emily Connaughton**  
BBA Macq, BA Macq, PhD/MClinNeuroPsych Macq  
Department of Cognitive Science  
Macquarie University

**Dr Kate Crookes**  
BA/BSc Melb, BSc ANU, PhD ANU  
School of Psychological Science  
The University of Western Australia

**Dr Yong Zhi Foo**  
BSoSc NUS, MSoSc NUS, PhD UWA  
School of Psychological Science  
The University of Western Australia

**Dr Linda Jeffery**  
BA UWA, PhD UWA  
School of Psychological Science  
The University of Western Australia

**Dr Ramón Landín-Romero**  
BSc UMAN, BSc York, MSc UB, PhD UB  
Brain and Mind Centre  
The University of Sydney

**Dr Eva Marinus**  
MS ClinDevPsych UvA, PhD UvA  
Department of Humanities, Social, and Political Sciences  
ETH Zürich, Switzerland

**Dr Simmy Poonian**  
BSc UoA, MSc UCL, PhD UQ  
Department of Cognitive Science  
Macquarie University

**Dr Serje Robidoux**  
BMath UOFW, MA UOFW, PhD UOFW  
Department of Cognitive Science  
Macquarie University

**Dr Clare Sutherland**  
BSc UOG, MPsych York, PhD York  
School of Psychological Science  
The University of Western Australia

**Professor Kirrie Ballard**  
BSpThy UQ, MA NWU, PhD NWU  
Discipline of Speech Pathology  
The University of Sydney

**Dr Ryan Balzan**  
BPsych Adel, PhD Adel  
School of Psychology  
Flinders University

**Dr Erin Banales**  
BBSc La Trobe, PGDipPsych La Trobe, PhD Macq  
Macquarie University Reading Clinic  
Macquarie University

**Associate Professor David Barner**  
BA McGill, BSc McGill, MA Harvard, PhD Harvard  
Department of Psychology  
University of California, San Diego, USA

**Dr Scott Barnes**  
BA UWA, PhD UWA  
Department of Linguistics  
Macquarie University

**Dr Polly Barr**  
BA Bangor, MA Bangor, PhD Macq  
Department of Cognitive Science  
Macquarie University

**Dr Jason Bell**  
BA UWA, PhD UWA  
School of Psychological Science  
The University of Western Australia

**Dr Titia Benders**  
BA UvA, MA UvA, PhD UvA  
Department of Linguistics  
Macquarie University

**Dr Nick Benikos**  
PhD UoW  
Department of Cognitive Science  
Macquarie University

**Dr Christopher Benton**  
BSc UMAN, MSc UMAN, PhD Lond  
Department of Experimental Psychology  
University of Bristol, UK

**Dr Elisabeth (Lisi) Beyersmann**  
MA Stuttgart, PhD Macq  
Department of Cognitive Science  
Macquarie University

**Dr Britta Biedermann**  
MA Uf, PhD Macq  
School of Psychology and Speech Pathology  
Curtin University

**Professor Emma Borg**  
BA KCL, MPhil UCL, PhD UCL  
Department of Philosophy  
University of Reading, UK

**Dr Jon Brock**  
BSc Bristol, PhD Warwick  
Franki Open Science

**Associate Professor Kevin Brooks**  
BSc York, DPhil US  
Department of Psychology  
Macquarie University

**Dr Laurence Bruggeman**  
BA RU, MA RU, PhD WSU  
MARCS Institute  
Western Sydney University

**Dr Jennifer Buckingham**  
BSc UNEW, PhD Macq  
The Centre for Independent Studies
Dr Nicolas Bullot  
MA Polytechnique, MA EHESS, PhD EHESS  
Department of Law, Education, Business and Arts  
Charles Darwin University

Associate Professor Hana Burianová  
BSc U of T, PhD U of T, MA U of T  
Department of Psychology  
Swansea University, UK

Dr James Burrell  
BSc, MBBS UNSW, BA UNSW, PhD UNSW, FRACP  
Brain and Mind Centre  
The University of Sydney

Professor Anthony (Mike) Burton  
BSc UNOT, PhD UNOT, CPsych  
Department of Psychology  
University of York, UK

Dr Nichola Burton  
BA UWA, PhD UWA  
School of Psychological Science  
The University of Western Australia

Dr Christopher Butler  
MA Cantab, MBChB UE, MRCP UK, PhD UOE, MSc UE  
Nuffield Department of Clinical Neurosciences  
University of Oxford, UK

Associate Professor Ivano Caponigro  
BA Pavia, MA UCLA, PhD UCLA  
Department of Linguistics  
University of California, San Diego, USA

Associate Professor Thomas Carlson  
BSc Psych/Mgmt UMN, PhD UMN  
School of Psychology  
The University of Sydney

Dr Leidy Castro-Meneses  
BPsych USCO, PhD Macq  
MARCS Institute  
Western Sydney University

Dr Lisa Ceccherini  
BSc UNIPD, MSc UNIPD, PhD Padova, PhD Macq  
Harrison Grierson, NZ

Dr Trevor Chong  
BMedSc Monash, MB,BS Monash, PhD Melb, FRACP  
School of Psychological Sciences  
Monash University

Dr Danielle Colenbrander  
BLibStud USyd, MSLP Macq, PhD Macq  
School of Experimental Psychology  
University of Bristol, UK

Associate Professor Veronika Coltheart  
BA USyd, PhD Monash  
Department of Psychology  
Macquarie University

Dr Adam Congleton  
BA BU, MA SBU, PhD SBU  
Department of Psychology and Behavioural Sciences  
Aarhus University, Denmark

Dr Michael Connors  
BA USyd, BSc USyd, PhD Macq, MD USyd  
Dementia Collaborative Research Centre  
The University of New South Wales

Dr Philip Corlett  
PhD Cantab  
Department of Psychiatry  
Yale School of Medicine, USA

Dr Rochelle Cox  
BSc UNSW, PhD UNSW  
NSW Department of Education

---

I started at the CCD in 2012 as a PhD student with the Person Perception Program, at The University of Western Australia. After I completed my PhD in 2017, I stayed on with the Centre as a Postdoctoral Research Associate. I investigate the evolutionary basis of human mate preferences, particularly in terms of physical attractiveness. My work draws theoretical and methodological approaches from a range of disciplines, including psychology, evolutionary biology, medicine, and computer science.

My work has benefited substantially from the generous support of the Centre. I was fortunate enough to be awarded a CCD Postdoc Exchange award to visit Professor David Perrett at the University of St Andrews, UK to learn about applying 3D geometric morphometric techniques to quantify face shape. We are now applying this technique to study the links between health and facial appearance using a large-scale public health dataset. The connections and support from the Centre have also allowed me to form collaborations with researchers from a wide range of disciplines, including biology, psychology, and medical science.

I am very glad, and grateful indeed, to have been part of the CCD.

Dr Yong Zhi Foo  
The University of Western Australia
Associate Professor Felicity Cox  
BA DipEd Macq, PhD Macq  
Department of Linguistics  
Macquarie University  

Dr Karen Croot  
PhD Cantab  
School of Psychology  
The University of Sydney  

Professor Linda Cupples  
BSc Monash and Melb, PhD Melb  
Department of Linguistics  
Macquarie University  

Dr Kim Curby  
BSc UOW, MA VANDY, PhD VANDY  
Department of Psychology  
Macquarie University  

Dr Kirsten Dalrymple  
BSc Queen’s, MA UBC, PhD UBC  
Institute of Child Development  
University of Minnesota, USA  

Dr Marshall Dalton  
BA UNSW, PhD UNSW  
Institute of Neurology  
University College London, UK  

Dr Amy Dawel  
BA UTAS/ANU, PhD ANU  
Research School of Psychology  
Australian National University  

Dr Peter de Lissa  
BSc Macq, MSc Maastricht, PhD Macq  
Department of Psychology  
University of Fribourg, Switzerland  

Dr Bianca de Wit  
BSc EUR, MSc EUR, PhD Macq  
Department of Cognitive Science  
Macquarie University  

Associate Professor Antonio Di Ieva  
MD UNINA, PhD MUW, FRACS  
Department of Clinical Medicine  
Macquarie University  

Dr Anastasiia Dockhorn-Romanova  
BA SPSU, MSc/MA Potsdam, PhD Macq  
The Collaborative Research Centre SFB 1287  
Limits of Variability in Language  
University of Potsdam, Germany  

Dr Kimberley Docking  
BSpPath UQ, PhD UQ  
Discipline of Speech Pathology  
The University of Sydney  

Professor Bradley Duchaine  
BA M3, PhD UCSD  
Department of Psychological and Brain Sciences  
Dartmouth College, USA  

Dr Sonja Eisenbeiss  
MA UoC, PhD HHU  
Department of Linguistics  
University of Cologne, Germany  

Dr Louise Ewing  
BA UWA, MPsych AppDev/PhD UWA  
Department of Psychological Science  
Birkbeck, University of London, UK  

Dr Nora Fieder  
PhD Macq, DipPathLing UNEW, PhD Macq  
Berlin School of Mind and Brain  
Humboldt University of Berlin, Germany  

Associate Professor Matthew Finkbeiner  
BA Arizona State, MA TESL Arizona State, PhD Arizona  
Department of Cognitive Science  
Macquarie University  

Dr Chiara Fiorentini  
MA Vita-Salute San Raffaele, PhD Geneva  
Swiss Center for Affective Sciences  
University of Geneva, Switzerland  

Professor Ken Forster  
BA Melb, MA Melb, PhD Illinois  

Dr Jason Friedman  
BSc Monash, MSc Weizmann, PhD Weizmann  
Department of Physical Therapy  
Tel Aviv University, Israel  

Dr Michael Gascoigne  
BA USyd, DClmPsych USyd, PhD USyd  
Australian College of Applied Psychology  

Dr Iain Giblin  
BA UNSW, PhD UNSW, PhD MIT  
Department of Linguistics  
Macquarie University  

Dr Erin Goddard  
BSc USyd, PhD USyd  
Department of Ophthalmology  
Montreal General Hospital, Canada  

Dr Oren Griffiths  
BA UNSW, PhD UNSW, MClinPsych UNSW  
School of Psychology  
The University of New South Wales  

Dr Tijl Grootswagers  
BSc RU, MSc RU, PhD Macq  
School of Psychology  
The University of Sydney  

Professor Maria Teresa Guasti  
BPhil Milan, PhD Geneva  
Department of Psychology  
University of Milano-Bicocca, Italy  

Dr Aviah Gvion  
BA Tel Aviv, MA Tel Aviv, PhD Tel Aviv  
Communication Sciences and Disorders Department,  
Ono Academic College, Israel  
Reuth Rehabilitation Hospital, Israel  
Language and Brain Lab, Tel Aviv University, Israel  

Professor Peter Halligan  
BA UCD, MA UCD, PhD OBU, DSc UWI  
School of Psychology  
Cardiff University, UK  

Dr Solène Hameau  
DiplLangSpeechPath Henri Poincaré, Hons Nantes, MA Toulouse, PhD Macq  
Department of Cognitive Science  
Macquarie University  

Dr Celia Harris  
BSc UNSW, PhD Macq  
Department of Cognitive Science  
Macquarie University  

Dr Elisabeth (Liz) Harrison  
BApSc SpPath USyd, PhD USyd  
Department of Linguistics  
Macquarie University  

Dr Wei He  
BMedSc Sichuan, MD ZJU, PhD Macq  
Department of Cognitive Science  
Macquarie University
I was fortunate to be supported by the CCD through the Postdoc Exchange Scheme in 2018 to visit Associate Professor Jeremy Wilmer at Wellesley College, USA. The funding also allowed me to visit Facebook HQ in New York where I spoke to scientists investigating online trust. Dr Wilmer is at the forefront of research on individual differences in face perception, having published multiple high-profile papers using twin analysis. Thanks to his expertise, I was quickly able to learn and apply cutting-edge behavioural genetics techniques to lead an exciting project on the genetic basis of trust impressions. Being based in Dr Wilmer’s lab for a month allowed us to develop a meaningful collaboration - the start of a long-standing link.

An additional benefit was that Laura McLaughlin Enfors, a CCD PhD student, also concurrently visited Dr Wilmer’s lab. This visit opened up unique opportunities. For example, we gave well-received symposia at Wellesley College, Boston Medical School, and McLean Hospital. Following the visit, we delivered two workshops on twin analysis and structural equation modelling at The University of Western Australia. Workshop materials are openly published: github.com/ClareSutherland.

By joining the CCD, I have greatly benefitted from outstanding financial resources and intellectual opportunities. I have been able to build collaborations with fantastic early career researchers, and have received mentorship by research leaders across fields. This support has been instrumental in allowing me to secure a 2019 DECRA.

None of this would be possible without the truly fantastic research support the CCD offers to its early career researchers.

Dr Clare Sutherland
The University of Western Australia
Associate Professor Nenagh Kemp  
BA UTAS, DPhil Oxon  
School of Psychology  
University of Tasmania

Associate Professor Drew Khlentzos  
BSc USyd, BA Macq, PhD ANU  
Department of Linguistics  
Macquarie University

Associate Professor Sachiko Kinoshita  
BSc UNSW, PhD UNSW  
Department of Psychology  
Macquarie University

Dr Colin Klein  
BA F&M, PhD PU  
Department of Philosophy  
Australian National University

Dr Nadine Kloth  
MSc UMG, PhD FSU  
School of Psychological Science  
The University of Western Australia

Dr Saskia Kohnen  
MA Potsdam, PhD Macq  
Department of Cognitive Science  
Macquarie University

Dr Loes Koring  
BA UU, MA UU, PhD UU  
Department of Languages, Literature and Communication  
Utrecht University, The Netherlands

Dr Trudy (Janna) Krajenbrink  
BA Groningen, MA Groningen, PhD Macq/IDEALAB

Dr Fiona Kumfor  
BPsych UNSW, M Clin Neuropsych Macq, PhD UNSW  
Brain and Mind Centre  
The University of Sydney

Dr Carmen Kung  
BA MUN, MSc RU, PhD RU  
Department of Linguistics  
Macquarie University

Dr Linda Larsen  
BSc Macq, PhD Macq  
Department of Special Needs Education  
University of Oslo, Norway

Dr Louise Lavrencic  
BA UniSA, PhD UniSA  
Neuroscience Research of Australia  
The University of New South Wales

Dr Mike Le Pelley  
BA Cantab, PhD Cantab  
School of Psychology  
The University of New South Wales

Dr Rose Ru-Whui Lee  
BA NCKU, MA USC, PhD NTNU  
Institute of Physics  
Academia Sinica, Taiwan

Associate Professor Suze Leitão  
BMedSci Speech USHeF, Grad Dip SpPath Curtin, PhD UWA  
School of Occupational Therapy, Social Work and Speech Pathology  
Curtin University

Dr Cristian Leyton  
BMed USACH, Grad Dip Neuro PUC, PhD UNSW  
Faculty of Health Sciences  
The University of Sydney

Cheng Tao Liang  
BAdvSc USyd  
Brain and Mind Centre  
The University of Sydney

Dr David Lick  
BA UVA, MA UCLA, PhD UCLA  
Department of Psychology  
New York University, USA

Dr Susan Lin  
BA UC Berkeley, PhD UM-Ann Arbor  
Department of Linguistics  
University of California, Berkeley, USA

Professor Ottmar Lipp  
DipPsych Giessen, PhD Giessen, FASSA, FAPS  
School of Psychology and Speech Pathology  
Curtin University

Dr Robin Litt  
BA SCR, PhD/DPhil Oxon  
Rocky Mountain Literacy and Child Development  
Denver, USA

Dr Weiyi Ma  
BA CWNU, MA Sichuan, MA UDEL, MA UDEL, PhD UDEL  
School of Human Environmental Sciences  
University of Arkansas, USA

Dr Yatin Mahajan  
BSc Mysore, MSc Mysore, PhD Macq  
The MARCS Institute  
Western Sydney University

Dr Robert Mannell  
BSc UNSW, BA UTAS, BA Macq, PhD Macq  
Department of Linguistics  
Macquarie University

Dr Aurélie Manuel Stocker  
BA UNIL, MA UNIL, PhD CHUV  
Brain and Mind Centre  
The University of Sydney

Professor Theo Marinis  
BA NKUA, PhD Potsdam  
Department of Linguistics  
University of Konstanz, Germany

Professor Daphne Maurer  
PhD Minnesota  
Visual Development Lab  
McMaster University, Canada

Associate Professor Simon McCarthy-Jones  
BSc Durham, PGDipPsych UNOT, MA Durham, PhD Durham  
School of Medicine  
Trinity College Dublin, Ireland

Dr Jonathan McGuire  
BPsych Macq, PhD Macq  
Mental Health Commission of NSW

Professor Elinor McKone  
BSc ANU, Grad Dip Sci ANU, PhD ANU  
Research School of Psychology  
Australian National University

Professor Catherine McMahon  
BSc UWA, PG Dip Audio Melb, PhD UWA, PG Dip Ed Macq  
Department of Linguistics  
Macquarie University

Associate Professor Michelle Meade  
BA GC, MA UW, PhD UW  
Department of Psychology  
Montana State University, USA
I have been an Associate Investigator within the Belief Formation Program since the inception of the CCD. My research investigates the problematic thinking styles that lead to the development and maintenance of delusions. As a clinician, I am also interested in investigating the efficacy of novel psychological treatments that aim to encourage people experiencing delusions to observe how problematic thinking styles may explain their unusual beliefs.

In 2018, I was fortunate to be a recipient of the Postdoc Exchange Scheme, which enabled me to visit Partner Investigator, Professor Ryan McKay’s lab at the Department of Psychology at Royal Holloway, University of London, UK. Specifically, we were investigating why people with delusions tend to disregard information that does not support their beliefs. The findings from this collaboration may help to explain why delusions are resistant to change (e.g., a person experiencing the delusion that he has magical powers will cling to this belief despite multiple failed attempts to communicate telepathically).

I was also able to use the funds to attend Beckfest 2018 at the University of Oxford, UK. Beckfest is an annual international academic meeting for clinical researchers investigating novel psychotherapies for psychosis, and is named in honour of Dr Aaron T. Beck, founder of the cognitive behavioural therapy (CBT).

I would like to thank the CCD for their generous support. The Postdoc Exchange Scheme has not only raised my international research profile and fostered new collaborations but has also helped shape the direction of my future research, based on the latest approaches and techniques from leading experts in the field.
Dr Sallyanne Palethorpe  
BSc USyd, PhD Macq  
Department of Cognitive Science  
Macquarie University  

Dr Iain Perkes  
BMedSc UNEW, BMed UNEW  
Brain and Mind Centre  
The University of Sydney  

Dr Vince Polito  
BPsych Macq, PhD Macq  
Department of Cognitive Science  
Macquarie University  

Associate Professor Melanie Porter  
MAPS, BPsych Macq, MCLIN Neuropsych Macq, PhD Macq, CCN  
Department of Psychology  
Macquarie University  

Dr Stephen Pritchard  
BA/BE UNSW, PhD Macq  
School of Psychology  
The University of New South Wales  

Dr Michael Proctor  
BA UNSW, BE UNSW, MA UQ, MPhil Yale, MA Yale, PhD Yale  
Department of Linguistics  
Macquarie University  

Dr Kylie Radford  
BLib USyd, PhD USyd, DCLIN Neuro USyd  
Neuroscience Research Australia  
The University of New South Wales  

Professor Kathleen Rastle  
PhD Macq  
Department of Psychology  
Royal Holloway, University of London, UK  

Professor Peter Rendell  
BSc Monash, DipEdPsych Monash, MEd Monash, PhD Monash  
School of Psychology  
Australian Catholic University  

Dr Kati Renvall  
MA Helsinki, PhD Turku  
Department of Behavioural Sciences and Philosophy  
University of Turku, Finland  

Associate Professor Anina Rich  
BSc Monash, MPsych/PhD Melb  
Department of Cognitive Science  
Macquarie University  

Dr Kay Ritchie  
MA UOA, PhD UOA  
School of Psychology  
University of Lincoln, UK  

Dr Amanda Robinson  
BA UQ, BSc UQ, PhD UQ  
Department of Cognitive Science  
Macquarie University  

Dr Jacopo Romoli  
BA UNIMIB, BA UNIMIB, PhD Harvard, PG CertEdu UOU  
School of Communication  
University of Ulster, UK  

Dr Daniel Roquet  
MSc UDS, MSc UPMF, PhD UDS  
Brain and Mind Centre  
The University of Sydney  

Dr Nathan Rose  
BSc Aquinas, MA WashU, PhD WashU  
Department of Psychology  
University of Notre Dame, USA  

Dr Robert Ross  
BA/BSc UOA, BSc UOA, MSc UOA, PhD Macq  
Department of Psychology  
Royal Holloway, University of London, UK  

Professor Jason Rothman  
BA Cornell, MA UCLA, PhD UCLA  
School of Psychology and Clinical Language Sciences  
University of Reading, UK  

Professor Mel Rutherford  
BA Yale, PhD UCSB  
Department of Psychology  
McMaster University, Canada  

Professor James Douglas Saddy  
BA SFU, MA UQ, PhD MIT  
School of Psychology and Clinical Language Sciences  
University of Reading, UK  

Dr Ami Sambai  
BA Tsukuba, MA Tsukuba, PhD Tsukuba  
Faculty of Education  
Osaka Kyoiku University, Japan  

Dr Ulrich (Uli) Sauerland  
MSc UKON, PhD MIT  
Center for General Linguistics  
ZAS Berlin, Germany  

Dr Sharon Savage  
BPsych Macq, MCLIN Psych Macq, PhD UNSW  
Department of Psychology  
University of Exeter, UK  

Dr Xenia Schmalz  
BSc ANU, PhD Macq  
Department of Developmental Psychology and Socialisation  
University of Padova, Italy  

Dr Elaine Schmidt  
MPhil Cantab, PhD Cantab  
Cambridge Language Sciences  
University of Cambridge, UK  

Dr Teresa Schubert  
BA UNC, MA JHU, PhD JHU  
Department of Psychology  
Harvard University, USA  

Professor Stefan Schweinberger  
DipPsych UKON, PhD UKON  
Department of General Psychology  
Friedrich Schiller University of Jena, Germany  

Dr Kiley Seymour  
MSc Tuebingen, PhD USyd  
School of Social Sciences and Psychology  
Western Sydney University  

Professor Leigh Simmons  
BSc Nottingham, PhD Nottingham, FAA  
Centre for Evolutionary Biology  
The University of Western Australia  

Dr Andy Skinner  
BEng UE, BSc Bristol, PhD Bristol  
School of Experimental Psychology  
University of Bristol, UK  

Professor Mary Lou Smith  
BSc STFX, MSc McGill, PhD McGill  
Department of Psychology  
University of Toronto Mississauga, Canada  

Dr Karen Smith-Lock  
BSc U of T, MHSc U of T, PhD UConn  
School of Psychology and Speech Pathology  
Curtin University
My research focuses on belief formation - in particular, religious belief, delusional belief, and politically partisan belief. In 2011 I joined the CCD as a PhD candidate in the Belief Formation Program at Macquarie University. After completing my PhD in 2015 I retained my CCD affiliation as an Associate Investigator while employed in postdoctoral positions at Royal Holloway, University of London, UK and the University of Oxford, UK. In 2019 I will return to Macquarie University as a Research Associate in the Department of Philosophy.

In 2018 I was fortunate to be a recipient of the CCD’s Postdoc Exchange Scheme which supported a three-month visit to Associate Professor David Rand’s Human Cooperation Lab at Yale University, USA. Here I participated in diverse lab meetings and seminars, met with leading academics to discuss research ideas, and developed friendships and collaborations. As a direct result of this lab visit, I have developed two ongoing collaborative projects that I expect will be published in 2019. The first explores the relationship between reasoning style and religious belief. The second explores the psychology of belief in and sharing of hyperpartisan political news through social media. This invaluable opportunity for me to further my academic career would not have been possible without the support of the CCD.

Dr Robert Ross
Royal Holloway, University of London, UK
Dr Hua-Chen Wang
BA National Chiao-Tung, MSc Potsdam, PhD Macq
Department of Cognitive Science
Macquarie University

Dr Xin Wang
BA BLCU, MA UA, PhD UA
Department of Linguistics
Macquarie University

Dr Susan Wardle
BA USyd, PhD USyd
Laboratory of Brain and Cognition
National Institute of Mental Health, USA

Dr Malin Wass
MSc Umeå, PhD Linköping
Department of Business Administration, Technology and Social Sciences
Luleå University of Technology, Sweden

Professor Michael Webster
BA UCSD, PhD UC Berkeley
Department of Psychology
University of Nevada, Reno, USA

Dr David White
BSc York, PhD UOG
School of Psychology
The University of New South Wales

Professor Mark Williams
BSc Monash, PhD Monash
Department of Cognitive Science
Macquarie University

Dr Megan Willis
BPsych Macq, PhD Macq
School of Psychology
Australian Catholic University

Dr Stephanie Wong
BPsych USyd, PhD/MClinNeuroPsych Macq
Brain and Mind Centre
The University of Sydney

Dr Cara Wong
BSc USyd, PhD USyd, MClinNeuro Macq
National Acoustics Laboratories

Dr Quincy Wong
BPsych USyd, PhD/MClinPsych UNSW
Black Dog Institute
Prince of Wales Hospital

Dr Alexandra Woolgar
BA Cantab, MA Cantab, PhD Cantab
MRC Cognition and Brain Sciences Unit
University of Cambridge, UK

Professor Denise Wu
BSc NTU, MA CCU, PhD Rice
Institute of Cognitive Neuroscience
National Central University, Taiwan

Dr Nan Xu Rattanasone
BAppHlthSc USyd, BA UWS, PhD UWS
Department of Linguistics
Macquarie University

Dr Jie Yang
BSc PKU, MSc PKU, PhD BNU
Solodkin/Small Brain Circuits Laboratory
University of California, Irvine, USA

Dr Shu Hui Yau
BSc Hull, PhD Macq
Graduate School of Education
University of Bristol, UK

Dr Eiling Yee
BA UR, PhD BU
Department of Psychology
University of Connecticut, USA

Dr Ivan Yuen
BA Reading, MSc Edinburgh, PhD Edinburgh
Department of Linguistics
Macquarie University

Professor Adam Zeman
BA Oxon, BM BCh Oxon, MRCP RCP, DM, FRCP RCP
Department of Psychology
University of Exeter, UK

Associate Professor Peng Zhou
BA BLCU, MA BLCU, PhD Macq
Department of Foreign Languages and Literatures
Tsinghua University, China

Dr Regine Zopf
MSc Tübingen, DipPsych Tübingen, PhD Macq
Department of Cognitive Science
Macquarie University
### RESEARCH SUPPORT STAFF

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>Education/Qualification</th>
<th>Department/University</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dr Nick Benikos</strong> (from June 2018)</td>
<td>Acting MEG Lab Technical Officer</td>
<td>PhD UoW Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Robin Blumfield</strong></td>
<td>Executive Assistant to the Centre Director</td>
<td>Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Rebecca Gelding</strong> (from October 2018)</td>
<td>Outreach Coordinator</td>
<td>BSc (Adv Math) USyd, MEd Macq Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Sarah Homewood</strong></td>
<td>Personal Assistant</td>
<td>Lab Manager</td>
<td>Brain and Mind Centre The University of Sydney</td>
</tr>
<tr>
<td><strong>Dr Rosalind Hutchings</strong> (from September 2018)</td>
<td>Administrative Officer</td>
<td>BASc USyd, PhD USyd Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Dr Daniel Johnston</strong> (from April 2018)</td>
<td>Research Grants Officer</td>
<td>BA Macq, BA USyd, BA Cantab, MA Cantab, PhD USyd Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Dr Marion Kellenbach</strong></td>
<td>Recruitment and Assessment Coordinator</td>
<td>BA Macq, PhD Macq Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Lesley McKnight</strong></td>
<td>HDR</td>
<td>HR Administrator</td>
<td>Department of Cognitive Science Macquarie University</td>
</tr>
<tr>
<td><strong>Marcus Ockenden</strong></td>
<td>Technical Support Assistant</td>
<td>BSc Macq Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Craig Richardson</strong></td>
<td>Systems Analyst</td>
<td>BSc Macq Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Dr Carolynn (K-lynn) Smith</strong> (until October 2018)</td>
<td>Outreach Coordinator</td>
<td>BA Maryland, BS Maryland, MSc GMU, Phd Macq Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Elisabeth Stylianou</strong> (parental leave from July 2018)</td>
<td>MEG Lab Technical Officer</td>
<td>BE Mtrx and BMedSci USyd, MSc USyd Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Dr Stan Tarnavskii</strong></td>
<td>Senior Scientific Advisor</td>
<td>MSc MIPT, PhD SRRIPP Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Elizabeth (Libby) Taylor</strong></td>
<td>Research Officer and Lab Manager</td>
<td>BA UWA School of Psychological Science The University of Western Australia</td>
<td></td>
</tr>
<tr>
<td><strong>Anne van Uden</strong> (until September 2018)</td>
<td>Administrative Officer</td>
<td>Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Katie Webb</strong></td>
<td>Financial Executive Officer</td>
<td>BCom Accg Macq Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
<tr>
<td><strong>Dr Lisa Yen</strong></td>
<td>Chief Operations Officer</td>
<td>BPsych Macq, PhD Macq Department of Cognitive Science Macquarie University</td>
<td></td>
</tr>
</tbody>
</table>
STUDENTS

PhD

Joanna Alexi
PhD, The University of Western Australia
Dr Jason Bell, Associate Professor Romina Palermo, Dr Nadine Kloth and Dr Sue Byrne (The University of Western Australia)
Serial dependence, body perception and disordered eating.

Noga Balaban
PhD, Tel Aviv University, Israel
Professor Naama Friedmann and Dr Yoad Winter (Utrecht University, The Netherlands)
Learning about contrastive conjunctives from individuals with brain damage.

Lydia Barnes
PhD, Macquarie University
Dr Nicholas Badcock and Professor Genevieve McArthur
Control of everyday skilled actions.

Dr Cory Bill
PhD, Macquarie University
Professor Stephen Crain and Professor Rosalind Thornton
Children take only some sentences literally: investigating children’s variable performance with scalar inferences.

Maira Braga
PhD, The University of Western Australia
Associate Professor Romina Palermo and Dr Linda Jeffery
The association between social anxiety, shyness and face recognition ability in children.

Olivia Brancatisano
PhD, Macquarie University
Professor William (Bill) Thompson and Associate Professor Paul Sowman
Understanding the therapeutic capacities of music for individuals with dementia.

Dr Catherine Browning
PhD, Macquarie University
Dr Celia Harris and Professor Amanda Barnier
Collaboration and prospective memory: Costs, benefits and helpful processes for strangers and intimate couples.

Dr Ann Carrigan
PhD, Macquarie University
Associate Professor Anina Rich and Dr Susan Wardle
Expertise in visual search of medical and non-medical images.

Hui-Ching Chen
PhD, Macquarie University
Professor Barbara Höhle (University of Potsdam, Germany), Professor Stephen Crain and Professor Lyndsey Nickels
The acquisition of the information structure.

Yu (Sherry) Chen
PhD, The University of Sydney
Professor Olivier Piguet and Dr Fiona Kumfor
Physiology of emotional memory in frontotemporal dementia.

Jemma Collova
PhD, The University of Western Australia
Professor Gillian Rhodes and Dr Clare Sutherland
First impressions of children’s faces.

Ella Creet
PhD, Newcastle University, UK
Professor Lyndsey Nickels and Dr Julie Morris (Newcastle University, UK)
Exploring the mechanisms underlying improvements in word retrieval for individuals with aphasia.

Dr Benjamin Davies
PhD, Macquarie University
Professor Katherine Demuth and Dr Nan Xu Rattanasone
Children’s gradual acquisition of singular and plural.

Robina Day
PhD, Macquarie University
Professor William (Bill) Thompson and Dr Simon Boag (Macquarie University)
The role of visual imagery in the elicitation of emotions through music.

Dr Laura Dondzilo
PhD, The University of Western Australia
Dr Jason Bell, Associate Professor Romina Palermo and Associate Professor Sue Byrne (The University of Western Australia)
The relationship between attentional bias and motivational orientation towards female bodyshape.

Dror Dotan
PhD, Tel Aviv University, Israel
Professor Naama Friedmann
Syntactic and quantity processing of multi-digit numbers.

Laura McLaughlin Engfors
PhD, The University of Western Australia
Associate Professor Romina Palermo and Dr Linda Jeffery
Factors that contribute to individual differences in face recognition ability.

Dr Anna Fiveash
PhD, Macquarie University
Professor William (Bill) Thompson and Professor Genevieve McArthur
The nature of syntactic processing in music and language.

Deanna Francis
PhD, Macquarie University
Professor Genevieve McArthur and Professor Jennifer Hudson
The relationship between children’s reading ability and emotional health.

Amanda Fullerton
PhD, Macquarie University
Professor Catherine McMahon and Associate Professor Blake Johnson
Brain changes following cochlear implantation in older adults.

Rebecca Golding
PhD, Macquarie University
Associate Professor Blake Johnson and Professor William (Bill) Thompson
Auditory-sensorimotor brain function during mental imagery of musical pitch and rhythm.

Rakshita Gokula
PhD, Macquarie University
Associate Professor Mridula Sharma (Macquarie University), Professor Linda Cupples, Associate Professor Mary Rudner (Linköping University, Sweden) and Associate Professor Joanne Arciuli (The University of Sydney)
Hearing, listening and reading: A new model to understand how what we hear affects how we learn to read.
Irene Graafsma  
PhD, Macquarie University  
Dr Eva Marinus, Dr Serge Robidoux,教授 Lyndsey Nickels,  
Assistant Professor Wim Tops, (University of Groningen, The Netherlands) and Professor Roelien Bastiaanse (University of Groningen, The Netherlands)  
Differences and overlap in cognitive processes in programming and natural language learning: Evidence from neurotypical and autism-spectrum disorder populations.

Revital Guggenheim  
PhD, Tel Aviv University, Israel  
Professor Naama Friedmann  
The effect of phonological output buffer impairment on reading, writing and syntax.

Inga Hameister  
PhD, Macquarie University  
Professor Lyndsey Nickels and Professor Roelien Bastiaanse (University of Groningen, The Netherlands)  
Conceptualisation in stroke-induced and primary progressive aphasia.

Dr Kate Hardwick  
PhD, Macquarie University  
Professor Mark Williams and Associate Professor Anina Rich  
Is ‘sexual’ a sub-type of disgust, or is it a separate basic emotion?

Heivet Hernandez Perez  
PhD, Macquarie University  
Professor Catherine McMahon, Dr Jessica Monaghan (Macquarie University) and Professor Sumitrajt Dhar (Northwestern University, USA)  
Disentangling the influence of attention in the auditory efferent system during speech processing.

Chris Hewitson  
PhD, Macquarie University  
Dr David Kaplan and Associate Professor Paul Sowman  
Investigating the neural mechanisms underlying Bayesian sensorimotor learning.

Rebecca Holt  
PhD, Macquarie University  
Professor Katherine Demuth and Dr Laurence Bruggeman  
Factors affecting sentence processing among children with and without hearing impairment.

Dr Haiquan (David) Huang  
PhD, Macquarie University  
Professor Stephen Crain, Professor Rosalind Thornton and Associate Professor Peng Zhou  
Mandarin-speaking children’s knowledge of entailments and inferences.

Dr Rosalind Hutchings  
PhD, The University of Sydney  
Professor Olivier Piguet and Dr Fiona Kumfor  
Face processing in frontotemporal dementia.

Emma Johnson  
PhD, The University of Sydney  
Dr Fiona Kumfor and Professor Olivier Piguet  
Investigating motivational changes in frontotemporal dementia and Alzheimer’s disease.

Samantha-Kaye Johnston  
PhD, Curtin University  
Dr Neville Hennessey (Curtin University) and Dr Suze Leitão  
The relationship between the attention network, phonological processing and reading development in typically developing and disordered reading populations.

I had the good fortune of being a recipient of a 2018 CCD Student Exchange Scheme award to spend one month with Associate Professor Jeremy Wilmer of the Human Variation lab, Wellesley College, USA. Jeremy is widely known in the field as an exceptional and infectiously enthusiastic researcher of individual differences in face recognition performance, the focus of my own PhD research. During my month there, Jeremy was a brilliant mentor and devoted an incredible amount of focussed energy to my project. Jeremy generously provided a number of large data sets that allowed me investigate an important question related to my PhD project. I was able to refine my understanding of structural equation modelling (SEM) and I was also taught how to apply this technique in R Jeremy and I are currently drafting our first manuscript together based on this work, which will also form the final chapter of my PhD thesis.

During my exchange, I had the opportunity to present my PhD research to three world class institutions: Wellesley College, Dr Laura Germine’s lab at McLean Hospital, and Associate Professor Joseph DeGutis’ lab at Harvard Medical School. As well as presenting at the largest conference in our field - the Vision Sciences Society Meeting in Florida. The connections gained via these experiences have led to further correspondences and have put me in a good position for future collaborations.

This exchange made possible by the CCD has greatly enriched my PhD. Thank you, CCD for making this exceptional opportunity possible!

Laura McLaughlin Engfors  
The University of Western Australia
<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Collaborators</th>
<th>Research Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Nenad Jovanovic</td>
<td>PhD, University of Potsdam, Germany</td>
<td>Professor Lyndsey Nickels, Professor Barbara Höhle (University of Potsdam, Germany), and Dr Kai Alter</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Newcastle University, UK)</td>
<td>The effect of rhythmic auditory priming on SLI children’s processing of syntax.</td>
</tr>
<tr>
<td>Antonios Kaldas</td>
<td>PhD, Macquarie University</td>
<td>Professor Richard Menary and Associate Professor Alex Holcombe (The University of Sydney)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Attention, consciousness and working memory.</td>
</tr>
<tr>
<td>Lilach Khentov-Kraus</td>
<td>PhD, Tel Aviv University, Israel</td>
<td>Professor Naama Friedmann</td>
<td>The distribution of developmental dyslexias.</td>
</tr>
<tr>
<td>Haleigh Khoshkhoy Delshad</td>
<td>PhD, Macquarie University</td>
<td>Professor Mark Williams and Associate Professor Anina Rich</td>
<td>Using fMRI to study the underlying neural network of the implicit visual episodic memory.</td>
</tr>
<tr>
<td>Leonie Lampe</td>
<td>PhD, Macquarie University</td>
<td>Professor Lyndsey Nickels and Dr Nora Fielder</td>
<td>Understanding language processing in aphasia.</td>
</tr>
<tr>
<td>Jo Lane</td>
<td>PhD, Australian National University</td>
<td>Professor Elinor McKone, Professor Ted Maddess (Australian National University), Professor Jan Provis (Australian National University), and Associate Professor Nick Barnes (Australian National University)</td>
<td>Age-related macular degeneration and face recognition.</td>
</tr>
<tr>
<td>Dr Yu Li</td>
<td>PhD, Macquarie University</td>
<td>Professor Anne Castles and Associate Professor Sachiko Kinoshita</td>
<td>Early neural dynamics of visual word recognition.</td>
</tr>
<tr>
<td>Luan Li</td>
<td>PhD, Macquarie University</td>
<td>Dr Hua-Chen Wang, Professor Anne Castles and Dr Eva Marinus</td>
<td>Lexical consolidation in learning to read in Chinese.</td>
</tr>
<tr>
<td>Chi Yhun Lo</td>
<td>PhD, Macquarie University</td>
<td>Professor Catherine McMahon, Professor William (Bill) Thompson and Dr Valerie Love (Sydney Cochlear Implant Centre)</td>
<td>Benefits of music training for children with hearing loss.</td>
</tr>
<tr>
<td>Zhe (Jill) Long</td>
<td>PhD, The University of Sydney</td>
<td>Dr James Burrell, Professor Olivier Piguet and Professor Glenda Halliday (The University of New South Wales)</td>
<td>Clinicopathological correlation in frontotemporal dementia and motor neuron disease.</td>
</tr>
<tr>
<td>Georgina Macken</td>
<td>PhD, The New School for Social Research, USA</td>
<td>Professor William Hirst (The New School for Social Research, USA), Professor Wendy D’Andrea (The New School for Social Research, USA) and Associate Professor Anina Rich</td>
<td>The stranger effect: In search of an accurate intelligence score for children with autism.</td>
</tr>
<tr>
<td>Tina Marusch</td>
<td>PhD, Macquarie University</td>
<td>Professor Lyndsey Nickels and Dr Frank Burchert (University of Potsdam, Germany)</td>
<td>Language production of verbal inflectional morphology in healthy and impaired adult speakers of German and English.</td>
</tr>
<tr>
<td>Dr Qingqing (David) Meng</td>
<td>PhD, Macquarie University</td>
<td>Associate Professor Blake Johnson and Professor Catherine McMahon (Australian National University) and Dr Amy Dawel</td>
<td>Neuromagnetic approaches to measuring auditory brain function in cochlear implant recipients: MEG markers of speech processing and evaluation of a prototype MEG system.</td>
</tr>
<tr>
<td>Bethanie Menzies</td>
<td>PhD, The University of Sydney</td>
<td>Associate Professor Sunciica (Sunny) Lah and Professor Sally Andrews (The University of Sydney)</td>
<td>Memory consolidation in sleep for children with obstructive sleep apnea.</td>
</tr>
<tr>
<td>Paige Mewton</td>
<td>PhD, Australian National University</td>
<td>Associate Professor Bruce Christensen (Australian National University), Professor Michael Smithson (Australian National University) and Dr Amy Dawel</td>
<td>The acquisition of acoustic cues to English voicing contrasts.</td>
</tr>
<tr>
<td>Julien Millasseau</td>
<td>PhD, Macquarie University</td>
<td>Professor Katherine Demuth, Dr Laurence Bruggeman and Dr Ivan Yuen (The University of New South Wales)</td>
<td>Identifying the mechanisms of impaired face processing in schizophrenia.</td>
</tr>
<tr>
<td>Luke Mills</td>
<td>PhD, Macquarie University</td>
<td>Associate Professor Sachiko Kinoshita and Dr Chris Donkin (The University of New South Wales)</td>
<td>The task of reading modulated by attentional control.</td>
</tr>
<tr>
<td>Claire Murphy</td>
<td>PhD, University College London, UK</td>
<td>Professor Wendy Best and Professor Chris Donlan (University College London, UK)</td>
<td>Profiling children with language and literacy needs: Defining skill-sets and evaluating responses to vocabulary/context-based strategy intervention.</td>
</tr>
<tr>
<td>Ana Murteira</td>
<td>PhD, Macquarie University</td>
<td>Professor Lyndsey Nickels and Associate Professor Paul Sowman</td>
<td>Effect of gesture observation on action-verb naming.</td>
</tr>
<tr>
<td>Andi Musrah</td>
<td>PhD, The University of Sydney</td>
<td>Professor Olivier Piguet and Dr Fiona Kumfor</td>
<td>Computational architecture of emotion coherence in frontotemporal dementia (FTD).</td>
</tr>
<tr>
<td>Annabelle Nankoo</td>
<td>PhD, The University of Western Australia</td>
<td>Dr Jason Bell, Associate Professor Romina Palermo and Associate Professor Carmela Pestell (The University of Western Australia)</td>
<td>Timing deficits, inattention and emotional dysregulation in patients with attention-deficit/hyperactivity disorder.</td>
</tr>
</tbody>
</table>
100
53

CENTRE MEMBERS

Hanh Nguyen
PhD, Newcastle University, UK
Dr Julie Morris (Newcastle University, UK), Professor Lyndsey Nickels and Dr Janet Webster (Newcastle University, UK)
Prior knowledge in text comprehension in healthy readers and readers with aphasia.

Samantha Parker
PhD, Macquarie University
Associate Professor Matthew Finkbeiner and Professor Andrew Heathcote (University of Tasmania)
Investigating the relationship between attention and eye movements during decision making.

Joshua Penney
PhD, Macquarie University
Associate Professor Felicity Cox and Dr Anita Szakay
Production and perception of glottalisation in Australian English.

Gemma Perry
PhD, Macquarie University
Professor William (Bill) Thompson and Dr Vince Polito
Can chanting alter DNA expression related to stress and social connection.

Selene Petit
PhD, Macquarie University
Dr Nicholas Badcock and Dr Alexandra Woolgar
Discovering preserved linguistic abilities in non-verbal children with autism.

Sarah Pini
PhD, Macquarie University
Professor John Sutton, Professor Greg Downey (Macquarie University) and Dr Julie-Anne Long (Macquarie University)
Dancing bodies, shaped minds: An ecological approach to kinesthetic intelligence.

Dr Valerie (Yi) Pu
PhD, Macquarie University
Associate Professor Blake Johnson and Professor Stephen Crain
Human hippocampal theta and high-gamma oscillations in spatial encoding and consolidation in a virtual Morris water maze task.

Siddharth Ramanan
PhD, The University of Sydney
Professor Olivier Piguet and Associate Professor Muireann Irish
Developing novel tests of non-verbal memory in neurodegenerative disorders.

Laura Ramos
PhD, University of Technology Sydney
Professor Elise van den Hoven
Design to support memory function in older adults for everyday living.

Hannah Rapaport
PhD, Macquarie University
Associate Professor Paul Sowman, Professor Elizabeth (Liz) Pellicano and Dr Wei He
The development of predictive brain function in preschool children.

Louise Ratko
PhD, Macquarie University
Dr Michael Proctor and Associate Professor Felicity Cox
Articulatory characterisation of vowel length contrasts in Australian English.

Being awarded the CCD student travel grant provided me the opportunity to visit the Sensorimotor Neuroscience lab at the University of Queensland under the supervision of Professor Tim Carroll. Tim and his group have a particular expertise in sensorimotor learning and represent one of the few labs in Australia that work in this field. Hence, creating a connection and collaborating with this group afforded me a unique opportunity. During my 6-week visit, I designed several experimental paradigms with Tim’s guidance and learned a variety of experimental techniques and skills that I can employ in my paradigms directly, including TMS and movement error clamp manipulation.

In addition, I presented my work in both sensorimotor integration and motor learning in expert surgeons at two lab meetings; with Tim’s group at the School of Human Movement and Nutrition Sciences and Dr Philip Grove’s group within the School of Psychology. Feedback from these groups was invaluable, providing me with explicit direction with respect to paradigm design and edition of key publications.

Motivated by my involvement with the CCD Inclusive Research Network, I investigated the university’s Science in Australia Gender Equity (SAGE) implementation practices in diversity and inclusion, spoke with various academics across the departments of Philosophy, Education and Psychology in regard to issues of learning, pedagogy, critical thinking and curriculum practice.

I am grateful for the opportunity afforded to me by the CCD and shall continue to build upon what I learned during my visit and to extend my collaborations with the community of researchers with whom I had the pleasure to visit and engage.

Chris Hewitson
Macquarie University
Matthew Robson  
PhD, The University of Western Australia  
Associate Professor Romina Palermo and Dr Linda Jeffery  
Investigation into the perceptual capabilities of congenital prosopagnosics.

Dr Kelly Rombough  
PhD, Macquarie University  
Professor Rosalind Thornton and Professor Stephen Crain  
Investigation of syntactic knowledge in question structures in children with specific language impairment.

Marguerite Rowe  
PhD, Macquarie University  
Professor Richard Stevenson (Macquarie University) and Associate Professor Anina Rich  
Synaesthesia and associate learning.

Cathleen Rubin  
PhD, Macquarie University  
Professor Lyndsey Nickels  
Enhancing communicative effectiveness and satisfaction between people with primary progressive aphasia and their communication partner.

Aimy Slade  
PhD, Macquarie University  
Professor William (Bill) Thompson and Dr Kirk Olsen (Macquarie University)  
Investigating the potential positive and negative effects of violent music on its fans.

Felice Smith  
PhD, Macquarie University  
Professor Mark Williams, Associate Professor Thomas Carlson and Associate Professor Anina Rich  
Elucidating the neural mechanisms responsible for the recognition of objects.

Cherie Strikwerda-Brown  
PhD, The University of Sydney  
Associate Professor Muireann Irish and Professor Olivier Piguet  
Changes to sense of self in dementia: Cognitive and neurobiological underpinnings.

Derek Swe  
PhD, The University of Western Australia  
Associate Professor Romina Palermo, Dr Clare Sutherland and Professor Gillian Rhodes  
Facial first impressions and behavioural traits.

Tünde Szalay  
PhD, Macquarie University  
Dr Michael Proctor, Associate Professor Felicity Cox and Dr Titia Benders  
Phonological characterisation of lateral-final rimes in Australian English.

Ping Tang  
PhD, Macquarie University  
Professor Katherine Demuth and Dr Nan Xu Rattanasone  
Children’s acquisition of Mandarin tones in context.

Lina Teichmann  
PhD, Macquarie University  
Associate Professor Anina Rich and Associate Professor Thomas Carlson  
Investigating the time-course of magnitude representation.

Alexa von Hagen  
PhD, University of Potsdam, Germany  
Dr Saskia Kohnen and Dr Nicole Stadie (University of Potsdam, Germany)  
Developmental dyslexia and second language learning.

Lulu Wan  
PhD, Australian National University  
Professor Elinor McKone, Dr Kate Crookes and Professor Katherine Reynolds (Australian National University)  
The other-race effect in face recognition.

Dr Vana Webster  
PhD, Macquarie University  
Professor Amanda Barnier and Dr Penny Van Bergen (Macquarie University)  
Collaborative memory: The role of closeness, cognitive need and strategies.

Signy Wegener  
PhD, Macquarie University  
Professor Anne Castles and Dr Hua-Chen Wang  
Oral vocabulary and reading acquisition: From orthographic skeletons to consolidated orthographic representations.
The CCD Student Exchange Scheme supported my six-week visit to the School of Psychological Sciences at The University of Western Australia (UWA), a department with world-leading face perception experts. This exchange allowed me to engage with a lab expert in a major component of my PhD as well as gain vital feedback from my external supervisor, Associate Professor Romina Palermo, who heads the Person and Emotion Perception Lab at UWA.

During my visit, I undertook regular meetings with Associate Professor Palermo, enabling in-depth discussion that would have been near impossible without being present in the lab, day-to-day. I also presented my work at a lab meeting and gained insightful feedback on my research from the whole research team. Importantly, attendance at lab meetings also exposed me to expert speakers offering new ideas and methods applicable to my own research.

This trip was an invaluable experience, opportunely timed in the final six months of my PhD. Through discussing my work with other researchers, this trip cemented my confidence in research ideas and enabled me to write up my thesis in a timely fashion. Indeed, while visiting UWA, I drafted two thesis chapters, which I am currently adapting for submission to peer-reviewed scientific journals.

My visit to UWA, only possible due to the CCD Student Exchange Scheme, was extremely rewarding and remains a highlight of my PhD. I feel lucky to have been a recipient of this award, which has allowed me to make new connections, both personal and professional.

Rosalind Hutchings
The University of Sydney
Cecilia (Yu Sze) Law
PhD/MClinPsych, The University of Sydney
Associate Professor Suncica (Sunny) Lah,
Associate Professor Ilona Juraskova (The University of Sydney),
and Associate Professor Sabina Kleitman (The University of Sydney)
Accelerated long-term forgetting: The lived-in experience,
independence in daily living and social functioning.

Benjamin McLean
PhD/ClinPsych, Flinders University
Dr Julie Mattiske (Flinders University) and Dr Ryan Balzan
The nature of the relationship between cognitive biases and
delusions in psychosis.

Cecilia Minogue
DCP/MSc, The University of Sydney
Associate Professor Suncica (Sunny) Lah, Dr Kylie Radford
and Professor Tony Broe (Neuroscience Research Australia)
Cognitive decline in elder Aboriginal Australians: Is
education protective?

Colleen Murphy
PhD/MClinNeuro, Macquarie University
Associate Professor Robyn Langdon
Poor social functioning in schizophrenia: Understanding
the role of automatic facets of social cognition.

Rachael Neville
PhD/MClinPsych, Macquarie University
Professor Greg Savage
Cerebrovascular biomarkers of dementia risk.

Tamar Paulin
PhD/MClinNeuro, Macquarie University
Professor Greg Savage, Professor Amanda Barnier
and Associate Professor Muireann Irish
Imagination in the real-world.

Belinda Poole
PhD/MClinPsych, The University of Sydney
Associate Professor Suncica (Sunny) Lah and
Associate Professor Irina Harris (The University of Sydney)
Investigation of working memory and mathematical
difficulties in children with epilepsy.

Gideon Sacks
PhD/MClinPsych, The University of Western Australia
Dr Carmela Pestell (The University of Western Australia)
and Associate Professor Romina Palermo
Time perception deficits in ADHD.

Daniell Steinberg
PhD/MClinNeuro, Macquarie University
Professor Greg Savage and Dr Nicholas Badcock
Using a neurocognitive model of Alzheimer’s disease to
facilitate early detection: The role of the hippocampus in
relational learning and associative inference.

Elizabeth Stewart
DCP/PhD, The University of Sydney
Associate Professor Suncica (Sunny) Lah
Theory of mind and executive functions in children with
idiopathic generalised epilepsy.

Ben Tappin
PhD/MSc, Royal Holloway, University of London, UK
Professor Ryan McKay and Professor Dominic Abrams
(University of Kent, UK)
Biases in social belief formation.

Bianca Thorup
PhD/ClinNeuro, The University of Western Australia
Professor Gillian Rhodes and Dr Kate Crookes
Neural plasticity and other-race face recognition: Is there
a critical period for developing perceptual expertise?

Alice Tobin
PhD/MClinPsych, The University of Western Australia
Dr Jason Bell, Associate Professor Romina Palermo and
Dr Patrick Clarke (Curtin University)
tDCS modulation of working memory using ERPs.

Kaitlyn Turbett
MClinNeuro/PhD, The University of Western Australia
Associate Professor Romina Palermo, Dr Linda Jeffery
and Dr Jason Bell
Individual differences in serial dependence for facial
identity.

Dr Jasmina Vrankovic
PhD/MClinNeuro, Macquarie University
Associate Professor Veronika Coltheart and
Dr Nicholas Badcock
New perspectives on iconic memory.

Sarah Watts
PhD/DClinPsych, The University of Sydney
Associate Professor Caroline Hunt (The University of Sydney),
Associate Professor Suncica (Sunny) Lah and
Associate Professor Paul Rhodes (The University of Sydney)
Understanding cross-cultural caregiving practices
and testing the efficacy of an innovative evidence-
based psychological intervention to improve children’s
development.

DPsych
Dr Karen Croot
DClinPsych, The University of Sydney
Professor Lyndsey Nickels and Dr Melanie Porter
Word retrieval in progressive aphasia.

MPhil
David Foxe
MPhil, The University of Sydney
Professor Olivier Piguet,
Associate Professor Muireann Irish and Dr James Burrell
Visuospatial short-term memory in primary progressive
aphasia.

Masters
Suzanna Azevedo
MCP, The University of Sydney
Associate Professor Suncica (Sunny) Lah and
Dr Belinda Barton (The University of Sydney)
Psychosocial outcomes of children considered for
epilepsy surgery: A pilot study.

Sarah Barrett Jones
MCP, The University of Sydney
Associate Professor Suncica (Sunny) Lah and
Associate Professor Laurie Miller
The relationship between episodic and semantic memory
in adults with temporal lobe epilepsy.

Michelle Edwards
MCP, The University of Sydney
Associate Professor Suncica (Sunny) Lah and
Associate Professor Romina Palermo
Facial emotion identification in children with epilepsy:
A systematic review with meta-analysis.

Nicola Filardi
MRes, Macquarie University
Dr Nicholas Badcock
The neural crowding of verbal and non-verbal information
processing.

Iuliia Fokina
MRes, Macquarie University
Dr Saskia Kohnen and Professor Genevieve McArthur
Does poor attention cause poor reading?
I was fortunate to receive funding from the 2018 CCD Student Exchange Scheme that allowed me to visit Professor Matt Lambon Ralph, a world leader in semantic cognition and Primary Progressive Aphasia research, based at The University of Manchester, UK. During my visit, I learnt the use of advanced multidimensional statistical techniques that help examine co-occurring cognitive and brain changes in patients with primary progressive aphasia, at an individual-level. This approach allowed me to further explore how changes in the cognitive architecture of patients over time map onto the propagation of their disease to different regions of the brain. My collaboration with Professor Lambon Ralph has resulted in one manuscript that is under preparation and three more projects that are in the pipeline.

During my visit, I also had the opportunity to give talks at the labs of Professor Florence Pasquier (Lille University Hospital, France), Professor Julie Snowden (The University of Manchester, UK), and Dr Aidan Horner (University of York, UK), all leading researchers in the field of memory and dementia. Moreover, I presented a talk on my ongoing PhD research at the International Neuropsychological Society Mid-Year Meeting in Prague, Czech Republic, where I was able to network with experts and form new collaborations. Finally, I attended the MRtrix3 Workshop in Paris, France on using advanced tractography methods to probe changes in white matter fibre structure in the brain, a method I intend on incorporating in my ongoing PhD research.

I am extremely grateful to the CCD for this opportunity!
**Matthew So**  
MClinNeuro, Macquarie University  
Professor Greg Savage and Professor Olivier Piguet  
Validation and normative studies of the ACE-III.

**Emma Williams**  
MOrgPsych, Macquarie University  
Dr Vince Polito  
Mindfulness and organisational citizenship.

**Honours**

**Zoë Akindele-Obe**  
BA, The University of Western Australia  
Dr Kate Crookes and Professor Gillian Rhodes  
Attractiveness judgements for own-race versus other-race faces.

**Jessamy Burton**  
BA, The University of Western Australia  
Associate Professor Romina Palermo and Dr Linda Jeffery  
Do individuals with higher levels of autistic-like traits show weakened use of previous visual information?

**Hannah Derrig**  
BSc, The University of New South Wales  
Dr Kim Delbaere (NeuRA) and Dr Kylie Radford  
Risk factors for mild cognitive impairment in urban Indigenous Australian populations.

**Liz Dietrich**  
BSc, Australian National University  
Dr Amy Dawel  
Is AU6 a marker of genuine happiness or genuine emotion?

**Bronte Donatti-Liddlelow**  
BSc, The University of Western Australia  
Dr Linda Jeffery and Associate Professor Romina Palermo  
An association study between genuineness of facial expressions and alexithymia traits.

**Brett Easton**  
BSc, Australian National University  
Dr Amy Dawel  
Dynamic markers affecting the perception of genuineness of emotional expressions.

**Blake Hunt**  
BPsysch, Macquarie University  
Professor Greg Savage and Dr Nicholas Badcock  
Rapid learning using portable EEG technology.

**Isabella Le Roux**  
BSc, The University of Western Australia  
Dr Clare Sutherland and Professor Gillian Rhodes  
Testing the automaticity of facial first impressions.

**Sara Maisey**  
BSc, The University of Western Australia  
Dr Linda Jeffery and Professor Gillian Rhodes  
Using adaption to test whether judgement of facial trustworthiness and expression are based on a common perceptual representation.

**Markus Michalowski**  
BPsysch, Macquarie University  
Dr Nicholas Badcock and Professor Greg Savage  
A transcranial doppler ultrasonography study of auditory lateralisation in a dichotic listening task.

**Gabrielle Picard**  
BPsysch, Macquarie University  
Dr Nicholas Badcock and Professor Greg Savage  
Temporal attention and reading.

**Kathleen Rippon**  
BSc, Australian National University  
Dr Amy Dawel  
Face identity processing in computer generated and real faces: An EEG study.

**Saba Siddique**  
BA, The University of Western Australia  
Associate Professor Romina Palermo and Dr Linda Jeffery  
Contribution of cognitive development to children’s face recognition ability.

**Cody Witham**  
BA, The University of Western Australia  
Dr Yong Zhi Foo and Professor Gillian Rhodes  
Tough guys look angry! Can we manipulate judgements of facial strength by biasing perception towards anger using adaptation?

**Jeong In Yook**  
BSc, Australian National University  
Dr Amy Dawel  
Does the brain individuate computer-generated faces and real faces of the same person(s)? An EEG study.
HOSTED EVENTS

WORKSHOP

CCD Annual Meeting
24 - 26 October | Gibraltar Hotel, Bowral

The final annual workshop for the Centre was again held offsite to encourage ongoing collaborations as well as establish future research projects beyond the life of the Centre. Over the course of three days, Centre members from the five programs gave thought-provoking research talks. The six winners of the 2017 Excellence in Research Student Awards for Publication gave speed talks in addition to the two speed talks by the winners of the 2018 Excellence in Research Student Awards for best PhD and best postgraduate poster. Further research projects were showcased in the poster sessions for students and for Centre members.

“A very fitting finale to all the great work done by Centre members over the life of the CCD.”
“… exciting to be taking what we’ve experienced with the CCD forward with us into our next line of adventures.”
“It has been an amazing opportunity to work in the Centre. Looking at the stats, it’s an amazing legacy.”

SHOWCASE

Discoveries and Impact
23 October | Macquarie University

Invited Speakers
Professor Anne Castles
Macquarie University
Professor Stephen Crain
Macquarie University
Professor S Bruce Downton
Macquarie University
Associate Professor Robyn Langdon
Macquarie University
Associate Professor Romina Palermo
The University of Western Australia
Professor Olivier Piguet
The University of Sydney
Professor Laurent Rivory
The University of Sydney
Professor Joanne Tompkins
Australian Research Council

The CCD was established through funding from the ARC Centres of Excellence Scheme, along with significant contributions from Macquarie University, The University of New South Wales, The University of Sydney and The University of Western Australia. The Centre’s mission has been to coordinate and conduct research in five areas of cognition: belief formation, language, memory, person perception, and reading. Over the last eight years (2011-2018), the Centre has offered unique opportunities for interdisciplinary and international collaborative research in the study of cognition, its disorders and their treatment.

The Discoveries and Impact Showcase was held to celebrate the achievements and highlight some of the outstanding research discoveries from across the Centre. During the event, the five Program Leaders gave overviews of their program’s research discoveries and engagement with the wider community. The Vice-Chancellor from Macquarie University (the administering organisation), the Chair of the CCD Advisory Board and the Executive Director of the ARC Centre of Excellence Scheme spoke at this very special celebration, sharing their thoughts on the success and achievements of the Centre.
WORKSHOP
The 2nd CCD International Workshop on Person Perception
23 - 24 March | The University of Western Australia

Invited Speakers
Professor Brad Duchaine
Dartmouth College, USA
Assistant Professor Jon Freeman
New York University, USA
Dr Kang Lee
University of Toronto, Canada
Professor Elinor McKone
Australian National University
Professor Cathy Mondloch
Brock University, Canada
Professor Ian Penton-Voak
University of Bristol, UK
Professor Alexander Todorov
Princeton University, USA
Professor Andrew Young
University of York, UK

This invitation-only workshop afforded leading researchers ample opportunity for participation and contribution to discuss current issues and future research directions in person perception research. The workshop hosted keynote talks by national and international researchers that stimulated lively and constructive discussion. In addition, there were two sessions featuring short talks by members of the CCD Person Perception node as well as a student poster session at the conclusion of the first day.

WORKSHOP
Memory Program
8 - 9 March | Manly Novotel

Keynote Speakers
Emeritus Professor Lynn Nadel
University of Arizona, USA
Dr Frank J van Schalkwijk
University of Salzburg, Austria
Professor John Hodges
The University of Sydney

This two-day workshop brought together eminent researchers as well as chief investigators, associate investigators, postdoctoral fellows and PhD students from the Memory Program to present their work on various aspects of memory. The research presentations combined animal models, neuroimaging and clinical approaches which examined theories of memory and its disorders, and avenues for remediation.

WORKSHOP
Current Issues in Child Bilingual Development
26 - 27 July | Macquarie University

Invited Speakers
Professor Erika Hoff
Florida Atlantic University, USA
Professor Theo Marinis
University of Konstanz, Germany
Dr Carmel O’Shannessy
Australian National University
Professor Johanne Paradis
University of Alberta, Canada
Professor Gillian Wigglesworth
The University of Melbourne

National and international researchers, clinicians and educators came together to discuss present issues in bilingual and multilingual language acquisition. Held over two days, this workshop addressed the significant challenges for identifying language delay in children who are early sequential bilinguals (ESBs). In English-speaking countries, including Australia, these children start learning their second language at preschool or school. Despite their increasing numbers, our knowledge of how ESBs acquire a second language is still very limited. This poses a challenge both for assessing school readiness, academic achievement, and for identifying those at risk for language disorders. A range of linguistic, developmental and environmental factors interact to determine how and when ESBs acquire knowledge of a second language, raising both theoretical and applied challenges for the field. Most ESBs eventually become competent in their second language, however, limited knowledge of what constitutes ‘typical’ ESBs language development poses a significant challenge for identifying language delay.

The workshop was sponsored by the CCD, CLaS and ARC Laureate Fellow Professor Katherine Demuth.

ARC CENTRE OF EXCELLENCE IN COGNITION AND ITS DISORDERS

61
PROFESSIONAL DEVELOPMENT | TRAINING
WORKSHOP
Language Acquisition Workshop
9 - 10 August | Macquarie University
Invited Speakers
Professor Adriana Belletti
University of Geneva, Switzerland; University of Siena, Italy
Associate Professor Ivano Caponigro
University of California, San Diego, USA
Professor Takuya Goro
Tsuda University, Japan
Professor Maria-Teresa Guasti
University of Milano-Bicocca, Italy
Professor Luigi Rizzi
University of Geneva, Switzerland; University of Siena, Italy
Dr Lyn Tieu
Western Sydney University
Associate Professor Peng Zhou
Tsinghua University, China

The CCD Language Program hosted a two-day international workshop on the nature of human language. Distinguished researchers from China, France, Italy, Japan, Norway, Switzerland, The Netherlands, USA and Australia came together to work on language acquisition in the generative framework, with an emphasis on young children’s knowledge of universal principles of syntax and semantics. The workshop consisted of both theoretical perspectives on the nature of language acquisition as well as reported on research findings on linguistic theory. Discussions focussed on directions for future research in child language, both within and across languages.

WORKSHOP
Keeping up to Date with Forced Alignment: The Montreal Forced Aligner
12 September | Macquarie University
Invited Speakers
Dr Simón González
Australian National University
Dr James Grama
Australian National University

Advances in the technology around speech recognition have seen the development of new tools for forced alignment in linguistics. Co-sponsored by the CCD and CLaS this three-hour hands-on workshop provided participants with instruction on the use of the Montreal Forced Aligner which is an automatic speech segmentation alignment tool. Focussing on its application to English data, best practices were outlined for data preparation and wrangling, and for managing output from the forced-alignment. Workshop participants had the opportunity to prepare and align their own data, and received feedback on how to enhance performance for their specific data sets.

WORKSHOP
Neuroimaging
6 - 7 November | Macquarie University
Invited Speakers
Professor Sylvain Baillet
McGill University, Canada
Associate Professor Tom Carlson
The University of Sydney
Dr Wei He
Macquarie University
Professor Tom Johnstone
Swinburne University of Technology
Professor Douglas Saddy
University of Reading, UK
Dr Matthew Sanderson
Macquarie University
Associate Professor Paul Sowman
Macquarie University

The CCD in conjunction with CLaS, hosted a two-day workshop to showcase its national and international research collaborations on cognitive processes using neuroimaging with a particular emphasis on magnetoencephalography (MEG). The first day of the workshop was a practical session on the newly developed software tools for organising MEG data to the new brain imaging data structure (BIDS) standard. This session consisted of an introduction to open MEG data, MEG data sharing and the BIDS format by Professor Sylvain Baillet, followed by a hands-on tutorial by Dr Matthew Sanderson in the afternoon. Day one concluded with research talks and a keynote presentation by Professor Douglas Saddy. The second day of the workshop featured a keynote presentation by Professor Baillet and research presentations from prominent national and international speakers.
WORKSHOP

Analysing Dynamic Phonetic Data using Generalised Additive Mixed Modelling

3 December | Macquarie University
Invited Speaker
Dr Martijn Wieling
University of Groningen, The Netherlands

This one-day workshop, co-sponsored by both CCD and CLaS, aimed to help participants understand the basic concepts underlying generalised additive modelling and to be able to apply generalised additive modelling to time-series data from the speech sciences. This was achieved through tutorials and associated hands-on data modelling and analysis sessions.

RESEARCH FORUM

Psychological Treatment for Psychosis

10 December | Macquarie University
Invited Speakers
Professor Anthony Harris
The University of Sydney
Associate Professor Neil Thomas
Swinburne University of Technology
Dr Ryan Balzan
Flinders University
Dr Frances Dark
Metro South Mental Health Services

This research forum hosted by the Belief Formation Program focussed on different psychological treatment approaches in psychosis, and brought together researchers and clinicians working in this area. The forum provided an opportunity to discuss current research and application of these findings in clinical practice.

WORKSHOP

Science of the Self: Body Representation, Misperception and Eating Disorders

14 December | Macquarie University
Invited Speakers
Associate Professor Jason Bell
The University of Western Australia
Associate Professor Kevin Brooks
Macquarie University
Manja Engel
Utrecht University, The Netherlands
Stephen Gadsby
Monash University
Dr Andrea Phillipou
Swinburne University of Technology
Dr Ian Stephen
Macquarie University
Dr Regine Zopf
Macquarie University

Psychologists, cognitive scientists, philosophers and clinical researchers who work on body representation and perception, with a focus on understanding body size and shape distortions related to eating disorders came together at this one-day workshop. The day consisted of presentations of theoretical perspectives and empirical findings on a range of phenomena related to body representation and perception in both healthy participants and eating disorder patients. In addition to talks, the workshop provided opportunities for participants to discuss future directions for research into these areas.
SPONSORED EVENTS

41st Annual Brain Impairment Conference
3 - 5 May | Hilton Hotel, Adelaide
The Centre sponsored the Australasian Society for the Study of Brain Impairment (ASSBI) conference this year. The theme of the conference was: Connecting and Collaborating in Rehabilitation. The conference covered both clinical and laboratory studies relating to assessment and rehabilitation of individuals with brain impairment across the lifespan, with a strong focus on how knowledge and scientific evidence can be effectively translated into practice. Researchers and health professionals in areas such as neuropsychology, clinical psychology, speech pathology, occupational therapy, physiotherapy, social work, neurology, psychiatry, rehabilitation and nursing contributed to the conference.

11th International Conference on Frontotemporal Dementias
11 - 14 November | International Convention Centre, Sydney
The Centre was pleased to provide support for the 11th International Conference on Frontotemporal Dementias (ICFTD). ICFTD was held for the first time in the Southern Hemisphere, demonstrating the global nature of the research on frontotemporal dementia and related conditions.

10th National Conference of Australian Science Communicators
11 - 15 November | Powerhouse Museum, Sydney
The Centre joined with a number of other ARC Centres of Excellence to offer sponsorship to the main networking event at the Australian Science Communicators Conference. The conference dinner was hosted by Dr Karl Kruszelnicki, and was attended by delegates from over 100 organisations including journalists, corporate communicators, policy makers, publicists, writers, educators and scientists.
HOSTED SEMINARS

- Joint CCD-CLaS (Macquarie Centre for Language Sciences) Research Colloquia
- Inclusive Research Network Meeting

Investigating early mechanisms of face processing in frontotemporal dementia.

**Rosalind Hutchings**

Brain and Mind Centre
The University of Sydney
22 January, The University of Western Australia

When “tone” is “voice” and “voice” is “tone”: Tone and tonogenesis in Kurtó. ♦

**Dr Gwendolyn Hyslop**

Department of Linguistics
The University of Sydney
30 January, Macquarie University

Origins of the #MeToo movement and its applicability to university settings. ♦

**Dr Simmy Poonian**

Department of Cognitive Science
Macquarie University
1 February, Macquarie University

Celebration of International Women’s Day and Gender Equity Week. ♦

**Dr Anna Eva Hallin**

Department of Clinical Science, Invention and Technology
Karolinska Institute, Sweden
26 February, Macquarie University

Orthographic overlap within a set determines treatment generalisation in acquired dysgraphia?

**Dr Polly Barr**

Department of Cognitive Science
Macquarie University
27 February, Macquarie University

Variational inference and deep generative models - Part 2. ♦

**Philip Schulz**

Institute for Logic, Language and Computation
University of Amsterdam, The Netherlands
20 March, Macquarie University

Nasal cycle as a non-invasive window to the brain: The interplay between cognitive functions and differential nostril airflow.

**Dr Roni-Judith Kahana Zweig**

Department of Neurobiology
Weizmann Institute of Science, Israel
27 March, Macquarie University

Improving intervention effects for children with dyslexia: Approaches from experimental and intervention research.

**Dr Katharina Galuschka**

Clinic of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy
University Hospital Munich, Germany
3 April, Macquarie University

How to ensure gender equity at scientific conferences from session chairs to panel members to keynote invitations. ♦

**Associate Professor Anina Rich**

Department of Cognitive Science
Macquarie University
5 April, Macquarie University

Body representation in fibromyalgia and other chronic pain conditions.

**Dr Carolyn Berryman**

Adelaide Medical School
The University of Adelaide
10 April, The University of Western Australia

Challenging the revisionist model of the Capgras delusion: An argument for the role of patient experience in delusional belief formation.

**Dr Garry Young**

School of Historical and Philosophical Studies
The University of Melbourne
24 April, Macquarie University

Mechanisms of statistical learning in infancy. ♦

**Professor Scott Johnson**

Psychology Department
University of California, Los Angeles, USA
24 April, Macquarie University

Language processing and awareness in Swedish-speaking school-age children with and without developmental language disorder. ♦

**Dr Anna Eva Hallin**

Department of Clinical Science, Invention and Technology
Karolinska Institute, Sweden
26 February, Macquarie University

Cognition of coding in 3-6-year olds: The relation between programming ability and compiling of syntax in natural language.

**Dr Eva Marinus**

Department of Cognitive Science
Macquarie University
13 March, Macquarie University

The lack of empathic concern in psychopathy and its impact on social decision-making.

**Professor Jean Decety**

Department of Psychology
University of Chicago, USA
16 March, Macquarie University

Mechanisms of statistical learning in infancy.

**Professor Scott Johnson**

Psychology Department
University of California, Los Angeles, USA
24 April, Macquarie University

Variational inference and deep generative models - Part 1. ♦

**Philip Schulz**

Institute for Logic, Language and Computation
University of Amsterdam, The Netherlands
19 March, Macquarie University

Autism from people not just textbooks.

**Robyn Steward**

Institute of Education
University College London, UK
20 March, The University of Western Australia

Nasal cycle as a non-invasive window to the brain: The interplay between cognitive functions and differential nostril airflow.

**Dr Roni-Judith Kahana Zweig**

Department of Neurobiology
Weizmann Institute of Science, Israel
27 March, Macquarie University

Improving intervention effects for children with dyslexia: Approaches from experimental and intervention research.

**Dr Katharina Galuschka**

Clinic of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy
University Hospital Munich, Germany
3 April, Macquarie University

How to ensure gender equity at scientific conferences from session chairs to panel members to keynote invitations. ♦

**Associate Professor Anina Rich**

Department of Cognitive Science
Macquarie University
5 April, Macquarie University

Body representation in fibromyalgia and other chronic pain conditions.

**Dr Carolyn Berryman**

Adelaide Medical School
The University of Adelaide
10 April, The University of Western Australia

Challenging the revisionist model of the Capgras delusion: An argument for the role of patient experience in delusional belief formation.

**Dr Garry Young**

School of Historical and Philosophical Studies
The University of Melbourne
24 April, Macquarie University

Mechanisms of statistical learning in infancy. ♦

**Professor Scott Johnson**

Psychology Department
University of California, Los Angeles, USA
24 April, Macquarie University

Beginner’s introduction and induction to magnetoencephalography (MEG).

**Elisabeth Stylianou**

Department of Cognitive Science
Macquarie University
15 February, Macquarie University

How musical rhythm entrains human brain activity: Surface and intracerebral EEG frequency-tagging.

**Dr Sylvie Nozaradan**

The MARCS Institute for Brain, Behaviour and Development
Western Sydney University
20 February, Macquarie University

Variational inference and deep generative models - Part 2. ♦

**Philip Schulz**

Institute for Logic, Language and Computation
University of Amsterdam, The Netherlands
20 March, Macquarie University

Nasal cycle as a non-invasive window to the brain: The interplay between cognitive functions and differential nostril airflow.

**Dr Roni-Judith Kahana Zweig**

Department of Neurobiology
Weizmann Institute of Science, Israel
27 March, Macquarie University

Improving intervention effects for children with dyslexia: Approaches from experimental and intervention research.

**Dr Katharina Galuschka**

Clinic of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy
University Hospital Munich, Germany
3 April, Macquarie University

How to ensure gender equity at scientific conferences from session chairs to panel members to keynote invitations. ♦

**Associate Professor Anina Rich**

Department of Cognitive Science
Macquarie University
5 April, Macquarie University

Body representation in fibromyalgia and other chronic pain conditions.

**Dr Carolyn Berryman**

Adelaide Medical School
The University of Adelaide
10 April, The University of Western Australia

Challenging the revisionist model of the Capgras delusion: An argument for the role of patient experience in delusional belief formation.

**Dr Garry Young**

School of Historical and Philosophical Studies
The University of Melbourne
24 April, Macquarie University

Mechanisms of statistical learning in infancy. ♦

**Professor Scott Johnson**

Psychology Department
University of California, Los Angeles, USA
24 April, Macquarie University

Beginner’s introduction and induction to magnetoencephalography (MEG).

**Elisabeth Stylianou**

Department of Cognitive Science
Macquarie University
15 February, Macquarie University

How musical rhythm entrains human brain activity: Surface and intracerebral EEG frequency-tagging.

**Dr Sylvie Nozaradan**

The MARCS Institute for Brain, Behaviour and Development
Western Sydney University
20 February, Macquarie University

Variational inference and deep generative models - Part 2. ♦

**Philip Schulz**

Institute for Logic, Language and Computation
University of Amsterdam, The Netherlands
20 March, Macquarie University

Nasal cycle as a non-invasive window to the brain: The interplay between cognitive functions and differential nostril airflow.

**Dr Roni-Judith Kahana Zweig**

Department of Neurobiology
Weizmann Institute of Science, Israel
27 March, Macquarie University

Improving intervention effects for children with dyslexia: Approaches from experimental and intervention research.

**Dr Katharina Galuschka**

Clinic of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy
University Hospital Munich, Germany
3 April, Macquarie University

How to ensure gender equity at scientific conferences from session chairs to panel members to keynote invitations. ♦

**Associate Professor Anina Rich**

Department of Cognitive Science
Macquarie University
5 April, Macquarie University

Body representation in fibromyalgia and other chronic pain conditions.

**Dr Carolyn Berryman**

Adelaide Medical School
The University of Adelaide
10 April, The University of Western Australia

Challenging the revisionist model of the Capgras delusion: An argument for the role of patient experience in delusional belief formation.

**Dr Garry Young**

School of Historical and Philosophical Studies
The University of Melbourne
24 April, Macquarie University

Mechanisms of statistical learning in infancy. ♦

**Professor Scott Johnson**

Psychology Department
University of California, Los Angeles, USA
24 April, Macquarie University
Tracking speech and language development of Dutch children migrating to Australia. ♦
**Dr Hans Boggaardt and Marrit Janabi**
Department of Linguistics
The University of Sydney
1 May, Macquarie University

Work-life Balance. ♦
**Professor Lyndsey Nickels, Professor Mark Williams,**
**Dr Regine Zopf and Rebecca Geiling (invited panellists)**
Department of Cognitive Science
Macquarie University
3 May, Macquarie University

Perception and learning in dyslexia: Failures to form or engage perceptual sets.
**Dr Nicholas Badcock**
Department of Cognitive Science
Macquarie University
8 May, Macquarie University

Obsessive compulsive disorder: Developmental pathophysiology.
**Dr Iain Perkes**
School of Psychiatry
The University of New South Wales
22 May, Macquarie University

The impact of hearing loss and hearing aid technology on cognitive function.
**Dr Brent Edwards**
National Acoustic Laboratories
29 May, Macquarie University

Language and vision using deep neural nets. ♦
**Peter Anderson**
Department of Computing
Macquarie University
4 June, Macquarie University

Preferential early attribution in segmental perception and its consequences for phonology. ♦
**Associate Professor Amanda Rysling**
Department of Linguistics
University of California, Santa Cruz, USA
5 June, Macquarie University

Cognition in (social) context: A psychologically-grounded approach to the formation of collective memory.
**Dr Alin Coman**
Department of Psychology
Princeton University, USA
5 June, Macquarie University

Equity in university hiring practices. ♦
**Professor John Sutton and Professor Marie Herberstein**
Department of Cognitive Science and Department of Biological Sciences
Macquarie University
7 June, Macquarie University

Embrace the random.
**Dr Chris Donkin**
School of Psychology
The University of New South Wales
19 June, Macquarie University

Creating a more inclusive research environment. ♦
**Dr Liza-Mare Syron and Sonal Singh**
Walanga Muru and Widening Participation
Macquarie University
5 July, Macquarie University

Articulating how our NLP data and systems do and don’t represent the world: Toward mitigating bias and enabling better science. ♦
**Professor Emily Bender**
Department of Linguistics
University of Washington, USA
5 July, Macquarie University

How does the brain learn to read?
**Professor James Booth**
Department of Psychology and Human Development
Vanderbilt University, USA
13 July, Macquarie University

The temporal dynamics of object representations: Using rapid serial presentation to probe the neural processes underlying visual perception.
**Dr Amanda Robinson**
Department of Cognitive Science
Macquarie University
17 July, Macquarie University

What bilingual children teach us about language development. ♦
**Professor Erika Hoff**
Department of Psychology
Florida Atlantic University, USA
23 July, Macquarie University

Bilingual development in children with language and communication disorders from migrant families. ♦
**Professor Johanne Paradis**
Department of Linguistics
University of Alberta, Canada
24 July, Macquarie University

The development of phonological awareness and reading decoding in bilingual children: Effects of bilingualism and language dominance. ♦
**Professor Theo Marinis**
Department of Linguistics
University of Konstanz, Germany
24 July, Macquarie University

A formal universal of natural language grammar. ♦
**Professor Mark Steedman**
School of Informatics
The University of Edinburgh, UK
30 July, Macquarie University

Body perception for interactions.
**Dr Regine Zopf**
Department of Cognitive Science
Macquarie University
31 July, Macquarie University

Discourse coherence: Concurrent explicit and implicit relations. ♦
**Professor Bonnie Webber**
School of Informatics
The University of Edinburgh, UK
1 August, Macquarie University

‘Doing’ diversity and inclusion: How we can address bias and inequality. ♦
**Harriet Jones**
Human Resources
Macquarie University
2 August, Macquarie University

Paradoxes of perception: How statistical learning affects what people see and remember.
**Assistant Professor Megan Papesh**
Department of Psychology
Louisiana State University, USA
7 August, Macquarie University

The pragmatic turn in explaining the origin and evolution of cognition and language.
**Dr Anton Sukhoverkhov**
Department of Philosophy
Kuban State Agrarian University, Russia
14 August, Macquarie University

Hearing and cognition: The bigger picture.
**Dr Dona Jayakody**
Ear Science Institute Australia
21 August, Macquarie University

Tips and tools for effective time management and giving/receiving constructive feedback. ♦
**Associate Professor Anina Rich**
Department of Cognitive Science
Macquarie University
6 September, Macquarie University
Empathy, externalism and mental disorders.

**Dr Joel Krueger**
Department of Sociology, Philosophy and Anthropology
University of Exeter, UK
11 September, Macquarie University

Expanding the study of linguistic variation through forced alignment.

**Dr James Grama and Dr Simón González Ochoa**
ANU College of Arts and Social Sciences
Australian National University
11 September, Macquarie University

Lexical quality, semantic diversity and reading development.

**Professor Kate Nation**
Department of Experimental Psychology
University of Oxford, UK
19 September, Macquarie University

What pathological aging could tell us about associate memory systems?

**Professor Sara Fernández Guinea**
Department of Experimental Psychology, Cognitive Processes and Speech Therapy
Complutense University of Madrid, Spain
25 September, Macquarie University

Inclusive practices on Australian campuses, update on the ALLY Network at Macquarie.

**Chris Hewitson and Dr Lisa Yen**
Department of Cognitive Science
Macquarie University
4 October, Macquarie University

What are the active ingredients of successful shared remembering?

**Dr Celia Harris**
Department of Cognitive Science
Macquarie University
9 October, Macquarie University

Morphological processing in speech production: The case of compounding.

**Professor Niels Schiller**
Leiden University Centre for Linguistics and Leiden Institute for Brain and Cognition
Leiden University, The Netherlands
16 October, Macquarie University

Jamovi: What statistical software is like, after SPSS.

**Jonathan Love**
School of Psychology
The University of Newcastle
30 October, Macquarie University

2018: The year in review.

**Associate Professor Anina Rich**
Department of Cognitive Science
Macquarie University
1 November, Macquarie University

Precision education initiative: Moving towards personalised education.

**Associate Professor Sara Hart**
Department of Psychology and Florida Centre for Reading Research
Florida State University, USA
6 November, Macquarie University

Assessing impacts of aging on human motor and executive control under unified quantification of task difficulty.

**Dr Erik Chang**
Institute of Cognitive Neuroscience
National Central University, Taiwan
20 November, Macquarie University

Language and speech functioning through an electrophysiological lens.

**Dr Vitória Piai**
Donders Institute
Radboud University, The Netherlands
21 November, Macquarie University

Mapping information use in active vision.

**Dr Sebastien Miellet**
School of Psychology
University of Wollongong
27 November, Macquarie University

Individual differences in emotion expression ability.

**Mattis Geiger**
Department of Individual Differences and Psychological Assessment
Ulm University, Germany
28 November, The University of Western Australia

Three consequences of language universals in semantics.

**Dr Emmanuel Chemla**
Laboratoire de Sciences Cognitives et Psycholinguistique
Ecole Normale Supérieure, France
4 December, Macquarie University

A varying role for abstraction in models of category learning constructed from neural representations in early visual cortex.

**Dr John (Brendan) Ritchie**
Laboratory of Biological Psychology
KU Leuven, Belgium
11 December, Macquarie University

Why are natural languages so ambiguous?

**Emeritus Professor Thomas Wasow**
Department of Linguistics
Stanford University, USA
17 December, Macquarie University
RESEARCH TRAINING EVENTS

WORKSHOP
Student and Early Career Researcher Development
23 October | Macquarie University

Invited Speakers
Dr Lisi Beyersmann
Macquarie University
Dr Daniel Johnston
Macquarie University
Carmel Whitty and Brad Shaw
Macquarie University
Dr Lisa Yen
Macquarie University

This highly successful development workshop for students and early career researchers (ECR) was again held as part of the Annual Workshop. Our student and ECR workshops over the years have included topics such as, careers outside of academia, why teaching is not a bad thing, using your transferable skills, and managing a career with personal life.

This year’s workshop, chaired by Dr Celia Harris, started with a presentation on ‘Responding to mental illness and dealing with conflict’ by Carmel Whitty and Brad Shaw. Feedback from this session was very positive. Dr Lisa Yen gave a presentation on ‘How to build your impact’ and supplied some excellent websites and activities to assist with this. Our last two speakers, Dr Daniel Johnston and Dr Lisi Beyersmann (with Dr Nathan Caruana), gave insights into ‘Developing grant writing ideas’ and ‘Applying for your first grant’. This session was very timely as many of our CCD members will be spending the summer writing grants for future research projects.

ONLINE TRAINING
Use of Research Facilities
Ongoing | Macquarie University

The aim of these workshops was to provide an opportunity for our researchers to consider potential improvements to the current practices within their research groups and covered topics that include how to end a session early if required, what to consider when testing offsite and how to make a report if there is an incident.

ONLINE TRAINING
Risk Assessment for Researchers with Participants
Ongoing | Macquarie University

To continue on from our successful workshop last year on Risk and Assessment for Researchers with Participants, we recorded this session so all new Macquarie University staff and students had access to this information. In addition to this, we also recorded a session on use of the Research Facilities.

WORKSHOP
Commencement, Progression and Completion Sessions
Ongoing | Macquarie University, The University of Sydney, The University of Western Australia

Across the participating organisations of the Centre, there are many workshops held to assist our undergraduate and postgraduate students in the successful commencement and completion of their degrees. The different stages of a PhD bring many different ‘stress levels’, so throughout the year the Centre provides additional support at Macquarie University by running sessions on the successful commencement, progression and final stages of completing a higher degree research program. These sessions are to assist the students navigate the different stages of a PhD and to ensure they have an understanding of the time pressures and demands at each stage of their candidature.

RESEARCH TRAINING
3 Minute Thesis
Ongoing | Macquarie University, The University of Sydney, The University of Western Australia

CCD students at Macquarie University, The University of Sydney and The University of Western Australia, take part each year in the Three Minute Thesis (3MT®) competition which celebrates the exciting research conducted by PhD students around the world. Developed by The University of Queensland, the competition cultivates students’ academic, research communication and presentation skills. Presenting in a 3MT competition increases their capacity to effectively explain their research in a short space of time, and in a language appropriate to a non-specialist audience. Competitors are allowed one PowerPoint slide, but no other resources or props. Congratulations to Nikki-Anne Wilson for reaching The University of Sydney finals, Julien Millasseau for being awarded third place at the Macquarie University finals and Selene Peat, for coming first at the Macquarie University finals and runner up in the Asia Pacific finals.

RESEARCH TRAINING
Reading and Discussion Groups
Ongoing | Macquarie University, The University of Sydney, The University of Western Australia

Across the CCD, there are 12 active reading and discussion groups that meet from each of our Programs:
Belief Formation: Belief Formation Group Meeting.
Language: Aphasia Research Group Meeting; Child Language Lab Meeting; Music, Sound, and Performance Group and Phonetics Lab Meeting.
Memory: Memory Frontier Lab Meeting and Frontier Journal Club.
Person Perception: Person Perception Reading Group; Person Perception Lab Meetings (with the PEPLab) and the Autism Research Group.
Reading: Macquarie University Reading Disorders Research Group (MURDR).
Neural Markers: Beginner MEG Training Sessions.
GRADUATES | ALUMNI

We continue to celebrate the outstanding achievements of our graduates. In 2018 we had 39 graduations from our PhD, Masters and Honours students which was an exceptional accomplishment. Congratulations to our research students and their supervisors on such an amazing achievement.

Our alumni have moved on to take up exciting positions at Concord Repatriation General Hospital and Balmain Hospital; Lyon Neuroscience Research Center, France; Macquarie University; Max Planck Institute for Empirical Aesthetics, Germany; Netherlands Cancer Institute, The Netherlands; Potsdam Research Institute for Multilingualism, Germany; The Chinese University of Hong Kong, Hong Kong; and the Sydney Centenarian Study.

Congratulations to our PhD graduates:

Dr Cory Bill, Children take only some sentences literally: Investigating children’s variable performance with scalar inferences; Dr Catherine Browning, Collaboration and prospective memory: Costs, benefits and helpful processes for strangers and intimate couples; Dr Ann Carrigan, Expertise in visual search of medical and non-medical images; Dr Benjamin Davies, Children’s gradual acquisition of singular and plural; Dr Laura Dondzilo, An investigation into the role of selective attention and rumination in eating disorder symptomatology; Dr Anna Fiveash, The nature of syntactic processing in music and language; Dr Kate Hardwick, Is ‘sexual’ a subtype of disgust, or is it a separate basic emotion?; Dr Haiquan (David) Huang, Mandarin-speaking children’s knowledge of entailments and inferences; Dr Rosalind Hutchings, Face processing in frontotemporal dementia; Dr Nenad Jovanovic, The effect of rhythmic auditory priming on SLI children’s processing of syntax; Dr Yu Li, Early neural dynamics of visual word recognition; Dr Valerie (Yi) Pu, Human hippocampal theta and high-gamma oscillations in spatial encoding and consolidation in a virtual Morris water maze task; Dr Kelly Rombough, Investigation of syntactic knowledge in question structures in children with specific language impairment; Dr Vana Webster, Collaborative memory: The role of closeness, cognitive need and strategies; and Dr Nikolas Williams, The role of executive control in collaborative recall.

A final congratulations to the achievements of our Honours graduates:

Zoë Akindele-Obe, Jessamy Burton, Hannah Derrig, Liz Dietrich, Bronte Donatti-Liddelow, Brett Easton, Blake Hunt, Isabella Le Roux, Sara Maisey, Markus Michalowski, Gabrielle Picard, Kathleen Rippon, Saba Siddique, Cody Witham, and Jeong In Yook.

Congratulations to our Masters graduates:

Tatiana Izmaylova, Prosodic processing in people who do and do not stutter: Evidence from pause perception; Louis Klein, Retrieval-induced belief revision: Memories, beliefs, and echo chambers; Hannah Rapaport, The influence of the laboratory environment on the measurement of language lateralisation; Louise Ratko, Articulatory characterisation of length of contrasts in Australian English vowels; Andrea Salins, Orthographic facilitation of vocabulary learning in children with hearing loss; Aimy Slade, An investigation of empathy among fans and non-fans of violent music; Matthew So, Validation and normative studies of the ACE-III; and Emma Williams, Mindfulness and organisational citizenship.

Congratulations to our PhD[Masters graduate:

Dr Jasmina Vrankovic, New perspectives on iconic memory.
STUDENT AWARDS

Each year we are pleased to recognise the significant contributions our students make to research projects undertaken within our Centre. Our Centre acknowledges outstanding contributions through two schemes: Excellence in Research Student Award - Publications; and Excellence in Research Award - Poster. The quality and the number of outstanding publications and poster presentations have always made it an extremely difficult decision process for our Research Management Committee.

Excellence in Research - Student Publication Awards

Congratulations to the six winners of the CCD Excellence in Research Student Award for outstanding publications from 2017. They each received a $1,000 prize and were invited to give a speed presentation at the Centre’s Annual Workshop.

Jemma Collova
Person Perception
The University of Western Australia

Michelle Edwards
Memory
The University of Sydney

Dr Tijl Grootswagers
Perception in Action
Macquarie University

Rosalind Hutchings
Memory
The University of Sydney

Siddharth Ramanan
Memory
The University of Sydney

Signy Wegener
Reading
Macquarie University

Excellence in Research - Student Poster Awards

During the student poster session on day one of the Annual Workshop, the best PhD and Masters/Honours posters were selected, with the winners receiving a $500 prize and an opportunity to give a speed presentation on day two of the Annual Workshop. Congratulations to the following students:

Best Postgraduate Poster
Lyndall Murray
Reading Program
Macquarie University
The role of oral vocabulary for children reading orthographically irregular novel words.

Best PhD Poster
Signy Wegener
Reading Program
Macquarie University
Orthographic skeletons: What form do they take?

Highly Commended PhD Posters
Yu (Sherry) Chen
Memory Program
The University of Sydney
Cerebellar white matter changes and their contributions to cognitive dysfunction in frontotemporal dementias.

Selene Petit
Perception in Action
Macquarie University
Discovering hidden treasures: Towards a measure of command-following abilities in non-verbal children using functional transcranial doppler ultrasound.

Bianca Thorup
Person Perception Program
The University of Western Australia
Increased motivation does not reduce other-race effects in face recognition or in categorizing faces by national origin.

Kaitlyn Turbett
Person Perception Program
The University of Western Australia
Do individual differences in serial dependence for facial identity contribute to variation in face recognition abilities?
CENTRE EXCHANGE SCHEMES

Student Exchange Scheme
The CCD Student Exchange Scheme promotes and rewards the significant contributions that our students make each year in their nominated research fields. Furthermore, it gives our higher degree research candidates the opportunity to visit national and international laboratories in order to provide them with additional experience and research training. Together, this more extensive research training and the increased collaboration benefited the successful applicants as well as enhanced our Centre. Congratulations to the selected applicants for the final round of the CCD Student Exchange Scheme.

Laura McLaughlin Engfors (Person Perception Program, The University of Western Australia) visited Associate Professor Jeremy Wilmer from the Department of Psychology, Wellesley College, USA. He provided expertise in conducting studies on individual differences, in particular, the collection and analysis of large online data sets.

Chris Hewitson (Perception in Action, Macquarie University) visited Associate Professor Timothy Carroll from the School of Human Movement and Nutrition Sciences, The University of Queensland. They worked on the implicit and explicit components of visuomotor learning of gestures and actions.

Rosalind Hutchings (Memory Program, The University of Sydney) visited another CCD node at the School of Psychological Science, The University of Western Australia, to extend interdisciplinary work on memory disorders and face processing. Specifically, she examined the theoretical underpinnings of face processing by investigating responses to faces in patients with frontotemporal dementia.

Siddharth Ramanan (Memory Program, The University of Sydney) visited Professor Matthew Lambon Ralph at the Neuroscience and Aphasia Research Unit, in the Division of Neuroscience and Experimental Psychology, The University of Manchester, UK. The visit focused on semantic cognition and brain connectivity to further understand neuroanatomical organisation and memory models.
Postdoc Exchange Scheme

The CCD Postdoc Exchange Scheme provides a national and international exchange opportunities for our postdoctoral researchers. Through this scheme, successful early career researchers received the opportunity to participate in a research exchange visit that provided them with additional research training and mentoring in their career. The enhanced research training and increased collaboration benefitted the successful applicants and strengthened our Centre. Congratulations to the four selected applicants in the final round of the CCD Postdoc Exchange Scheme.

Dr Ryan Balzan (Belief Formation Program, Flinders University) visited Partner Investigator, Professor Ryan McKay, at the Department of Psychology, Royal Holloway, University of London, UK to collaborate on theories of belief formation.

Dr Yong Zhi Foo (Person Perception Program, The University of Western Australia) visited Professor David Perrett at the School of Psychology and Neuroscience, University of St. Andrews, UK, to continue work on the evolutionary basis of human facial preferences.

Dr Robert Ross (Belief Formation Program, Royal Holloway, University of London, UK) visited Associate Professor David Rand at the School of Psychology, Yale University, USA. The visit provided the opportunity to develop two collaborative research projects – beliefs in, and sharing of, biased political news through social media, and the relationship between religious beliefs and reasoning.

Dr Clare Sutherland (Person Perception Program, The University of Western Australia) visited Associate Professor Jeremy Wilmer at Department of Psychology, Wellesley College, USA, and Facebook, NY to increase understanding of facial first impressions.
Belief Formation Program

Book Chapters


Periodicals


Quidé, Y., Matosin, N., Atkins, J.R., Fitzsimmons, C., Carins, M.J., Carr, V.J., & Green, M.J. (2018). Common variation in ZNF804A (rs1344706) is not associated with brain morphometry in schizophrenia or healthy participants. Progress in Neuro-Psychopharmacology and Biological Psychiatry, 82, 12-20.


B.W., Sammler, D., & Thompson, W.F.
Sun, Y., Lu, X., Ho, H.T., Johnson, in children with SLI.

G. (2018). Language in individuals with
Rofes, A., Talacchi, A., Santini, B., Pinna,

Glottalisation as a cue to coda consonant voicing in Australian English.

Non-invasive investigation of human hippocampal rhythms using
magnetoencephalography: A review.

The compositionality of logical connectives in child Italian.

On children’s variable success with scalar inferences: Insights from disjunction in the scope of a universal quantifier.


Fluid intelligence is supported by the multiple-demand system not the language system. Nature Human Behaviour, 2(3), 200–204.

Five-year-olds’ acoustic realization of Mandarin tone sandhi and lexical tones in context are not yet fully adult-like.


Using the visual-world paradigm to explore the meaning of conditionals in natural language. Language, Cognition and Neuroscience, 33(8), 1049-1062.


Memory Program

Books


Book Chapters


Personal memory, the scaffolded mind, and cognitive change in the Neolithic. In I. Hodder (Ed.), Consciousness, Creativity and Self at the Dawn of Settled Life: The test case of Çatalhöyük: John Templeton Foundation, USA.


Published Conference Proceedings


Weighting of coda voicing cues: Glottalisation and vowel duration.

Mora or more? The phonological unit of Japanese word production in the Stroop color naming task. Memory and Cognition, 46(3), 410–425.

Acquisition of weak syllables in tonal languages: Acoustic evidence from neutral tone in Mandarin Chinese. Journal of Child Language.


Hearing Services in Schools

the issues.

Breadmore, H.L. (2018). Early

Colenbrander, D., Ricketts, J., &

Psychological Science in the Public

Castles, A., Rastle, K., & Nation, K.

Interest

Psychophysiology,

meditation.

in the auditory N1 during first-time

Barnes, L.J. McArthur, G.M., Biedermann,

younger children.

for assessing language lateralization in

& Kezilas, Y., Kohnen, S.,

Badcock, N.A., Spooner, R., Hofmann,

funeral of Body, Brain and Cognition

young children. In M. Casillas, A. Cristia &

Marrinu, E., Powell, Z., Thornton,

Unravelling the cognition of coding in

3-to-6-year olds. In T.B. Gallant & A.

Korhonen (Eds.), Proceedings of ACM

International Computing Education

Research (ICER) Conference (pp. 133-

141). Espoo, Finland: ACM, USA.

Johnston, S.K., Hennessey, N.W.,

Leitão, S., & Kane, R.T. (2018). Reading
development and developmental
dyslexia. In M. Casillas, A. Cristia &

C. Rowland, (Eds.), Many Paths to

Language (MPaL) (pp. 98-99). Nijmegen,
The Netherlands: Max Planck Institute

for Psycholinguistics.

Marrinu, E., Powell, Z., Thornton,

Wegener, S., Wang, H.-C., de Lissa, P.,

Robidoux, S., Nation, K., & Castles, A.

Children reading spoken words:

interactions between vocabulary and

orthographic expectancy. Developmental

Science, 21(3), e12577.

Published Conference Proceedings

Reading Program

Book Chapters

Byrne, B., Olson, R.K., & Samuelsen, S.
(In Press). Behavior-genetic studies of
literacy development: A commentary for professionals in psychology and
education. In D.A. Kilpatrick, R.M. Joshi,
& R.K. Wagner (Eds.), The Science of
Reading Development and Reading
Difficulties: Bridging the Gap between
Research and Practice. New York, USA:
Springer.

Types of developmental dyslexia. In A.
Bar-On & D. Ravid (Eds.), Handbook of
Communication Disorders: Theoretical, Empirical and Applied Linguistic
Perspectives (pp. 706-721). Berlin, Germany:
De Gruyter Mouton.

& D.J. Juss (Eds.), The Oxford Handbook of Cyberpsychology (pp. 1-26). Oxford,
UK: Oxford University Press.

The SAGE Encyclopedia of the Internet
(pp. 858-863). Thousand Oaks, USA:
SAGE.

Kemp, N. (2018). Reading and writing. In
B. Hopkins, E. Geang & S. Linkenauger

Periodicals

Badcock, N.A., Spooner, R., Hofmann,
J., Fitton, A.J., Elliott, S., Kurylowicz, L.,
Lavrenvic, L.M., Payne, H.M., Holt, G.K.,
young children. Laterality: Asymmetries ofBody, Brain and Cognition, 23(4),
391-408.

Barnes, L.J. McArthur, G.M., Biedermann,
B.A., de Lissia, P., Polito, V., & Badcock, N.
(2018). No mediation-related changes in
the auditory N1 during first-time
meditation. International Journal of
Psychophysiology, 127, 26-37.

Boyes, M.A., Tebbutt, B., Preece, K.A., &
between reading ability and child mental

Castles, A., Rastle, K., & Nation, K.
(2018). Ending the reading wars: Reading
acquisition from novice to expert. Psychological Science in the Public
Interest, 19(1), 5-51.

Colenbrander, D., Ricketts, J., &
Breadmore, H.L. (2018). Early
identification of dyslexia: Understanding the issues. Language, Speech and
Hearing Services in Schools, 49, 817-828.

is nonword reading so variable in adult
skilled readers? PeerJ, 6, e4879.

Francis, D.A., Caruana, N., Hudson,
J.L., & McArthur, G.M. (In Press). The
association between poor reading and
internalising problems: A systematic
review and meta-analysis. Clinical Psychology Review.

Kohnen, S., Nickels, L., Geigis, L.,
Coltheart, M., McArthur, G., & Castles,
A. (2018). Variations within a subtype:
Developmental surface dyslexias in

Larsen, L., Kohnen, S., McArthur, G., &
Nickels, L. (2018). An investigation of
grapheme parsing and grapheme-
phoneme knowledge in two children with
dyslexia. Reading and Writing, 31, 991-1015.

Li, L., Wang, H.-C., Castles, A., Hsieh, M., &
Marrinu, E. (2018). Phonetic radicals,
not phonological coding systems,
support orthographic learning via self-
teaching in Chinese. Cognition, 176,
184-200.

Marrinu, E., Kezilas, Y., Kohnen, S.,
Who are the noisiest neighbors in the hood? Using error analyses to study the
acquisition of letter-position processing. Journal of Experimental Psychology:
Learning Memory and Cognition, 44(9),
1384-1396.

Norris, D., Kinoshita, S., Hall, J., & Henson,
really lexical? Language, Cognition and
Neuroscience, 33(9), 1152-1167.

Pritchard, S.C., Coltheart, M., Marrinu,
model of the self-teaching hypothesis
based on the dual-route cascaded

Reading single words aloud with
monocular presentation: The effect of
word frequency. Frontiers in
Communication, 3, 16.

Schubert, T., Gawthrop, R., & Kinoshita,
abstract identities in learners of
Japanese Kana. Memory and Cognition, 46(6),
1010-1021.

Schubert, T., Kinoshita, S., & Norris,
D. (2018). What causes the greater
perceived similarity of consonant-
transposed nonwords? The Quarterly
Journal of Experimental Psychology, 71,
642-656.

Schubert, T., Reih, C., & McCloskey,
M. (2018). Knowledge about writing
influences reading: Dynamic visual
information about letter production
facilitates letter identification. Cortex,
103, 302-315.

Snowling, M.J., Gooch, D., McArthur,
G., & Hulme, C. (In Press). Language
skills, but not frequency discrimination,
predict reading skills in children at risk of
dyslexia. Psychological Science.

Wass, M., Ching, T., Cupples, L., Wang,
H.-C., Lyvell, B., Martin, L., Button, L.,
Gunnourie, M., Bosnert, I., McMahon, C., &
Castles, A. (In Press). Orthographic
learning in children who are deaf or
hard of hearing. Language, Speech, and
Hearing Services in Schools.

Wegener, S., Wang, H.-C., de Lissia, P.,
Robidoux, S., Nation, K., & Castles, A.
(2018). Children reading spoken words:
Interactions between vocabulary and
orthographic expectancy. Developmental Science, 21(3), e12577.
Other Programs

Books

Book Chapters


Periodicals


KEYNOTE | INVITED TALKS | COMMUNITY PRESENTATIONS

**Keynote | Invited Talks**


Crain, S. (2018, July). Everything you always wanted to know about how children resolve ambiguity (but were afraid to ask). Keynote paper presented at the Workshop on Ambiguity - Theory, Development and Processing, Gottingen University, Germany.


Crain, S. (2018, December). Innate ideas and where to find them. Keynote paper presented at the Sagol School of Neuroscience, Tel Aviv University, Israel.


Irish, M. (2018, March). ‘Memories are made of this’ – New Insights from the dementias. Invited symposium conducted at the MARCS Institute for Brain, Behaviour and Development, Western Sydney University.


**Community Presentations**


Engfors, L.M. (2018, July). What contributes to individual differences in face recognition ability? Invited presentation given at the Brain and Cognitive Health Technology Laboratory, McLean Hospital, Boston, USA.


Manes, F. (2018, August). The disintegration of the frontal lobes in fronto-temporal degenerations. Presentation given at the Meeting the Minds, Sao Paulo, Brazil.


AWARDS | RECOGNITION | GRANTS

**Awards**

- **Nicholas Badcock**
  Research Service Award, Faculty of Human Sciences, Macquarie University
- **Kevin Brooks**
  Student Nominated Teaching Award, Faculty of Human Sciences, Macquarie University
- **Catherine Browning**
  Vice Chancellor’s Commendation for Academic Excellence, Macquarie University
- **Leidy Castro-Meneses**
  Higher Degree Research Excellence Award, Faculty of Human Sciences, Macquarie University
- **Jemma Collova**
  Outstanding Postgraduate Research Award, Society of Australian Social Psychologists
- **Max Coltheart, Rochelle Cox, Paul Sowman, Hannah Morgan, Amanda Barnier, Robyn Langdon, Emily Connaughton, Lina Teichmann, Nikolos Williams and Vince Polito**
- **Rebecca Gelding**
  Higher Degree Research Excellence Award, Faculty of Human Sciences, Macquarie University
- **Tijl Grootswagers**
  Higher Degree Research Excellence Award, Faculty of Human Sciences, Macquarie University
- **Celia Harris**
  Early Career Researcher Award, Faculty of Human Sciences, Macquarie University
- **Saskia Kohnen**
  Research Translation Award, Faculty of Human Sciences, Macquarie University
- **Fiona Kumfor**
  Early Career Research Award, Australian Psychological Society
- **Pragati Rao Mandikal Vasuki**
  Higher Degree Research Excellence Award, Faculty of Human Sciences, Macquarie University
- **Bianca de Wit**
  Promoted to Lecturer (Level B)
- **Séliène Petit**
  1st Place, 3 Minute Thesis Competition, Faculty of Science, Macquarie University
  1st Place, 3 Minute Thesis Competition, Macquarie University
  2nd Place, 3 Minute Thesis Competition, Asia-Pacific
- **Sarah Pini**
  Best Poster Award, Australasian Skill Acquisition Network Conference
- **Siddharth Ramanan**
  BrightFocus Foundation Travel Award, Alzheimer's Research
- **Signy Wegener**
  Higher Degree Research Excellence Award, Faculty of Human Sciences, Macquarie University
- **Stephanie Wong**
  Excellent PhD Thesis in Psychology Award for 2018, Australian Psychological Society
- **Michelle Edwards**
  CCD Excellence in Research Student Award: Outstanding 2017 Publication
- **Tijl Grootswagers**
  CCD Excellence in Research Student Award: Outstanding 2017 Publication
- **Rosalind Hutchings**
  CCD Excellence in Research Student Award: Outstanding 2017 Publication
- **Siddharth Ramanan**
  CCD Excellence in Research Student Award: Outstanding 2017 Publication
- **Bianca Thorup**
  CCD Annual Workshop Winner Best PhD Poster Award
- **Kaitlyn Turbett**
  CCD Annual Workshop Highly Commended PhD Poster Award
- **Signy Wegener**
  CCD Excellence in Research Student Award: Outstanding 2017 Publication
  CCD Annual Workshop Winner Best PhD Poster Award

**Centre Awards**

- **Yu (Sherry) Chen**
  CCD Highly Commended PhD Poster Award
- **Jemma Collova**
  CCD Excellence in Research Student Award: Outstanding 2017 Publication
- **Michelle Edwards**
  CCD Excellence in Research Student Award: Outstanding 2017 Publication
- **Tijl Grootswagers**
  CCD Excellence in Research Student Award: Outstanding 2017 Publication
- **Rosalind Hutchings**
  CCD Excellence in Research Student Award: Outstanding 2017 Publication
- **Siddharth Ramanan**
  CCD Excellence in Research Student Award: Outstanding 2017 Publication
- **Bianca Thorup**
  CCD Annual Workshop Winner Best PhD Poster Award
- **Kaitlyn Turbett**
  CCD Annual Workshop Highly Commended PhD Poster Award
- **Signy Wegener**
  CCD Excellence in Research Student Award: Outstanding 2017 Publication
  CCD Annual Workshop Winner Best PhD Poster Award

**Promotions**

- **Scott Barnes**
  Promotion to Senior Lecturer (Level C)
- **Elisabeth (Lisa) Bayersmann**
  Promotion to Lecturer (Level B)
- **Nathan Caruana**
  Promotion to Lecturer (Level B)
- **Bianca de Wit**
  Promotion to Lecturer (Level B)
- **Wei He**
  Promotion to Lecturer (Level B)
- **Eva Marinus**
  Promotion to Senior Lecturer (Level C)
- **Caroline McMahon**
  Promotion to Professor (Level E)
- **Rosalind Thornton**
  Promotion to Professor (Level E)
- **Hua-Chen Wang**
  Promotion to Lecturer (Level B)
- **Susan Wardle**
  Promotion to Lecturer (Level B)
- **Nan Xu Rattanasone**
  Promotion to Lecturer (Level B)

**New External Appointments**

- **Stephan Crain**
  Member, Humanities and Creative Arts Research Evaluation Committee, Australian Research Council Excellence in Research for Australia (2018)
- **Antonio Di Ieva**
  Associate Professor of Neurosurgery, Ministry of Education Universities and Research, Italy (2018)
  Associate Professor of Neuroanatomy, Medical University of Vienna, Austria (2018)
- **Fiona Kumfor**
  Early- and Mid-Career Representative, Executive Committee for the Dementia Network (2018 - continuing)
- **Facundo Manes**
  Distinguished Visitor, National University of Cordoba, Argentina (2018)
- **Romina Palermo**
  Member, Academic Board, The University of Western Australia (2018 - continuing)
- **Anina Rich**
  Executive Committee Member, Global Young Academy (2018 - 2022)
  Expert Advisor, Scientific Partner, Sydney Science Festival, Culture at Work Art/Science Residency (2018)
New Editorial Appointments

Janet Hsiao
Associate Editor, Cognitive Science: A Multidisciplinary Journal (2018 - continuing)

Nenagh Kemp
Co-Editor-in-Chief, Journal of Research in Reading (2018 - continuing)

Ryan McKay
Associate Editor, British Journal of Psychology (2018 - continuing)

Editorial Board, Religion, Brain and Behavior (2018 - continuing)

John Sutton
Editorial Board, Memory Studies (Sage) (2018 - continuing)

Grants


ARC Discovery Project [DP170101715] (2017 - 2020) “Capture and control: Overcoming distraction by reward-related stimuli.” Le Pelley, M., Most, S., Theeuwes, J., & Wiers, R. (£393,000)


ARC Discovery Project Grant [DP160102756] (2016 - 2018) “Improved syntactic parsing and semantic analysis for natural language processing.” Johnson, M., & Steedman, M. (£388,000)


ARC Future Fellowship [FT170100105] (2017 - 2021) “Insights from brain imaging to study the neural basis of cognition.” Woolgar, A. (£759,284)


Australian Postgraduate Research Intern (2018) Stipend with the Department of Industry, Innovation and Science, Colloca, J. (£13,500)

Australian Postgraduate Research Intern (2018) Academic Mentor Grant (£2,977)

Australian Rotary Health ‘Mental Health of Young Australians’ Research Grants (2017 - 2018) “Determinants of risk and resilience in maltreated children using multi-agency administrative records: A population record-linkage study.” Green, M., Carr, V., Kitz, J., Laurens, K., Dean, K., & Tzourakis, S. (£135,854)


Canadian Institutes of Health Research Team Grant (2018 - 2024) “Healthy living for HIV-exposed uninfected Children – Cognitive, behavioural, neuroimaging and animal studies to assess the impact of in utero exposure to HIV and antiretrovirals.” (CAD2,735,444) Serghides, L., Smith, M.L., Bitnun, A., Brophy, J., Sled, J. et al. ($2,500,000)


Department of Industry, Innovation and Science, National Science Week Grant (2018) “A night of illusions.” Ransley, K., Connolly, M., & Snead, C. ($659,000)


Economic and Social Research Council and Department for International Development Grant (2016 - 2020) “Multilingualism and multiliteracy: Raising learning outcomes in challenging contexts in primary schools across India” (£650,748) Timpson, I., Mannis, T., & Treffers-Daller, J. ($1,314,700)


European Commission 7th Framework Programme for Research and Technological Development (2014 - 2019) “Advancing the European multilingualness.” (£5,000,000) Saddy, J.D., Mannis, T., & Timpson, I. ($10,800,000)


Japan Society for the Promotion of Science Grant-in-Aid for Scientific Research - Scientific Research Category C (17K02738) (2017 - 2020) Kiguchi, H., Funakoshi, K., & Throrton, R. ($26,500)


VISITORS

Academic Visitors

Dr Tetsu Hirosawa
Department of Psychiatry and Neurobiology Graduate School of Medical Science
University Kanazawa, Japan
3 October 2017 - 30 March 2018, Macquarie University
6 - 7 November, Macquarie University

Professor Karin Landerl
Department of Psychology
University of Graz, Austria
2 January - 30 March, Macquarie University

Dr Gwendolyn Hyslop
Department of Linguistics
The University of Sydney
30 January, Macquarie University

Dr Joseph Shroer
Department of Educational Psychology
Miami University, USA
2 February, Macquarie University

Dr Sylvie Nozaran
The MARCS Institute for Brain, Behaviour and Development
Western Sydney University
20 February, Macquarie University

Dr Anna Eva Hallin
Department of Clinical Science, Invention and Technology
Karolinska Institute, Sweden
26 February, Macquarie University

Professor Lynn Nadel
Department of Psychology
The University of Arizona, USA
8 - 9 March, The University of Sydney

Dr Frank van Schalkwijk
Centre for Cognitive Neuroscience
Salzburg University of Salzburg, Austria
8 - 9 March, The University of Sydney

Professor Jean Decety
Department of Psychology
University of Chicago, USA
14, 16 March, Macquarie University

Dr Brooke Donnelly
School of Psychology
The University of Sydney
19 March - 12 April, Macquarie University

Dr Nasim Forough
School of Medicine
Western Sydney University
19 March - 12 April, Macquarie University

Robyn Steward
Institute of Education
University College London, UK
20 March, The University of Western Australia

Associate Professor Jonathan Freeman
Department of Psychology
New York University, USA
23 - 24 March, The University of Western Australia

Professor Kang Lee
Dr Eric Jackman Institute of Child Study
University of Toronto, Canada
23 - 24 March, The University of Western Australia

Professor Ian Penton-Voak
School of Experimental Psychology
University of Bristol, UK
23 - 24 March, The University of Western Australia

Professor Alexander Todorov
Department of Psychology
Princeton University, USA
23 - 24 March, The University of Western Australia

Dr Roni-Judith Kahana Zweig
Department of Neurobiology
Weizmann Institute of Science, Israel
27 March, Macquarie University

Dr Katharina Galuschka
Psychosomatics and Psychotherapy
University Hospital Munich, Germany
3 April, Macquarie University

Associate Professor Sarah Fernandez Guinea
Department of Basic Psychology II (Cognitive Processes)
Universidad Complutense Madrid, Spain
3 April - 30 September, Macquarie University

Professor Jason Hollowell
Department of British and American Studies
Musashino University, Japan
3 April 2018 - 2 April 2019, Macquarie University

Dr Carolyn Berryman
School of Medicine
The University of Adelaide
10 April, Macquarie University

Professor Scott Johnson
Psychology Department
University of California, USA
23 - 28 April, Macquarie University

Dr Garry Young
School of Historical and Philosophical Studies
The University of Melbourne
24 April, Macquarie University

Dr Hans Bogaardt
Faculty of Health Sciences
The University of Sydney
1 May, Macquarie University

Associate Professor Alin Coman
Psychology Department
Princeton University, USA
28 May - 22 June, Macquarie University

Dr Brent Edwards
National Acoustic Laboratories
29 May, Macquarie University

Dr Jun Lai
Tilburg Center for Cognition and Communication
Tilburg University, The Netherlands
31 May - 30 September, Macquarie University

Dr Olena Nikolenko
Institute of Cryogenic Technologies and Engineering
Odessa I.I. Mechnikov National University, Ukraine
1 June - 30 November, Macquarie University

Peter Anderson
Department of Computing
Macquarie University
4 June, Macquarie University

Associate Professor Amanda Rysling
Department of Linguistics
University of California, Santa Cruz, USA
5 June, Macquarie University

Dr Chris Donkin
School of Psychology
The University of New South Wales
19 June, Macquarie University

Associate Professor Yoshiaki Adachi
Applied Electronics Laboratory
Kanazawa Institute of Technology, Japan
25 - 28 June, Macquarie University

Miki Kawabata
Applied Electronics Laboratory
Kanazawa Institute of Technology, Japan
25 - 28 June, Macquarie University

Professor Jun Kawai
Applied Electronics Laboratory
Kanazawa Institute of Technology, Japan
25 - 28 June, Macquarie University

Professor Yasuhiro Haruta
Department of Medical Imaging
University of Toronto, Canada
27 June - 15 July, Macquarie University

Professor Emily Bender
Department of Linguistics
University of Washington, USA
5 July, Macquarie University

Dr Lianzhong Zheng
College of Foreign Languages
Zhejiang Normal University, China
5 July 2018 - 4 July 2019, Macquarie University

Professor Andrew Yonelinas
Department of Psychology
University of California, Davis, USA
11 - 12 July, The University of Sydney

Professor James Booth
Department of Psychology and Human Development
Vanderbilt University, USA
13 July, Macquarie University
Professor Erika Hoff  
Department of Psychology  
Florida Atlantic University, USA  
23 - 27 July, Macquarie University

Professor Johanne Paradis  
Department of Linguistics  
University of Alberta, Canada  
23 - 27 July, Macquarie University

Professor Gillian Wigglesworth  
Department of Languages and Linguistics  
The University of Melbourne  
23 - 27 July, Macquarie University

Dr Emmanuel Chemla  
Laboratoire de Sciences Cognitives et Psycholinguistique  
École Normale Supérieure, France  
24 July 2018 - 27 June 2019, Macquarie University

Dr Erik Chang  
Institute of Cognitive Neuroscience  
National Central University, Taiwan  
25 July - 1 October, Macquarie University  
22 October - 22 December, Macquarie University

Associate Professor Carmel O'Shanessy  
ANU College of Arts and Social Sciences  
Australian National University  
26 - 27 July, Macquarie University

Dr Masataka Ohkubo  
National Institute of Advanced Industrial Science and Technology (AIST), Japan  
27 July, Macquarie University

Professor Saburo Tanaka  
Toyohashi Institute of Technology, Japan  
27 July, Macquarie University

Professor Bonnie Webber  
School of Informatics  
The University of Edinburgh, UK  
30 July - 1 August, Macquarie University

Assistant Professor Megan Papesh  
Department of Psychology  
Louisiana State University, USA  
7 August, Macquarie University

Professor Adriana Belletti  
Department of Linguistics  
University of Geneva, Switzerland  
8 - 10 August, Macquarie University

Professor Gennaro Cierchia  
Department of Linguistics  
Harvard University, USA  
8 - 10 August, Macquarie University

Professor Takuya Goro  
Department of English  
Tsuda University, Japan  
8 - 10 August, Macquarie University

Associate Professor Hirohsa Kiguchi  
Department of Cultural Studies  
Miyagi Gakuin Women’s University, Japan  
8 - 15 August, Macquarie University

Professor Luigi Rizzi  
Department of Linguistics  
University of Geneva, Switzerland  
8 - 10 August, Macquarie University

Professor Terje Lohndal  
Department of Language and Literature  
Norwegian University of Science and Technology, Norway  
9 - 10 August, Macquarie University

Professor Hedde Zeijlstra  
Department of Linguistics  
Georg-August University, Germany  
13 - 31 August, Macquarie University

Dr Anton Sukhoverkov  
Department of Philosophy  
Kuban State Agrarian University, Russia  
14 August, Macquarie University

Professor Robert Savage  
Institute of Education  
University College London, UK  
8 - 15 September, Macquarie University

Dr Joel Krueger  
Department of Sociology, Philosophy and Anthropology  
University of Exeter, UK  
10 - 29 September, Macquarie University

Dr James Grama  
ANU College of Arts and Social Sciences  
Australian National University  
11 - 12 September, Macquarie University

Dr Simon González Ochoa  
ANU College of Arts and Social Sciences  
Australian National University  
11 - 12 September, Macquarie University

Professor Mark Eckert  
Department of Otolaryngology  
University of South Carolina, USA  
19 - 21 September, Macquarie University

Dr Susanne Ravn  
Institute of Sports Science and Clinical Biomechanics  
University of Southern Denmark, Denmark  
20 September - 3 October, Macquarie University

Professor Niels Schiller  
Leiden University Centre for Linguistics and Leiden Institute for Brain and Cognition  
Leiden University, The Netherlands  
16 October, Macquarie University

Associate Professor Sara Hart  
Department of Psychology  
Florida State University, USA  
19 October - 18 November, University of New England  
6 November, Macquarie University

Dr Dona Jayakody  
Ear Science Institute Australia  
20 - 22 October, Macquarie University

Jonathon Love  
School of Mathematical and Physical Sciences  
The University of Newcastle  
29 - 31 October, Macquarie University

Professor Sylvain Baillet  
Department of Neurology and Neurosurgery  
McGill University, Canada  
5 - 9 November, Macquarie University

Professor Ingo Bojak  
School of Psychology and Clinical Language Sciences  
University of Reading, UK  
5 - 9 November, Macquarie University

Dr Christos Platsikas  
School of Psychology and Clinical Language Sciences  
University of Reading, UK  
5 - 9 November, Macquarie University

Dr Kyung-min An  
Research Center for Child Mental Development  
Kanazawa University, Japan  
6 - 8 November, Macquarie University

Dr Patrick Cooper  
School of Psychology  
The University of Newcastle  
6 - 7 November, Macquarie University

Dr Chiaki Hasegawa  
Research Center for Child Mental Development  
Kanazawa University, Japan  
6 - 8 November, Macquarie University

Professor Tom Johnstone  
School of Health Sciences  
Swinburne University of Technology  
6 - 8 November, Macquarie University

Dr Emma Mitchell  
CSIRO  
6 - 7 November, Macquarie University

Dr William Woods  
School of Health Sciences  
Swinburne University of Technology  
6 - 7 November, Macquarie University

Dr Vitória Piai  
Donders Institute  
Radboud University, The Netherlands  
21 November, Macquarie University

Dr Sebastien Miellet  
School of Psychology  
University of Wollongong  
27 November, Macquarie University

Professor Martijn Wieling  
Centre for Groningen Language and Culture  
University of Groningen, The Netherlands  
3 December, Macquarie University

Dr Donna Rose Addis  
Department of Psychology  
The University of Auckland, NZ  
4 - 7 December, Macquarie University

Dr Frances Dark  
Rehabilitation Academic Clinical Unit  
Princess Alexandra Mental Health Service  
10 December, Macquarie University

Professor Anthony Harris  
Sydney School of Medicine  
The University of Sydney  
10 December, Macquarie University

Associate Professor Neil Thomas  
School of Health Sciences  
Swinburne University of Technology  
10 December, Macquarie University
Student Visitors

Ayako Prokopczuk
Department of Linguistics
University of Leipzig, Germany
1 September 2017 - 3 April 2018, Macquarie University

Kendelle Cinco
Department of Linguistics
Macquarie University
12 March - 15 June, Macquarie University

Philip Schulz
Institute for Logic, Language and Computation
University of Amsterdam, The Netherlands
19 - 20 March, Macquarie University

Marrit Janabi
Faculty of Health Sciences
The University of Sydney
7 May, Macquarie University

Shanèle Payart
Ecole Normale Supérieure, France
4 June - 24 August, The University of Western Australia

Kate Alderton
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Ghadeer Ali
Department of Linguistics
Macquarie University
13 August - 9 November, Macquarie University

Eitan Ben-Sefer
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Naomi Bouskila
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Talia Burdon
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Joshua Carey
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Andrew Chen
Department of Psychology
Macquarie University
13 August - 9 November, Macquarie University

William Cole
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Silas Collard
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Marianne Cuasay
Department of Psychology
Macquarie University
13 August - 9 November, Macquarie University

Ayeesha Dadamia
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Simon Gooch
Department of Psychology
Macquarie University
13 August - 9 November, Macquarie University

Camille Gourouvadou
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Kate Alderton
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Xanthe Harrison
Department of Psychology
Macquarie University
13 August - 9 November, Macquarie University

Wendy Higgins
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Nora Holmes
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Rabea Horoni
Department of Linguistics
Macquarie University
13 August - 9 November, Macquarie University

Vedaant Ravi Khandelwal
Department of Psychology
Macquarie University
13 August - 9 November, Macquarie University

Siock Mei King
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Andrea Kuriakose
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Emily-Sue Lightowler
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Lara Livolsi
Department of Psychology
Macquarie University
13 August - 9 November, Macquarie University
George Lynch
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Lauren Meltzer
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

James Meredith
Department of Linguistics
Macquarie University
13 August - 9 November, Macquarie University

Brodie Miller
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Courtney Muir
Department of Psychology
Macquarie University
13 August - 9 November, Macquarie University

Eric Jon Presnall
Department of Psychology
Macquarie University
13 August - 9 November, Macquarie University

Emma Salteri
Department of Psychology
Macquarie University
13 August - 9 November, Macquarie University

Olivia Soesanto
Department of Psychology
Macquarie University
13 August - 9 November, Macquarie University

Cassandra Walton
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Daniel Whiting
Department of Psychology
Macquarie University
13 August - 9 November, Macquarie University

Christopher Whyte
Department of Cognitive Science
Macquarie University
13 August - 9 November, Macquarie University

Mattis Geiger
Department of Individual Differences and Psychological Assessment
Ulm University, Germany
28 November - 5 December, The University of Western Australia

Sophie Gillan
Department of Linguistics
Macquarie University
10 December 2018 - 25 January 2019, Macquarie University

Wai Lok
Department of Linguistics
Macquarie University
10 December 2018 - 25 January 2019, Macquarie University

Mikiko Nakamura
Department of Linguistics
Macquarie University
10 December 2018 - 25 January 2019, Macquarie University

Yao Tong
Department of Linguistics
Macquarie University
10 December 2018 - 25 January 2019, Macquarie University

Manja Engel
Department of Social and Behavioural Sciences
Utrecht University, The Netherlands
14 December - 14 December, Macquarie University

Stephen Gadsby
Philosophy Department
Monash University
14 December - 14 December, Macquarie University

Sophie Gillan
Department of Linguistics
Macquarie University
10 December 2018 - 25 January 2019, Macquarie University

Dr Rosalind Hutchings
Brain and Mind Centre
The University of Sydney
22 January - 28 February, The University of Western Australia

Professor Elizabeth (Liz) Pellicano
Department of Educational Studies
Macquarie University
19 - 23 March, The University of Western Australia

Professor Andrew (Andy) Young
Department of Psychology
The University of York, UK
23 - 24 March, The University of Western Australia

Professor William Hayward
Faculty of Social Sciences
The University of Hong Kong, Hong Kong
23 - 24 March, The University of Western Australia

Professor Cathy Mondloch
Department of Psychology
Brock University, Canada
23 - 24 March, The University of Western Australia

Professor Bradley Duchaine
Department of Psychological and Brain Sciences
Dartmouth College, USA
23 - 24 March, The University of Western Australia

Associate Professor Romina Palermo
School of Psychological Science
The University of Western Australia
26 - 28 April, Macquarie University
24 - 26 October, Macquarie University

Dr Iain Perkes
Brain and Mind Centre
The University of Sydney
22 May, Macquarie University

Professor Theo Marinis
Department of Linguistics
University of Konstanz, Germany
23 - 27 July, Macquarie University

Professor Naama Friedmann
School of Education and Sagol School of Neuroscience
Tel Aviv University, Israel
30 July - 31 August, Macquarie University

Professor Mark Steedman
School of Informatics
University of Edinburgh, UK
30 July - 1 August, Macquarie University

Professor Maria Teresa Guasti
Department of Psychology
University of Milano-Bicocca, Italy
6 - 17 August, Macquarie University

Associate Professor Peng Zhou
Department of Foreign Languages and Literatures
Tsinghua University, China
7 - 10 August, Macquarie University

Dr Loes Koring
Department of Languages, Literature and Communication
Utrecht University, The Netherlands
8 - 10 August, Macquarie University
Dr Lyn Tieu  
School of Education  
Western Sydney University  
8 - 10 August, Macquarie University

Associate Professor Ivan Caponigro  
Department of Linguistics  
University of California, San Diego, USA  
8 - 10 August, Macquarie University

Professor Kate Nation  
Department of Experimental Psychology  
University of Oxford, UK  
10 - 29 September, Macquarie University

Dr Ryan Balzan  
School of Psychology  
Flinders University  
23 - 26 October, Macquarie University  
10 December, Macquarie University

Ellen Bothe  
School of Psychological Science  
The University of Western Australia  
23 - 26 October, Macquarie University

Dr Nichola Burton  
School of Psychological Science  
The University of Western Australia  
23 - 26 October, Macquarie University

Jemma Collova  
School of Psychological Science  
The University of Western Australia  
23 - 26 October, Macquarie University

Dr Marshall Dalton  
Institute of Neurology  
University College London, UK  
23 - 26 October, Macquarie University

Dr Amy Dawel  
Research School of Psychology  
Australian National University  
23 - 26 October, Macquarie University

Chloe Giffard  
School of Psychological Science  
The University of Western Australia  
23 - 26 October, Macquarie University

Dielle Horne  
School of Psychological Science  
The University of Western Australia  
23 - 26 October, Macquarie University

Samantha-Kaye Johnston  
School of Psychology  
Curtin University  
23 - 26 October, Macquarie University

Dr Jacopo Romoli  
School of Communication  
University of Ulster, UK  
23 - 26 October, Macquarie University

Dr Teresa Schubert  
Department of Psychology  
Harvard University, USA  
23 - 31 October, Macquarie University

Professor Stefan Schweinberger  
Department of General Psychology  
Friedrich Schiller University of Jena, Germany  
23 - 26 October, Macquarie University

Dr Clare Sutherland  
School of Psychological Science  
The University of Western Australia  
23 - 26 October, Macquarie University

Derek Swe  
School of Psychological Science  
The University of Western Australia  
23 - 26 October, Macquarie University

Kaitlyn Turbett  
School of Psychological Science  
The University of Western Australia  
23 - 26 October, Macquarie University

Dr Britta Biedermann  
School of Psychology and Speech Pathology  
Curtin University  
24 - 26 October, Macquarie University

Emeritus Professor Brian Byrne  
School of Humanities, Arts, and Social Sciences  
University of New England  
24 - 26 October, Macquarie University

Dr Nenagh Kemp  
School of Psychology  
University of Tasmania  
24 - 26 October, Macquarie University

Professor Ryan McKay  
Department of Psychology  
Royal Holloway, University of London, UK  
24 - 26 October, Macquarie University

Professor Gillian Rhodes  
School of Psychological Science  
The University of Western Australia  
24 - 26 October, Macquarie University

Bianca Thorup  
Department of Psychology  
The University of Western Australia  
24 - 26 October, Macquarie University

Professor James Douglas Saddy  
School of Psychology and Clinical Language Sciences  
University of Reading, UK  
5 - 9 November, Macquarie University

Associate Professor Thomas Carlson  
School of Psychology  
The University of Sydney  
7 November, Macquarie University

Dr Sharon Savage  
Department of Psychology  
University of Exeter, UK  
19 - 28 November, Macquarie University

Dr Jason Bell  
School of Psychological Science  
The University of Western Australia  
14 December, Macquarie University

Dr Louise Ewing  
Department of Psychological Science  
Birkbeck, University of London, UK  
19 December, The University of Western Australia
# PERFORMANCE INDICATORS

*These new targets were set based on the 2017 targets in the ARC Agreement that were revised for our approval to extend Centre operations in an additional year of operations.*

<table>
<thead>
<tr>
<th>Research Findings</th>
<th>TARGET #</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of research outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Books</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Book chapters</td>
<td>40</td>
<td>26</td>
</tr>
<tr>
<td>Journal articles</td>
<td>120</td>
<td>187</td>
</tr>
<tr>
<td>Quality of journal articles (IF &gt; 2)</td>
<td>50</td>
<td>133</td>
</tr>
<tr>
<td>Keynote and invited presentations at major meetings</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Commentaries about Centre achievements</td>
<td>30</td>
<td>139</td>
</tr>
<tr>
<td>Scopus citations for Chief Investigators</td>
<td>1,000</td>
<td>10,683</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research Training</th>
<th>Professional Education</th>
<th>TARGET #</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training sessions organised by the Centre</td>
<td>15</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Number of attendees at Centre training sessions</td>
<td>57</td>
<td>&gt;2,700</td>
<td></td>
</tr>
<tr>
<td>New postgraduate students</td>
<td>15</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>New postdoctoral researchers</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>New honours students</td>
<td>10</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>PhD completions, completion times</td>
<td>15, 3yr 6mth</td>
<td>19, 4yr 3mth</td>
<td></td>
</tr>
<tr>
<td>Number of Early Career Researchers (within 5 years of PhD)</td>
<td>17</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>Mentored high school and visiting students</td>
<td>10</td>
<td>75</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>International, National And Regional Links</th>
<th>Networks</th>
<th>TARGET #</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>International visitors</td>
<td>18</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>National and international workshops organised by the Centre</td>
<td>5</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Visits to overseas laboratories</td>
<td>30</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Interdisciplinary research supported by the Centre</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross-program experiments/papers</td>
<td>7</td>
<td>28: 21 papers and 7 projects</td>
<td></td>
</tr>
<tr>
<td>Interdisciplinary PhD supervision</td>
<td>30%</td>
<td>23%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>End-user Links</th>
<th>TARGET #</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government, industry and business briefings</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td>Public awareness programs</td>
<td>3</td>
<td>3: Community Engagement, Educational Outreach, Regional Engagement</td>
</tr>
<tr>
<td>Website updates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Events</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>Research outcomes</td>
<td>4</td>
<td>53</td>
</tr>
<tr>
<td>Website hits</td>
<td>20,000</td>
<td>48,885</td>
</tr>
<tr>
<td>Public talks given by the Centre</td>
<td>10-15</td>
<td>64</td>
</tr>
</tbody>
</table>
## Organisational Support

<table>
<thead>
<tr>
<th></th>
<th>TARGET $</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total annual cash contributions from Collaborating Organisations</td>
<td>$94,178</td>
<td>$94,178</td>
</tr>
<tr>
<td>Total annual in-kind contributions from Collaborating Organisations</td>
<td>$2,266,753</td>
<td>$2,419,951</td>
</tr>
<tr>
<td>Total annual cash contributions from Partner Organisations</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total annual in-kind contributions from Partner Organisations</td>
<td>$96,192</td>
<td>$96,192</td>
</tr>
<tr>
<td>Total annual other research income</td>
<td>$3,825,000</td>
<td>$21,087,262</td>
</tr>
<tr>
<td>New collaborations with institutions/industry</td>
<td>0</td>
<td>2 (Autism West; University of Geneva, Switzerland)</td>
</tr>
</tbody>
</table>

## Governance

<table>
<thead>
<tr>
<th></th>
<th>TARGET $</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Committee</td>
<td>4</td>
<td>No meeting held</td>
</tr>
<tr>
<td>Advisory Board Members</td>
<td>10</td>
<td>10 members</td>
</tr>
<tr>
<td>Advisory Board meetings</td>
<td>2</td>
<td>1 meeting: 23 Oct (Showcase)</td>
</tr>
</tbody>
</table>

Bringing researchers together to form an interactive and effective research team

<table>
<thead>
<tr>
<th></th>
<th>TARGET $</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruit/retain staff and recruit students across the five research programs</td>
<td>42</td>
<td>40</td>
</tr>
<tr>
<td>Research Management Committee meetings</td>
<td>1</td>
<td>4 meetings: 28 Mar, 23 May, 1 Aug, 21 Nov; plus 2 Director/CDO visits to UWA/USyd nodes</td>
</tr>
</tbody>
</table>

## National Benefit

<table>
<thead>
<tr>
<th></th>
<th>TARGET $</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution to the National Research Priorities and the National Innovation Priorities</td>
<td>6</td>
<td>Contributed to National Research Priorities: A healthy start to life: Reading, Language and Person Perception Programs; Ageing well, ageing productively: Memory, Belief Formation and Language Programs Contributed to National Innovation Priorities: 1, 2, 6 &amp; 7</td>
</tr>
</tbody>
</table>

## Centre-specific Performance Indicators

<table>
<thead>
<tr>
<th></th>
<th>TARGET $</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation at peak body meetings and information sessions</td>
<td>15</td>
<td>29</td>
</tr>
</tbody>
</table>

Cognitive science in the public interest program

Four member spotlight articles and 28 research feature articles on the CCD homepage; 12 Centre members contributed to ‘The Conversation’. (see Media | Public Awareness); 5 Centre members maintain blogs relevant to their research; Twitter list generated of CCD Members reached 120 members. The Person Perception Program and Child Language Lab also maintained active twitter accounts. Increased activity using the @CCD outreach twitter account: over 24,000 impressions and over 550 profile views per month.

Women in Science program

The CCD Inclusive Research Network (IRN) has two main objectives: 1. Provide a supportive environment to educate and advocate for inclusive practices in academia, and 2. Communicate current issues regarding equity and diversity in our research communities. Hosted monthly meetings in 2018.

Educational outreach program

Hosted 25 high school students for work experience as part of the CCD Work Experience Program. Centre members also provided mentoring to 50 student interns. (see Educational Outreach).

Rural outreach program

Katherine Demuth and colleagues worked with 43 primary school students from the Northern Territory on hearing issues and phonological awareness. Linda Jeffery and colleagues hosted 57 Year 9 students from the Kimberley region in Western Australia introducing them to face memory abilities.
## INCOME

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC Centre of Excellence Grant</td>
<td>$3,047,251</td>
<td>$3,164,494</td>
<td>$3,286,244</td>
<td>$3,385,555</td>
<td>$3,446,191</td>
<td>$3,504,776</td>
<td>$3,557,348</td>
<td>-</td>
</tr>
<tr>
<td>Cash Contributions by Node</td>
<td>$1,098,116</td>
<td>$1,824,287</td>
<td>$996,487</td>
<td>$1,442,681</td>
<td>$1,295,742</td>
<td>$1,056,096</td>
<td>$932,177</td>
<td>$94,178</td>
</tr>
<tr>
<td>Macquarie University</td>
<td>$750,535</td>
<td>$1,473,899</td>
<td>$646,099</td>
<td>$1,065,792</td>
<td>$945,084</td>
<td>$705,707</td>
<td>$608,289</td>
<td>$94,178</td>
</tr>
<tr>
<td>The University of New South Wales</td>
<td>$150,000</td>
<td>$150,000</td>
<td>$150,000</td>
<td>$150,000</td>
<td>$150,000</td>
<td>$150,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The University of Sydney</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$150,000</td>
<td></td>
</tr>
<tr>
<td>The University of Western Australia</td>
<td>$197,581</td>
<td>$200,388</td>
<td>$200,388</td>
<td>$226,888</td>
<td>$200,388</td>
<td>$200,388</td>
<td>$173,888</td>
<td></td>
</tr>
<tr>
<td>Other Income</td>
<td></td>
<td>$11,060</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$1,136</td>
<td>$455</td>
</tr>
<tr>
<td>NSW Science Leveraging Fund</td>
<td>$511,579</td>
<td>$408,456</td>
<td>$471,986</td>
<td>$31,234</td>
<td>$107,738</td>
<td>$24,965</td>
<td>$460</td>
<td>$41,050</td>
</tr>
<tr>
<td>TOTAL INCOME</td>
<td>$4,656,946</td>
<td>$4,999,841</td>
<td>$4,282,731</td>
<td>$4,828,236</td>
<td>$4,741,663</td>
<td>$4,560,872</td>
<td>$4,490,662</td>
<td>$94,633</td>
</tr>
<tr>
<td>Accumulated funds from previous year</td>
<td>$2,062,637</td>
<td>$2,607,150</td>
<td>$2,339,975</td>
<td>$2,680,118</td>
<td>$2,809,046</td>
<td>$2,905,850</td>
<td>$3,675,997</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) $500,000 brought forward from 2016 and 2017 to contribute to NSW Science Leverage Fund Helium Recovery System project

\(^2\) $250,000 cash contribution for 2016 was received in 2012 to contribute to NSW Science Leverage Fund Helium Recovery System project

\(^3\) $250,000 cash contribution for 2017 was received in 2012 to contribute to NSW Science Leverage Fund Helium Recovery System project

\(^4\) Carry forward of Administering Organisation cash contribution

## EXPENDITURE

<table>
<thead>
<tr>
<th>Description</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries/Contractors</td>
<td>$1,830,699</td>
<td>$1,450,435</td>
<td>$3,525,912</td>
<td>$3,625,640</td>
<td>$2,991,800</td>
<td>$2,320,308</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scholarships</td>
<td>$285,369</td>
<td>$348,185</td>
<td>$497,888</td>
<td>$373,636</td>
<td>$382,676</td>
<td>$241,770</td>
<td>$181,105</td>
<td>$41,050</td>
</tr>
<tr>
<td>Equipment</td>
<td>$295,387</td>
<td>$408,456</td>
<td>$471,986</td>
<td>$31,234</td>
<td>$107,738</td>
<td>$24,965</td>
<td>$460</td>
<td>$41,050</td>
</tr>
<tr>
<td>Travel/Professional Development</td>
<td>$160,836</td>
<td>$267,494</td>
<td>$167,891</td>
<td>$231,646</td>
<td>$347,652</td>
<td>$287,158</td>
<td>$130,008</td>
<td>$440,657</td>
</tr>
<tr>
<td>Maintenance/Consumables</td>
<td>$165,195</td>
<td>$212,482</td>
<td>$235,848</td>
<td>$135,957</td>
<td>$60,080</td>
<td>$29,221</td>
<td>$52,172</td>
<td>$54,851</td>
</tr>
<tr>
<td>Other Expenditure</td>
<td>$112,192</td>
<td>$132,977</td>
<td>$95,198</td>
<td>$140,933</td>
<td>$197,718</td>
<td>$114,410</td>
<td>$124,304</td>
<td>$176,646</td>
</tr>
<tr>
<td>TOTAL EXPENDITURE</td>
<td>$2,594,309</td>
<td>$4,455,328</td>
<td>$4,549,906</td>
<td>$4,488,093</td>
<td>$4,612,735</td>
<td>$4,464,069</td>
<td>$3,720,515</td>
<td>$3,214,618</td>
</tr>
<tr>
<td>Accumulated funds to next year</td>
<td>$2,062,637</td>
<td>$2,607,150</td>
<td>$2,339,975</td>
<td>$2,680,718</td>
<td>$2,809,046</td>
<td>$2,905,850</td>
<td>$3,675,997</td>
<td>$556,012</td>
</tr>
</tbody>
</table>

\(^4\) Carry forward of Administering Organisation cash contribution
PARTICIPATING ORGANISATIONS

Funding sources

Administering organisations

Collaborating organisations

Partner organisations
## ASSOCIATE INVESTIGATOR ORGANISATIONS

**INTERNATIONAL**
- Aarhus University, Denmark
- Academia Sinica, Taiwan
- Aix-Marseille University, France
- Aston University, UK
- Birkbeck, University of London, UK
- Bristol University, UK
- Brock University, Canada
- Cardiff University, UK
- Dartmouth College, USA
- Friedrich Schiller University of Jena, Germany
- Goldsmith, University of London, UK
- Humboldt University of Berlin, Germany
- Indiana University, USA
- Leibniz-Zentrum Allgemeine Sprachwissenschaft (ZAS), Germany
- Linköping University, Sweden
- Massachusetts Institute of Technology, USA
- McMaster University, Canada
- Montana State University, USA
- National Central University, Taiwan
- New York University, USA
- Swansea University, UK
- The Ohio State University, USA
- The University of Hong Kong, Hong Kong
- Trinity College Dublin, Ireland
- Tsinghua University, China
- University Medical Center Hamburg-Eppendorf, Germany
- University of Alberta, Canada
- University of Birmingham, UK
- University of Bristol, UK
- University of California, Berkeley, USA
- University of California, San Diego, USA
- University of Cambridge, UK
- University of Connecticut, USA
- University of Edinburgh, UK
- University of Essex, UK
- University of Exeter, UK
- University of Geneva, Switzerland
- University of Lincoln, UK
- University of Milano-Bicocca, Italy
- University of Minnesota, USA
- University of Nevada, Reno, USA
- University of Oslo, Norway
- University of Padova, Italy
- University of Reading, UK
- University of Siena, Italy
- University of Toronto, Mississauga, Canada
- University of Tsukuba, Japan
- University of Turku, Finland
- University of Ulster, UK
- Victoria University of Wellington, NZ

**NATIONAL**
- Australian Catholic University, ACT/NSS/VIC
- Australian College of Applied Psychology, NSW
- Australian National University, ACT
- Charles Sturt University, SA
- Curtin University, WA
- Flinders University, SA
- Monash University, NSW
- Murdoch University, WA
- Neuroscience Research Australia, NSW
- National Acoustics Laboratories, NSW
- The Centre for Independent Studies, NSW
- The University of Queensland, NSW
- The University of Sydney, NSW
- University of Tasmania, TAS
- University of Technology, Sydney, NSW
- Western Sydney University, NSW