



# The **A**ustralasian Society for Philosophy and Psychology

Schedule and Abstract Booklet

December 5<sup>th</sup>-7<sup>th</sup> 2018

Sydney, Australia

Macquarie University



## Welcome

Welcome to the first meeting of the Australasian Society for Philosophy and Psychology! This three-day conference, hosted by Macquarie University, runs from December 5<sup>th</sup> to 7<sup>th</sup>.

The Australasian Society for Philosophy and Psychology was formed in 2017 to promote interaction in Australasia among philosophers and psychologists, broadly construed to include anyone interested in scientific study of the mind, and scholars in related fields on issues of common concern (including but not limited to neuroscience, linguistics, computer science, and anthropology).

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For more information please visit <http://theaspp.org>

## Venue Information

The ASPP 2018 conference is hosted by Macquarie University. The venue is located in the MUSE building on campus. Please enter via 18 Wally's Walk located at N16 on the Campus map provided in this booklet.

Wifi will be available at the venue. Important locations are marked on the map for your convenience.

There are breastfeeding and pumping rooms available in 14 Eastern Road, Room 107 (Map: M22) and 29 Wally's Walk, Room 109 (Map: N11).

Friendly Volunteers are here to help,  
so if you have any questions please ask.

## Transport Information

The Macquarie University train station is undergoing renovations, as such the most convenient mode of transport are the buses along University Avenue and Herring Road.

The app 'TripView' can assist you with planning your transport routes. Parking is available on campus (see map). Make sure you display the permit you received with your registration. If you don't have one, we have spares at the registration desk!



# MACQUARIE University

- Legend**
- PATHWAYS
  - ROADS
  - SHARED ZONES
  - FACULTY/THEATRE
  - OTHER BUILDINGS
  - PARKING
  - SECURITY
  - CAFE/RESTAURANT
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Updated May 2018



## Wednesday, December 5<sup>th</sup>

Time	Room A	Room B
<b>8:00</b>	Registration and Coffee	
<b>9:00</b>	Welcome to Country	
<b>9:15-10:15</b>	Keynote: Michael Richardson (Macquarie University) "Symmetries of Order in Perception, Action and Cognition"	
<b>10:15-10:45</b>	Morning Tea	
<b>10:45-12:15</b> <b>Parallel Sessions</b>	Alessio Bucci (University of Turin): Altered States of Consciousness: A Conceptual Analysis Based on Empirical Cases	Nick Byrd (Florida State University): Not All Who Ponder Count Costs: Arithmetic Reflection Predicts Utilitarian Inclinations, but Syllogistic Reflection Predicts both Deontological and Utilitarian Inclinations
	Katsunori Miyahara (UoW): Expediting Neurophenomenology: Lessons from an Initial Attempt	Graham Wood (UTAS): Toward a Unified Cognitive Science of Moral Intuition.
	Alex Morgan (Rice University): Gaining Perspective: On the Neurocomputational Mechanisms of Subjectivity	Noel Viana (UTAS): Stimulating the Brain or Altering the Self? The Effects of Neurostimulation for Alzheimer's Disease
	Lin Ying-Tung (National Yang-Ming University): Field and Observer Perspectives in Episodic Simulation and the Sense of Self	Pablo López-Silva (University of Valparaíso): Are These My Own Thoughts? Attributions of Mental Agency and the Challenge from Psychopathology
<b>12:15-13:00</b>	Lunch	
<b>13:00-15:00</b> <b>Long Symposia</b>	"Enculturated Minds: E-Cognition Perspectives on Collective Intentionality, Social Cognition and Perception." Glenda Satne (UOW/UAH) and Richard Menary (Macquarie); Ines Hipolito and Daniel Hutto (UOW); Nick Brancazio and Miguel Segundo Ortin (UOW); Alan Jurgens (UOW).	Author-Meets-Critics session. Josh May Regard for Reasons in the Moral Mind. Daniel Cohen (CSU Wagga Wagga); Philip Gerrans (University of Adelaide); Jeanette Kennett (Macquarie); Joshua May (University of Alabama at Birmingham); Robin Zheng (Yale NUS)
<b>15:00-15:30</b>	Afternoon Tea	
<b>15:30-17:00</b> <b>Parallel Sessions</b>	Peter Slezak (UNSW): Intuition and Omniscience	Isaac Wiegman (Texas State University): The Motivational Structure of Emotions
	Corey Maley (University of Kansas): Analog Computation for Cognitive Science	Mizumoto Masaharu (Japan Advanced Institute of Science and Technology): Knowing Emotions of Others: A Cross-linguistic and Cross-cultural Study
	Larry Shapiro and Greg Nirshberg (University of Wisconsin–Madison): Structural and Indicator Representations: A Difference in Degree, Not Kind	Olivia Odoffin (Rutgers): A Productivity Argument for Emotion
	Jon Opie and Gerard O'Brien (University of Adelaide): Commentary	Jodie Valpied (University of Melbourne): Are Extraverts Really Happier? Philosophical and Methodological Issues in the Study of Introversion-Extraversion and Positive Affect.
<b>17:15-18:15</b>	Keynote: Kate Stevens (Western Sydney University) "Bodies of Knowledge": Recollective and Creative Cognition in Australian Contemporary Dance	
<b>18:15-19:30</b>	Poster Reception, including informal welcome remarks from Max Coltheart (Macquarie)	

## Thursday, December 6<sup>th</sup>

Time	Room A	Room B
<b>9:00-10:00</b>	Keynote: Donna Rose Addis (University of Toronto) "Episodic Memory and Episodic Simulation: One and the Same?"	
<b>10:00-10:30</b>	Morning Tea	
<b>10:30-12:00</b> <b>Parallel Sessions</b>	Symposium: "Current Issues in Cognitive Neuroscience" Tom Carlson (USyd); Mark Williams (Macquarie); Brendan Ritchie (KU Leuven)	Vicente Raja Galian (Western University): Don't Trust the Body Snatchers! Predictive Processing and Dis-Embodied Cognitive Science.
		Guilherme Sanches De Oliveira (University of Cincinnati): Scientific Representation, Mental Representation, and Embodied Cognition.
		Martin Hartmann (University of Jyväskylä): Music-induced movement: Prediction of Perceived Similarity and Interaction between Dyads
<b>12:00-13:00</b>	Lunch and General Meeting of the ASPP	
<b>13:00-15:00</b> <b>Long Symposia</b>	"Minds in Skilled Performance" Jesús Ilundáin-Agurruza (Linfield College) and Yoshiko Oda (Tokai Gakuen University) ; Michael D. Kirchoff (University of Wollongong) and Ian Robertson (University of Wollongong); Katsunori Miyahara (University of Wollongong/University of Tokyo)	"Collective Memory" Catherine A. Browning (Macquarie); Celia B. Harris (Macquarie); Craig Thorley (James Cook University); Chloe Wall (University of Otago)
<b>15:00-15:30</b>	Afternoon Tea	
<b>15:30-17:00</b> <b>Parallel Sessions</b>	Symposium: "Beliefs Beyond Rationality" Stephanie Howarth (Macquarie), Colin Klein (ANU), Vince Polito (Macquarie)	Wayne Christensen (University of Warwick): Meshed Cognitive and Automatic Control in Skilled Action
		Angus McLachlan (Federation University): The Ticklish Touch: Stimulus or Sign
		Markos Valaris (UNSW): Action Demonstratives and Knowledge of Action
		Christopher Hewitson (Macquarie): Exploring Bayesian Integration in Visuomotor Learning
<b>17:15-18:15</b>	Keynote: Andy Clark (University of Edinburgh) Computational Psychiatry and the Construction of Human Experience	
<b>18:30</b>	Conference Dinner at The Ranch	

Friday, December 7<sup>th</sup>

Time	Room A	Room B
9:00-10:00	Presidential Address: John Sutton (Macquarie University) "Otto in the Wild: dementia and distributed cognition"	
10:00-10:30	Morning Tea	
10:30-12:00 Parallel Sessions	Symposium: "The temporally extended self – from development to degeneration" Thomas Suddendorf (UQ); Jonathan Redshaw (UQ); Adam Bulley (UQ); Muireann Irish (USyd); Cherie Strikwerda-Brown (USyd)	Kate Devitt (QUT): Antagonising the echo chamber: Can a social network counteract cognitive bias with Bayesian rationality?
		Hoda Mostafavi (Macquarie): Person-reading: The cultural evolution of social cognition
		Linus Huang (Academia Sinica): Neurodemocracy: Self-Organization of the Embodied Mind
		Mike Dacey (Bates College): Evidence against Default Models in Comparative Psychology
12:00-13:00	Lunch	
13:00-15:00 Long Symposia	"The Biological Boundaries of Predictive Processing" Jakob Hohwy (Monash), Michael Kirchhoff (UOW); Alex Morgan (Rice); Ross Pain (ANU) and Stephen Mann (ANU)	"Movement, Expertise and Creativity" Maya Gavish (Western Sydney University); Robin Dixon (USyd); Ian Maxwell (USyd); Kath Bicknell (Macquarie); Sarah Pini (Macquarie)
15:00-15:30	Afternoon Tea	
15:30-17:00 Parallel Sessions	Sophie Stammers (University of Birmingham): Confabulation, the stigma of illness and stories of empowerment	Symposium: "Mutual Manipulability, Extended Cognition, Enactivism: Open Challenges and Future Directions" David M. Kaplan (Macquarie University); Alexander James Gillett (Macquarie University); Michael D. Kirchhoff (Wollongong University); Richard Menary (Macquarie University), Karola Stotz (Macquarie University)
	Lauren Olin (University of Missouri - St. Louis): Mistaking Identities	
	Quinn Gibson (NYU Shanghai): Monothematic Delusions: An expressivist two-factor account	
	Katya Numbers (ChEBA, UNSW): Mine or Yours? Responsibility and Remembering in Strangers and Romantic Couples.	
17:15-18:15	Keynote: Peter Godfrey-Smith (University of Sydney) "Mental Unity and Animal Experience"	
18:15-18:30	Closing remarks: Colin Klein	

## Keynote Abstracts



Wed 9:15-10:15

**Professor Michael Richardson**

**Symmetries of Order in Perception, Action and Cognition**

*Macquarie University*

How is the patterning of behaviour organized? Who or what decides what action possibilities or behavioural modes are afforded within a given task context? Is there a complementary relationship between the low-level physical laws that constrain the mechanics of embedded perceptual-motor behaviour and the higher-level cognitive decision making processes that define ongoing human activity? Using a range of complex systems phenomena from physics, biology, psychology, cognitive science and computational cognition, I will discuss whether symmetry principles can provide a way of answering these questions. In particular, I will detail how the theory of symmetry-breaking can be employed to understand and explain the dynamical processes of perception, action and cognition that define everyday human behaviour and how symmetry-breaking bifurcations are fundamental to the emergence of complex order in human (and animal) and social activity.



Wed 17:15-18:15

**Professor Kate Stevens**

**"Bodies of Knowledge": Recollective and Creative Cognition in Australian Contemporary Dance**

*Western Sydney University*

Knowledge in contemporary dance is declared through and with the body (Stevens & McKechnie, 2005). What is the nature of memory for complex extended sequences of whole body movement and what factors influence recall? A study with mature professional dancers investigated recall through bodily production of dance-drama exercises that had been performed between 3 and 30 years ago. The presence of social and musical associative cues was controlled and recall using the dancer's body compared with recall through manipulating a small mannequin. Qualitative data revealed a range of multimodal associates in dance recall. Collaborating with Australian Dance Theatre, we co-designed an experiment to explore dancers' recall of excerpts from previous performances. Given the precision of the artists' memory for movement, the experiment took the form of a challenge with two teams of dancers "challenging" each other with deliberately difficult excerpts to recall. While dancers hypothesized that excerpts from works that they had performed would be easier to recall than those not performed, this was not reflected in the data. Continuing with the practice of artist as both participant and expert, studies that demonstrated the social and relational aspects of improvising new movement material, and shed some light on the time-course of the creative process are discussed. Together, the studies suggest embodied, distributed and social factors in acquiring, creating, and reproducing contemporary dance.



Thu 9:00-10:00

**Professor Donna Rose Addis**

**Episodic Memory and Episodic Simulation:**

**One and the Same?**

*University of Toronto*

Over the past decade, episodic memory has been reconceptualised as future-oriented. Relevant psychological theories have started from the premise that remembering and imagining are distinct neurocognitive processes, and thus have to account for the overlapping cognitive and neural substrates. For instance, in our 2007 'constructive episodic simulation hypothesis', Schacter and I argued that details from episodic memories of past events provides the content for simulating future events. Here, I draw on contemporary philosophical and psychological perspectives to update and refine this theoretical position. I will argue that, fundamentally, remembering and imagining are instantiations of the same neurocognitive process – constructive episodic simulation – and that differences between past and future events arise from differences in representational content.



Thu 17:15-18:15

**Professor Andy Clark**

**Computational Psychiatry and the Construction  
of Human Experience**

*University of Edinburgh and Macquarie University*

An emerging body of work in cognitive philosophy and computational neuroscience depicts human brains as prediction machines – multi-level networks that specialize in using generative models to both match and anticipate the evolving stream of sensory information. However, the relationship between these posited cascades of prediction and conscious human experience itself remains unclear. Recent work in computational psychiatry provides important clues. For example, it is thought that malfunctions in hierarchical inference can explain core patterns of alteration seen in autism and schizophrenia, and can shed new light on so-called 'psychogenic' symptoms - functional impairments without standard organic causes. Such accounts reveal the deep continuities between perception, belief, and hallucination and may help reveal common processing motifs underlying both typical and atypical forms of human experience.



Fri 9:00-10:00

**Professor John Sutton**

**Otto in the Wild: Dementia and Distributed Cognition**

*Macquarie University*

It is 20 years since Otto the Alzheimer's patient first consulted his notebook and took us to the Museum of Modern Art, and to the claim that mental states and processes can in certain circumstances spread across bodily, social, and worldly – as well as neural – resources. Critics and proponents of Clark & Chalmers' extended cognition hypothesis alike focus on metaphysical implications of the Otto thought experiment. But we can put '4E' or distributed cognition fruitfully to applied work if we take Otto's plight literally. How do real Ottos get by as dementia progresses? What forms of social or technological scaffolding buffer or transform their changing cognitive profiles? Distributed approaches to memory, emotion, and psychopathology help us rethink dominant concepts of neuroplasticity and compensation. For some older adults, cognitive reserve may be partly realised in the social and material environment. Individualistic discourses of cognitive decline can be supplemented or tempered in building an interdisciplinary science of dementia in the wild.



Fri 17:15-18:15

**Professor Peter Godfrey-Smith**

**Mental Unity and Animal Experience**

*University of Sydney*

Famous and puzzling phenomena involving cognitive disunity in humans ('split brain' cases) may cast light on animal experience of various kinds, especially in invertebrates.

## Symposium Abstracts

### Enculturated Minds: E-Cognition Perspectives on Collective Intentionality, Social Cognition and Perception

*Wed 1:00-3:00 Room A*

Glenda Satne (*University of Wollongong/University of Alabama*) and Richard Menary (*Macquarie University*), Ines Hipolito and Daniel Hutto (*University of Wollongong*), Nick Brancazio and Miguel Segundo Ortin (*University of Wollongong*), and Alan Jurgens (*University of Wollongong*)

This symposium focuses on the nature, extent and means by which culture structures minds and cognitive processes. By considering cognition in embodied, embedded, enactive and ecological terms, the presentations evaluate rival proposals and engage with on-going debates in philosophy of mind, cognitive neuroscience, and developmental comparative, and evolutionary psychology. The presentations draw on empirical literature in evaluating explanatory proposals about how culture might influence cognition and dynamically embodied skills in constraint-led ways. By focusing on the embodied and embedded effects that enculturation has on various cognitive processes, including perception, social cognition and collective intentionality, the different contributions attempt to provide explanations that are at least as adequate, if not better than their main rivals, cognitivist accounts of cognition. These proposals seek to develop tenable alternatives to cognitivist conceptions of cognition that incorporate traditional conceptions of representational processing. The alternative explanations proposed assume that agents respond to the environment and to others through sustained embodied, engaged interactions where such cognition of the world and others is not mediated by representational content.

The symposium begins with an examination of the development of increasingly complex enculturated minds. Satne and Menary explore the evolutionary origins of complex enculturated minds arguing that sophisticated normative capacities evolved as adaptations to socio-cultural practices. Hutto and Hipolito provide arguments in favour of the possibility that cultural factors permeate rather than penetrate cognition. Brancazio and Segundo-Ortin concentrate on developing an ecological psychology account of cultural affordances in perception, focusing on the effect enculturation plays in the formation and acceptance of social roles, and especially gender roles. The symposium closes with consideration of how culture makes a difference to social cognition, looking particularly at pragmatic explanations of false belief test (FBT) success in diverse cultures. Jurgens examines Westra and Carruthers' (2017) nativist Theory Theory pragmatic account of FBT success, arguing that an enactive account of belief attribution cast in terms of on pragmatic know-how acquired through one's history of interactions is more parsimonious and better able to explain the cross-cultural empirical data.

**Individual Abstracts:****Evolving Enculturated Minds: from Social Emotions to Social Norms**

Glenda Satne (*University of Wollongong /University of Alabama*) and Richard Menary (*Macquarie University*)

In this paper, we explore the role that socio-cultural practices played for progressively sophisticated enculturated minds to emerge in the human lineage. Drawing on the Extended Evolutionary Synthesis, we argue that complex conceptual capacities originated externally as responses to the complexity in the environment, and investigate what kind of cognitive endowments made this emergence possible. Reviewing empirical evidence on collective and normative behaviour in human and non-human primates, we argue that the progression in evolutionary history from basic forms of social engagement (based on emotional attunement, coordination and mutual tracking) to sophisticated forms of collective intentionality (encompassing the exercise of higher cognitive capacities), made possible the emergence of sophisticated forms of reason-guided behaviour. In particular, we show that basic normative capacities such as emotional tuning and social emotions like aversion and disgust, that came in early in the great apes lineage, made possible basic forms of social conformism and social life. These were later specialized and transformed giving place to differentiated normative practices and corresponding more complex normative abilities including abilities for sophisticated folk psychological reasoning.

**Culture in Mind: Not Cognitive Penetration but Cultural Permeation**

Daniel D. Hutto and Inês Hipólito (*University of Wollongong*)

We provide arguments in favour of the possibility that cultural factors permeate rather than penetrate cognition, such that cognition extensively and transactionally incorporates cultural factors rather than there being any question of cultural factors having to break into the restricted confines of cognition. The paper reviews the limitations of two classical cognitivist, modularist accounts of cognition and a revisionary, new order variant of cognitivism – a Predictive Processing account of Cognition, or PPC. It argues that the cognitivist interpretation of PPC is conservatively and problematically attached to the idea of inner models and stored knowledge. In abandoning that way of understanding PPC, it offers an alternative account of how cultural factors matter to cognition – one that abandons all vestiges of the idea that cultural factors might contentfully communicate with basic forms of cognition. In place of that idea, the possibility that culture permeates cognition is promoted.

**Seeing the Social: Sociocultural Specialization and Affordance Perception**

Nick Brancazio and Miguel Segundo-Ortin (*University of Wollongong*)

How one perceives the possibilities for interaction, or affordances, offered by the environment depends, at least in part, on what one wants the environment to provide. That is, our goals or intentions can shape the way that we perceive affordances. This has been acknowledged by some ecological psychologists (Heft, 1989; Reed, 1993;). However, the relation between intentions and affordances is still underdeveloped. In this paper, we clarify the link between intentions and affordances, providing a richer account of how it is that affordance perception becomes habituated. In doing so, we will highlight the ways that

social roles influence intention formation, often overlooked in discussions about the relation between affordances and culture (see e.g. Rietveld and Kiverstein, 2014). We will point out that agents are prompted from birth into playing specialized social roles, i.e. roles that fall within a certain pre-ordained set of socially acceptable norms, as is the case with belonging to a gender category. This specialization, we argue, pervasively affects our intentions, in both present and prospective senses. Thus, by influencing our intention-formation processes, this specialization can also affect how we perceive the saliency of possibilities for interaction in our environment. Acknowledging the role of specialization, we contend, provides a more comprehensive account of the relation between affordance saliency and sociocultural norms.

### **Getting the Pragmatics Right: An Explanation of Cross-Cultural False Belief Test Success**

Alan Jurgens (*University of Wollongong*)

Westra and Carruthers' (2017) Pragmatic Development Account offers a novel approach for explaining success on standard false belief tests (FBT) across diverse cultures. In line with their nativist Theory Theory (TT) commitments, their account assumes that a conceptual meta-representational understanding of belief is necessary for explaining FBT success. Examining additional cross-cultural data on FBT performance, I argue that we have reason to prefer an enactive account over the Pragmatic Development Account. I argue their pragmatic account only demonstrates that a pragmatic know-how regarding belief discourse gained from a history of experience of interacting with others is necessary for success on FBTs. The alternative enactive explanation of FBT success I advocate appeals to the constitutive roles our embodiment, embeddedness and enculturation play in facilitating non-conceptual pragmatic FBT success. Nevertheless, I argue that enactive accounts of FBT success would do well incorporating some of the key insights made by the Pragmatic Development Account regarding the interactional dynamics present in the experimental setup of FBTs.

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#### **Author-Meets-Critics session: Josh May *Regard for reasons in the moral mind***

*Wed 1:00-3:00 Room B*

Daniel Cohen (*Charles Sturt University*), Philip Gerrans (*University of Adelaide*), Jeanette Kennett (*Macquarie University*), Joshua May (*University of Alabama at Birmingham*), and Robin Zheng (*Yale-National University of Singapore*)

This symposium will be an *author-meets-critics session* on a book by Josh May forthcoming with Oxford University Press. The symposium will bring together a diverse group of philosophers from across the world to discuss an important new book in moral psychology by a young scholar in a thriving area of interdisciplinary research.

The author is Joshua May (Assistant Professor of Philosophy, University of Alabama at Birmingham). May earned his PhD in philosophy in 2011 from the University of California, Santa Barbara. Before taking his current position at UAB, he spent 2 years as a Lecturer teaching at Monash University in Melbourne, Australia.

May's research is primarily in ethics and epistemology with an emphasis on how empirical work informs philosophical debates. He has published over a dozen peer-reviewed journal articles in both philosophy and cognitive science journals, including the *Australasian Journal of Philosophy*, *Canadian Journal of Philosophy*, *Cognition*, *European Journal of Philosophy*,

*Journal of Medical Ethics, Philosophical Studies, Synthese, and the Southern Journal of Philosophy* (the Spindel Supplement's Emerging Scholar Prize essay). He has also published several chapters in edited volumes, including *The Ethics of Human Enhancement* (OUP), *Moral Psychology Vol. 5: Virtue & Character* (MIT Press), *The Many Moral Rationalisms* (OUP), and *The Routledge Handbook of Moral Epistemology*.

May's book, *Regard for Reason in the Moral Mind*, will be published in May 2018 with Oxford University Press. (The author will provide PDF copies to the rest of the participants before the book is released so that they can begin reading it straight away.) *Regard for Reason* is a culmination of May's work in moral psychology over the past decade. It offers a rejoinder to those who think that the science of morality warrants skepticism about moral knowledge and virtue. May argues that rationality in ethics is possible not just despite, but also in virtue of, the psychological and evolutionary mechanisms that shape moral thought. Ultimately, the book covers a wide range of topics in moral psychology and meta-ethics, including: the rationalism/sentimentalism debate, disgust, empathy, evolutionary influences, debunking arguments, moral skepticism, peer disagreement in ethics, egoism vs. altruism, motivated reasoning, the Humean theory of motivation, and situational influences on moral motivation.

*Book abstract.* The burgeoning science of ethics has produced a trend toward pessimism. Ordinary moral thought and action, we're told, are profoundly influenced by arbitrary factors and ultimately driven by unreasoned feelings. This book counters the current orthodoxy on its own terms by carefully engaging with the empirical literature. The resulting view, optimistic rationalism, shows the pervasive role played by reason our moral minds, and ultimately defuses sweeping debunking arguments in ethics. The science does suggest that moral knowledge and virtue don't come easily. However, despite the heavy influence of automatic and unconscious processes that have been shaped by evolutionary pressures, we needn't reject ordinary moral psychology as fundamentally flawed or in need of serious repair. Reason can be corrupted in ethics just as in other domains, but a special pessimism about morality in particular is unwarranted. Moral judgment and motivation are fundamentally rational enterprises not beholden to the passions.

### Current Issues in Cognitive Neuroscience

*Thu 10:30-12:00 Room A*

Tom Carlson (*University of Sydney*), Mark Williams (*Macquarie University*), and Brendan Ritchie (*Katholieke Universiteit Leuven*)

### Individual Abstracts:

#### **Seeing the Trees through the Forest: What is a Category in the Brain?**

Thomas A. Carlson, Tijn Grootswagers, David McMahon, and David Leopold

Neuroscience has produced a variety of metrics aimed to characterize the response of neurons from single unit recording studies and regions of interest (ROIs) from fMRI. Many of these metrics were developed in the context of univariate measures of neuronal activity (e.g., spike rates from single neurons, BOLD activation in ROIs). Over the past two decades,

Multivariate recordings of neuronal activity have become standard for the field, and there has been a corresponding development of multivariate methods for analysing these data. In the present study, we evaluated the efficacy of various measures of category selectivity to study neuronal activity at the population level. We applied these measures to spiking activity in 36 neurons located in macaque's anterior fundus "face patch" in response to 2,500 individual object exemplars from 10 different categories, including human and primate faces. We broadly observed that population activity was effective at distinguishing faces from other object categories (i.e., categorization); and importantly also distinguishing individual faces within the category (i.e., individuation). While most current selectivity metrics performed adequately in characterizing the categorical response, they overlooked the population's capacity for individuating exemplars within the preferred face category. Moreover, some metrics that pooled the categorization and individuation components of the response produced both false positives (i.e., identifying non-preferred categories as preferred) and false negatives (i.e., identifying preferred categories as non-preferred). To overcome the limitations of current selectivity metrics in the population context, we propose a new metric "chirps" that parcels the categorization and individuation components of the population response.

### **A Mechanistic Approach to Biological and Psychological Plausibility in Cognitive Neuroscience** Brendan Ritchie (*Katholieke Universiteit Leuven*)

Multivariate pattern analysis (MVPA) has been a boon for the field of cognitive neuroscience, and allowed researchers to investigate large scale neural pattern responses in the human and primate brain. Some even go so far to claim that MVPA allows us to (non-invasively) measure and compare neural representations in a brain region. This claim hinges on two respects in which these methods might be theoretically plausible: that they are biologically plausible, in that they approximate the sort of information read-out used in neural information-processing (DiCarlo and Cox, 2007; Yamins and DiCarlo, 2016); and whether they are psychologically plausible, in the sense that we can use MVPA, when applied to neural responses, to predict behavior using some psychological model (Ritchie and Carlson, 2016; Ritchie, Kaplan, and Klein, 2017). However, to date, these forms of theoretical plausibility have only been partially articulated. I argue that both notions are well captured by a mechanistic approach to explanation in neuroscience (Bechtel, 2008; Craver, 2007). In particular, I claim that a technique is biologically plausible to the extent it assumes a mechanism sketch that is similar to schemas of neural tuning, and psychologically plausible to the extent it conforms to the sketch of a psychological model. I discuss this characterization with respect to several MVPA techniques (e.g. decoding, representational similarity analysis) and so-called "model-based" approaches to cognitive neuroscience, which make use of formal models from psychology. The upshot is that the theoretical plausibility of these approaches has been greatly overstated.

### **Time to Rethink the Nomenclature used in Cognitive Neuroscience** Mark A. Williams (*Macquarie University*)

There are several terms used in the cognitive neuroscience literature which are ill-defined and often result in confusion. For example, top-down and bottom-up are terms often used when referring to neural activity traveling across the cortex. An issue with these terms is

where is the 'top' or the 'bottom' of a neuronal circuit or the brain as a whole? The frontal cortex versus primary sensory cortices perhaps? Or anterior temporal lobe and the sensory organs? Other ill-defined terms include feed-back and feed-forward when referring to neuronal interactions or high-level and low-level when referring to neuronal topography or stimulus types. I will discuss why these terms are ill-defined and how the cognitive neuroscience community could move forward.

### **Minds in Skilled Performance**

*Thu 1:00-3:00 Room A*

Jesús Ilundáin-Agurruza (*Linfield College*) and Yoshiko Oda (*Tokai Gakuen University*), Michael D. Kirchhoff (*University of Wollongong*) and Ian Robertson (*University of Wollongong*), and Katsunori Miyahara (*University of Wollongong/University of Tokyo*)

This symposium showcases some of the main lines of research associated with the newly launched ARC Discovery Project, Minds in Skilled Performance - DP170102987. Performing successfully, in any domain, depends on being in a certain state of mind. But what state of mind? While most agree that the skill exhibited in expert performances requires a special kind of mindedness, we lack consensus about its nature. Characterizing the mentality needed for skilled performance poses deep conceptual puzzles. Any adequate account must explicate the nature of the cognitive and affective aspects of skilled performances, without over- intellectualising these or depicting them as merely mindless and automatic.

Our project seeks to give an integrated account of the mind in skilled performance that takes stock of these requirements. Collectively the speakers seek to understand the novelty, spontaneity and highly context-sensitive features of the know-how involved in skill performance and how these relate to its distinctive phenomenology. They do so by drawing on naturalistic philosophy of mind, phenomenology, pragmatism and insights from Japanese do— self- cultivation practices. In this respect our research traverses the boundaries thought to divide analytic and non-analytic traditions.

### **Individual Abstracts:**

#### **In the Thick of the Action — An Enactive Analysis of Mushin States**

Jesús Ilundáin-Agurruza (*Linfield College*) and Yoshiko Oda (*Tokai Gakuen University*)

In Japanese martial and performing arts (e.g., kendo 剣道, and No theater 能), the phenomenon of *mushin* 無心 is an elusive state associated with unparalleled performance that is characterized by a fluid, mindful awareness. The analysis of skillful performances when mushin states are operative includes in-the-thick-of-the-action moments as well as reflective ones before, in-between, and after action. While the former are enactively embodied and lack representational content the latter are scaffolded and culturally permeated. In this presentation, we expand on previous analyses of mushin (Ilundáin-Agurruza, 2014; Krein and Ilundáin 2014) and kendo (Oda and Kondo, 2014) to conduct a comparative examination of *mushin* whereby we contrast the writings of, among others, medieval Zen Monk Takuan Soho (1986) and 20th century Buddhist monk Daisetz Suzuki (2007) in light of recent enactivist work (Gallagher 2017; Hutto and Myin 2017). Together, enactivism and the

Japanese texts can provide a transparent and revealing description and explanation of *mushin* in relation to attentional focus, automaticity, and improvisation during highly skilled performance in sports as well as martial and performing arts.

### **Predictive Processing and Sports Performance**

Michael D. Kirchhoff (*University of Wollongong*) and Ian Robertson (*University of Wollongong*)

Predictive processing, an increasingly influential research paradigm in contemporary cognitive science, conjectures that the primary—or exclusive—imperative of neural activity is the avoidance of unpredictable states (Friston 2010; Bastos et al. 2012). This presentation considers how predictive processing might aid in our explaining the highly context-sensitive intricacies of the action involved in sports performance. Hohwy (2016)—in line with his contention that cognition involves the continual manipulation of “massive hierarchical representations” of the world—has recently claimed that the brain is implicated in “heavy, explicit modelling of external causes” even during the kind of on-the-fly action procedures characteristic of high-octane sports (2016). Clark (2017) disagrees with Hohwy’s assessment. He claims that predictive processing is consonant with the idea of a predictive brain that, in facilitating sports performance, exploits “quick and cheap” heuristics *rather than* engaging in explicit, detailed neuro-modelling. In this talk, we canvass a third alternative for understanding sports performance; one that can capture the idea that the dynamics involved in prediction error minimisation unfold over nested spatial and temporal scales and involve non-trivial aspects of the non-neural body and environment. We argue that the relevant informational dynamics implied by such an account need not (*contra* both Clark and Hohwy) be understood in representational terms. We conclude by suggesting that our non-representational rendering of predictive processing can substantially aid in our understanding of expert sports performance, and in clarifying previous debates about the ramifications of predictive processing for understanding skilful action.

### **Coping with Pain and Obeying Commands**

Katsunori Miyahara (*University of Wollongong/University of Tokyo*)

Everyday skilful coping depends in part on bodily sensations and particularly on the sensations of pain. How do skilful agents take pains into account in shaping bodily behaviors? Perceptual theories of pain, including representational theories, suggest a highly intellectualist account, according to which the agent shapes its behavior in two steps: It recognizes bodily damage from the pain sensation, and then it makes decisions. In his imperative theory of pain, Colin Klein advances an alternative account based in part on phenomenological considerations, which maintains that pains motivate bodily behaviors directly by giving commands to the agent. In other words, engagement in skilful coping is a matter of obeying bodily commands. I propose to challenge the imperative account of skilful coping on phenomenological grounds. Despite its aspiration to make sense of the direct motivating power of pains, the imperativist account still fails to get the phenomenology right. In particular, it overlooks the difference between involvement and commitment: We find ourselves already engaged in skilful coping, while we commit ourselves to action in obeying commands. I will also argue that this theoretical failure is tied to another failure of overseeing the difference between two forms of bodily self-consciousness, which is

expressed in terms of *Leib/Körper* (or lived body/objective body) in the phenomenological tradition.

### Collective Memory

*Thu 1:00-3:00 Room B*

Catherine A. Browning (*Macquarie University*), Celia B. Harris (*Macquarie University*), Craig Thorley (*James Cook University*), and Chloe Wall (*University of Otago*)

Memory has always been a central topic of study in psychology, but much psychological research into memory has remained uninformed by philosophical accounts. In philosophy, on the other hand, memory was long-ignored but has enjoyed a revival in recent years, leading to development of philosophy of memory as a growing field. Though historical philosophical forays into memory have largely neglected the relevant developments in the psychology of memory, the present philosophical revival has been driven by increased attention to these developments. Similarly, psychologists are starting to take into consideration the relevant philosophical accounts of memory, and so the gap between philosophy and psychology of memory is closing. This symposium aims to further this trend toward productive interdisciplinary interactions by bringing together philosophical and psychological research into the phenomenon of collective memory, which has become increasingly prominent as a topic of study in both disciplines. The symposium begins with three psychology papers. Craig Thorley's talk "The Costs and Benefits of Collaborative Remembering" reports findings from a recent meta-analysis of the conditions under which certain costs and benefits obtain, and sets the stage for "Cue content or social context: where do benefits of shared remembering come from?" by Celia B. Harris. In keeping with the theme of costs and benefits of collaborative remembering, we move to Catherine A. Browning's presentation "Prospective Memory in Social Situations: What We Know So Far," which identifies processes that bring about certain costs and benefits in collective prospective memory. The symposium then transitions from psychology to philosophy and concludes with Chloe Wall's presentation "The 'Mandela Effect': Collective Confabulation?" which provides a philosophical account of the "Mandela Effect," and makes the case for considering it as a collective memory phenomenon that seems to come about as a direct result of group interaction.

### Individual Abstracts:

#### **Prospective Memory in Social Situations: What We Know So Far.**

Catherine A. Browning (*Cognitive Science, Macquarie University*)

When we talk about everyday memory we often refer to prospective memory (PM) tasks – remembering to do things in the future against a backdrop of daily activities. As such, PM tasks are often performed in social situations with partners, family members, friends and colleagues. Despite a vast body of research devoted to investigating the effects of remembering the past in social situations, to date, very little research has investigated the effect of collaboration on PM. A series of experiments using the methodology used in collaborative recall research was conducted in order to fill this gap. PM performance was assessed using Virtual Week, a PM task that aims to replicate PM in everyday life. Given that

theoretical accounts of distributed cognition predict benefits of collaborative memory develop over time, we tested stranger dyads and intimate couples in order to assess whether the effects of collaboration would differ depending on the relationship between collaborators. We also tested the effects of collaboration on PM in couples where one partner had PM difficulties due to acquired brain injury (ABI). We found that strangers incurred the typical costs of collaboration observed in the collaborative recall literature, however intimate couples were able to reduce these costs, except in the couples where one partner had an ABI. Analysis of the dialogue of a subsample of collaborating dyads enabled us to identify certain processes that were helpful, regardless of relationship, as well as some processes that were more successful for strangers, and some processes that were particularly detrimental for couples.

### **Cue Content or Social Context: Where do Benefits of Shared Remembering Come From?**

Celia B. Harris (*Cognitive Science, Macquarie University*)

We often remember with others, and especially, we reminisce about our shared past in intimate groups such as couples, families, and friends. Although theoretical frameworks such as distributed cognition predict benefits of shared remembering, most experimental research has indicated that collaborative remembering has reliable costs in groups of strangers. In prior research, we have identified benefits of shared remembering in long-married older couples, such that at least some couples can remember substantially more when they collaborate than when they recall separately. Moreover, these benefits are associated with particular patterns of cuing behaviours. So far, it is unknown whether these benefits are driven by the intimacy and rapport within couples, their shared experiences and shared knowledge, their sensitive provision of memory cues, or some combination of these factors. In the current research, I aimed to determine whether it is the content of the cues provided by a partner, or the social context provided by a partner, that determines memory benefits, using both word list memory tasks and autobiographical memory tasks. Results suggest a complex relationship between cue content and social context, that depends on the memory task. I discuss the distinct "active ingredients" that underlie successful systems of shared remembering.

### **The Costs and Benefits of Collaborative Remembering**

Craig Thorley (*Psychology, James Cook University*)

People often collaborate to recall shared experiences. Collaborative remembering has associated costs and benefits. Focussing on the costs, collaboration can be harmful to remembering as groups sometimes recall less than their constituent members would if each member worked alone and their individual recall was pooled (i.e., a nominal group). This impairment is called collaborative inhibition. Focussing on the benefits, a collaborative group's recall is often more accurate than that of an equivalent sized nominal group. Moreover, engaging in collaborative remembering can enhance group members' subsequent individual recall. This talk will discuss the findings from a recent meta-analysis examining the conditions under which collaborative inhibition occurs and the cognitive mechanisms underpinning this decrement. The reasons why collaboration can improve recall accuracy and enhance group members' post-collaborative individual recall will also be discussed.

### **The "Mandela Effect": Collective Confabulation?**

Chloe Wall (*Philosophy, University of Otago*) and Kourken Michaelian (*Philosophy, Université Grenoble Alpes*)

In recent years, popular fora have seen lively discussion of the “Mandela Effect”. The Mandela Effect—so called in reference to the paradigm case of a widely shared memory of Nelson Mandela dying in prison in the 1980s—occurs when individuals who have never met each other in person develop highly similar memories of events that never occurred. Popular explanations of this phenomenon are fanciful, and the scientific literature so far contains no discussion of the effect or the mechanisms giving rise to it. The purposes of this talk are, first, to make a case for the existence of the Mandela Effect as a novel memory error worthy of scientific attention and, second, to sketch a general account of a mechanism that might give rise to it. Our hypothesis is that the Mandela Effect is an instance of collective confabulation, and so we show that it is both genuinely collective and genuinely confabulatory. We argue that, given either the causal account of mnemonic confabulation defended by Robins (2016) and Bernecker (2017) or the reliability account defended by Michaelian (2016), the effect amounts to confabulation on the collective level. It does not, however, reduce to individual confabulation. Instead, the effect comes about as a result of an individual-level memory error combined with certain malfunctioning features of group-level interaction.

### **Beliefs Beyond Rationality**

*Thu 3:30-5:00 Room A*

Stephanie Howarth (*Macquarie University*), Colin Klein & Peter Clutton (*Australian National University*), and Vince Polito (*Macquarie University*)

Beliefs can change in response to evidence. They can also change, sometimes dramatically, by intervening on other parts of the cognitive system. This symposium explores phenomena like hypnosis, drug microdosing, and shifts to new ways of seeing the world after exposure to conspiracy theories. None fit the standard mold of rational belief change, yet in many cases we can make the case that people are better off after these changes. What do such changes tell us about the nature of belief? Should we worry about the apparent non-rationality, or even irrationality, of such changes?

### **Individual Abstracts:**

#### **Conspiracy Theories and Narratives of Awakening**

Colin Klein and Peter Clutton (*Australian National University*)

Recent psychological work on conspiracy theorists suggests two things: that conspiracy theorists have diverse interests, and that narratives of “awakening” and conversion tend to be important for the most committed of those in the group. We suggest that this poses an underexplored problem for philosophical theories of the rationality of conspiracy belief. On the one hand, many conspiracy theorists probably form their beliefs via methods that are no less rational than most of our beliefs. On the other hand, the group that speaks in terms of ‘awakening’ are probably at least arational, but arational in a way that recent philosophical work on ‘transformative experiences’ has tended to defend. We discuss whether there are

reliable ways to endorse non-rational epistemic shifts without having to also endorse patently unpalatable versions of transformative experiences.

### **Placebo or Panacea? Expectations and Experiences of People who Microdose Psychedelics**

Vince Polito (*Macquarie University*)

After a long period of absence from the scientific literature, experimental studies involving psychedelic substances are reappearing. High profile research teams are publishing findings in top journals showing that psychedelics can be used to better understand cognition, perception, neurobiology, psychopathology and wellbeing. In parallel there has been increasing interest in these substances from the general public. One topic of growing interest in online substance use communities is the phenomenon of "microdosing". Microdosing refers to consumption of an extremely low dose of a psychedelic substance, most typically LSD or psilocybin. Due to the very low dose users do not usually report the marked cognitive and perceptual alterations that typically characterise psychedelic experiences, rather immediate effects are reported to be very subtle and sometimes barely noticeable. Despite this users make a wide variety of claims for the benefits of microdosing with various substances. Are the claims justified or are microdosers' experiences shaped by their beliefs and expectations about these substances? I will present results of a systematic observational study showing the immediate and long term effects of microdosing, and compare the reports of genuine microdosers with individuals' expectations about the outcomes of this practice.

### **Hypnosis Moderates Belief Evaluation in Human Reasoning**

Stephanie Howarth (*Macquarie University*)

According to the "two-factor" theory of delusions, Factor 1 determines the 'content' of the [delusional] belief whilst Factor 2 refers to the deliberative evaluation (and acceptance or rejection) of that belief (Langdon & Coltheart, 2000). The belief evaluation system allows us to assess our beliefs in terms of their veracity. Hypnosis and appropriate hypnotic suggestions have been used to disrupt the belief evaluation system in healthy subjects as a way of testing and understanding various mono-thematic delusional beliefs (Connors, Barnier, Coltheart, Cox & Langdon, 2012). I will present the results from the first in a set of studies that examine the role of the belief evaluation system on human reasoning and draw upon this dual process model of beliefs, developed in part to explain pathological disturbances of belief systems. In Experiment 1 we targeted highly hypnotizable subjects with a suggestion of agnosia in relation to knowledge about a specific category (fruits or animals) and examined logical performance and belief bias on a syllogistic reasoning task before and during hypnosis. Our findings showed that hypnosis has a generalised impact on belief evaluation leading to reduced belief bias, whilst specific suggestions [of agnosia] under hypnosis create levels of uncertainty significant enough to reduce individual's endorsements rates and confidence in their performance.

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**The Temporally Extended Self – from Development to Degeneration***Friday 10:30-12:00 Room A*

Thomas Suddendorf (*University of Queensland*), Jonathan Redshaw (*University of Queensland*), Adam Bulley (*University of Queensland*), Muireann Irish (*University of Sydney*), and Cherie Strikwerda-Brown (*University of Sydney*)

Despite decades of empirical research and vigorous debate, the self remains a topic that divides and perplexes the scientific community. This impasse reflects the somewhat ephemeral nature of “selfhood” and how best to operationalise such a multifaceted construct. We propose that a more nuanced understanding of the self might be gained by focusing on temporally extended expressions of spontaneous and deliberate thought including autobiographical memory, episodic future thinking, temporal discounting, and mind wandering. This symposium brings together international experts and emerging leaders in the fields of developmental psychology, evolutionary psychology, and cognitive neuroscience to explore the cognitive and neural underpinnings of temporally extended expressions of self from a multidisciplinary perspective. In recognition of the complexity of the self, we adopt a lifespan perspective charting the origins, and deterioration, of complex expressions of self. First, we consider the developmental origins of temporally extended forms of cognition as revealed by studies of young children. We discuss how the required capacities for foresight emerge in early childhood (Suddendorf), followed by recent findings regarding a fundamental component of such thought, namely the ability to represent and prepare for mutually exclusive possible versions of the future (Redshaw). We next explore how the capacity for foresight impacts adaptive forms of cognition, as exemplified by decision-making (Bulley). Despite having mental access to the future, humans nonetheless ‘discount’ the value of future rewards relative to those in the here-and-now. We examine this seeming paradox and outline the central role of foresight in decisions with temporally extended outcomes. We then shift our focus to consider how discrete aspects of temporally-oriented forms of thinking change over the lifespan (Irish). Using a novel experimental paradigm to elicit spontaneous instances of cognition, we demonstrate distinct shifts in the temporal content and self-referential nature of evoked representations in healthy aging. Finally, we consider how mechanisms of self-referential processing are altered in neurodegenerative populations, focusing on frontotemporal dementia (Strikwerda-Brown). We consider how canonical expressions of the self are compromised across temporal contexts and consider how an inability to disengage from an egocentric perspective impacts complex social interactions. In adopting this novel framework, our hope is to stimulate potential collaborative efforts across traditionally disparate lines of enquiry to understand the temporal dynamics of the self, and ultimately to promote a cohesive sense of self in clinical populations across past, present, and future contexts.

**Individual Abstracts:****Exploring the Emergence of Episodic Foresight – A Developmental Perspective**

Thomas Suddendorf (*University of Queensland*)

Imagining future events and adjusting current behaviour accordingly is a hallmark of human cognition. The development of such episodic foresight is currently attracting increasing research attention. Here I review a selection of recent work on the emergence of episodic

foresight and its role in a variety of domains. Results suggest that over the preschool years children begin to take future scenarios into account, enabling them increasingly to plan, prepare and shape their future, including their own future skills and knowledge. The potential predictive power of early individual differences in episodic foresight on later cognitive capacities and developmental outcomes deserves closer scrutiny.

### **Developmental and Comparative Perspectives on the Understanding of Future Uncertainty**

Jonathan Redshaw (*University of Queensland*)

Many future events are difficult to predict for certain, and so adult humans often imagine and prepare for multiple, even mutually exclusive possibilities. My research examines the development and evolution of this capacity with a novel minimalist paradigm. The results suggest that, across cultures, children become able to prepare for alternative future possibilities from about 3 or 4 years of age. Younger children and non-human apes, on the other hand, typically prepare for a single future possibility only. I synthesise these findings under a counterintuitive hypothesis: humans are uniquely proficient at securing future selective benefits because we know that we can't precisely imagine the future – and we compensate for this known cognitive limitation to our enormous advantage.

### **Look before you Leap – Emotional Propection and 'Impulsive' Decision-making**

Adam Bulley (*University of Queensland*)

Humans frequently create mental models of the future, allowing outcomes to be inferred in advance of their occurrence. Recent evidence suggests that imagining positive future events reduces delay discounting (the devaluation of reward with time until its receipt), while imagining negative future scenarios may increase it. Here, we assess the effects of simulating positive and negative future scenarios on decision-making in the context of both delay discounting and risk-taking. Cuing the simulation of positively and negatively valenced future scenarios was associated with reduced delay discounting relative to neutral imagery but did not affect risk-taking in a standard laboratory task. Thus, although these results replicate previous findings suggesting episodic future simulation can reduce delay discounting, they indicate that this effect is not dependent on the valence of the thoughts and does not generalise to all other forms of 'impulsive' decision-making. We discuss various interpretations of these results and suggest avenues for further research on the role of propection in decision-making.

### **Closing the Temporal Window – Age-related Changes in Spontaneous Cognition**

Muireann Irish (*University of Sydney*)

A fascinating aspect of human cognition is the unique capacity to mentally retreat from our immediate surroundings to consider perspectives distinct from the here and now. Here, we demonstrate age-related alterations in the frequency and content of spontaneous cognition as assessed using a novel thought-sampling paradigm. Healthy older adults displayed significantly attenuated levels of mind wandering in the context of elevated task-related thoughts relative to younger controls. In terms of content, older adults defaulted to past reflection rather than future-oriented thought, and further exhibited higher levels of other-versus self-related cognition. Our findings suggest a distinct shift in the frequency and

nature of spontaneous thought processes with increasing age, manifesting in a narrowing of the temporal window within which mind wandering occurs.

### **When the Self Breaks Down – Self-related Cognition in Frontotemporal Dementia**

Cherie Strikwerda-Brown (*University of Sydney*)

A unique opportunity to examine the temporally extended self is offered by clinical conditions in which self-referential cognition breaks down. One such syndrome is that of behavioural variant frontotemporal dementia (bvFTD), a progressive neurodegenerative disease characterised by alterations in personality and behaviour and deterioration in multiple aspects of selfhood. Here, we discuss recent findings demonstrating how the self in bvFTD is compromised across temporal contexts, manifesting in altered autobiographical memory and episodic future thinking abilities. Preliminary results regarding the social self in bvFTD will also be explored, namely how difficulties disengaging from an egocentric perspective may affect complex social interactions. By examining the self in bvFTD from multiple angles, we hope to improve understanding of this elusive construct, and shed new light on the brain regions integral to self-related processing.

### **The Biological Boundaries of Predictive Processing**

*Fri 1:00-3:00 Room A*

Jakob Hohwy (*Monash University*), Michael Kirchhoff (*University of Wollongong*), Alex Morgan (*Rice University*), Ross Pain (*Australian National University*), and Stephen Mann (*Australian National University*)

Predictive processing is an exciting new theoretical framework in computational cognitive neuroscience that has been heralded as a “grand unified theory of the mind” (Clark 2015). The framework promises to illuminate philosophical questions about the nature of mind, and in particular to distinguish mindless from genuinely minded systems. However, there are a number of open questions about the proper interpretation of predictive processing that must be addressed before its broader philosophical significance can be evaluated. For example, predictive processing in the brain is often characterized as just one manifestation of a more basic biological imperative to minimize information-theoretic *free energy*, an imperative that is said to be faced by any living organism (Friston 2009). Minimizing free energy is said to involve a process of updating a system’s generative models such that the predictions of those models better explain sensory evidence, thereby reducing the system’s ‘uncertainty’ about the world. But if these processes are exhibited by plants and other putatively mindless organisms, as proponents of the free energy principle claim (Calvo & Friston 2017), one might wonder what distinguishes the predictive processing that mediates *psychological* processes from the free energy minimization found in mindless systems. One idea that has been floated in this vicinity is that the free energy minimization found in mindless system involves generative models that are merely *tacitly embodied* within the system, whereas the models that mediate psychological predictive processes are *explicit representations*. This bears on a current controversy about whether predictive processing is a theoretical framework within which representations play a robust explanatory role. A related set of questions concerns how to interpret technical information-theoretic notions like ‘prediction’ and ‘uncertainty’, which are used within the predictive processing framework to characterize sub-organismic informational states, but which are nevertheless intended to

illuminate the expectations and uncertainty of whole organisms. How does the 'uncertainty' encoded by a population of neurons relate to the uncertainty of an individual organism? The purpose of this symposium is to bring these various issues into focus by assembling leading experts to address the following questions: What are the 'boundaries' of predictive processing? What exactly does it take, mechanistically speaking, for a system to minimize free energy? Where in phylogeny do organisms capable of predictive processing or free energy minimization first appear? How does the minimization of free energy relate to other basic biological imperatives? And what does any of this have to do with mentality?

### Individual Papers:

#### **The Free Energy Principle, Predictive Processing and Process Theories**

Jakob Hohwy (*Monash University*)

The idea that prediction is central to perception and cognition is being developed in different ways, giving rise to uncertainty about its scope, falsifiability and explanatory power. Here I set out a key distinction between the free energy principle and what is known as predictive processing, and explain the relation between the free energy principle and its process theories. This provides the foundation for understanding what it would take to provide evidence for, and explain, the predictive mind in different kinds of systems. Essentially, the free energy principle is a regulatory principle, guiding the construction of process theories in different domains.

#### **The Autonomous Organization of Biological Systems**

Michael Kirchhoff (*University of Wollongong*)

This talk addresses the autonomous organization of biological systems. It does so by considering the boundaries of biological systems, from individual cells to *Homo Sapiens*, in terms of the presence of Markov blankets under the active inference scheme—a corollary of the free energy principle. A Markov blanket defines the boundaries of a system in a statistical sense. Here we consider how a collective of Markov blankets can self-assemble into a global system that itself has a Markov blanket, thereby providing an illustration of how autonomous systems can be understood as having layers of nested and self-sustaining boundaries. This allows us to show that: (i) any living system is a Markov blanketed system and (ii) the boundaries of such systems need not be co-extensive with the biophysical boundaries of a living organism. In other words, autonomous systems are hierarchically composed of Markov blankets of Markov blankets—all the way down to individual cells, all the way up to you and me, and all the way out to include elements of the local environment.

#### **Measuring Prediction**

Alex Morgan (*Rice University*)

The free energy principle (FEP) is supposed both to explain the distinctive features of psychological processing in intentional agents and to capture a fundamental biological imperative that describes the behavior of all living systems. Indeed, proponents of FEP have recently used the principle to explain the adaptive activities of plants, arguing that plants reduce their uncertainty about the world by revising predictions made by their generative

models (Calvo & Friston, 2017). These claims raise foundational questions about how to interpret the central theoretical concepts of the FEP, and how the FEP relates to the empirical phenomena it purports to explain. While sometimes treated merely as a useful interpretative framework, the FEP ultimately seems to be regarded as an empirical hypothesis that makes falsifiable claims. Whether a system is subsumed by the FEP depends at least in part on whether it embodies generative models that reflect the causal structure of its environment. But what exactly is a generative model, and how would we tell whether plants embody them? How does the information-theoretic uncertainty mediated by the generative models of a plant differ from the psychological uncertainty of a subject? One idea suggested in the literature is that the generative models in plants, bacteria, and other presumably mindless systems are merely *tacitly* embodied, whereas the generative models in full-blown subjects are in some sense *explicit*. But the empirical content of this distinction is no more transparent than the content of the claim it is used to clarify. In this talk I argue that if we're to secure the empirical foundations of the FEP we should turn to a more basic idea, that of *measurement*. One of the alleged virtues of the FEP is the mathematical precision of its central concepts, but this is only a virtue insofar as those concepts pick out measurable quantities. I argue that the best test of whether of whether a system really minimizes free energy turns on whether we can identify specific measurable quantities like prediction errors within the system, and that plants in fact fail this test. The best case for predictive processing in plants comes from work on plant circadian rhythms. Plant circadian clocks embody the structure of the day-night cycle, and even play an important role in future- directed, 'anticipatory' behavior, but there is no evidence that they involve mechanisms that encode quantities like prediction errors. I conclude that the situation is precisely the opposite of what proponents of the FEP have claimed: plants do not embody generative models, but they do contain explicit representations.

### **Prediction and Uncertainty**

Ross Pain and Stephen Mann (*Australian National University*)

The idea that perception, action and attention are best understood as attempts to reduce uncertainty is rapidly gaining traction. According to the predictive processing framework, cognitive systems produce predictions of sensory input using generative models. Any error between predictions and sensory input is then used to update the generative models, such that more accurate predictions are produced in the future. Cognitive systems thereby minimise the difference between predictions and sensory input and, in doing so, decrease uncertainty about the world. However, clearly the terms "uncertainty" and "prediction" are here being employed in different ways than in ordinary usage: what is meant when we describe sub-organismic informational states as "uncertain" or as "making predictions" is very different from what we mean when we say that organisms are uncertain or make predictions. In this paper we outline how the terms "prediction" and "uncertainty" are used (i) as information-theoretic terms relating to sub-organismic informational states (or *tacitly embodied models*); and (ii) as terms to describe the psychological states of organisms (or *explicitly represented models*). We then examine the relationship between these two types of usage. We advocate a teleosemantic approach to this task. Though often misunderstood as requiring a demanding notion of "representation", a much less severe and more broadly applicable form of teleosemantics provides conceptual tools needed to understand the distinction between tacitly embodied and explicitly represented models. Precisely because it

applies to biological control systems as well as psychological phenomena, this approach is well suited to the task of distinguishing biology from cognition. We argue that the best way to capture the difference between implicit and explicit notions of prediction and uncertainty is in terms of decoupled representation. On our view, decoupled representations are a hallmark of truly cognitive systems, handling decoupled representations is in part what cognition is for, and the distinction between coupled and decoupled representation is a matter of degree rather than kind. In addition, recent work has emphasised the harmony between teleosemantics and mathematical communication theory, giving us more reason to be hopeful about the integration of these historically distinct methods.

### **Movement, Expertise and Creativity**

*Fri 1:00-3:00 Room B*

Maya Gavish (*Western Sydney University*), Robin Dixon (*University of Sydney*), Ian Maxwell (*University of Sydney*), Kath Bicknell (*Macquarie University*), and Sarah Pini (*Macquarie University*)

Through case studies from dance, theatre, circus and sailing, this symposium examines the relations between movement, expertise and cognition in live performance. We draw on methods from philosophy, anthropology, psychology, performance studies and history. Maya Gavish examines strategies used to solve problems in contemporary choreographic processes and their impact on creative development. Robin Dixon then takes us back in time examining how actors' masks functioned within the cognitive ecology of *commedia dell'arte*, shining new light on historical performance processes in this popular form of Italian theatre. Drawing surprising parallels to improvisation practices on the stage, Ian Maxwell's evocative descriptions of sailing are as revealing as his analysis of yachting as extended embodiment; constantly mediating between, and in response to, bodies, environment and equipment. Kath Bicknell continues this exploration of embodied action as jointly responsive to internal and external resources, demonstrating the multimodal layering of task-specific cues before performing at height on the trapeze. Sarah Pini ties our panel together bringing us back to the dance world. She draws on sustained ethnographic work to reveal the phenomenon of stage presence across specific cognitive ecologies of different dance practices and performers.

This symposium shares interdisciplinary insights and perspectives on how performance and creative practices shape, and are shaped by, remarkable bodily and cognitive capacities. And it encourages further cross-disciplinary awareness, discussion and collaboration. In doing so, we address a need in philosophy and psychology for complex, real-world examples of embodied practices to challenge and extend existing work on thought and action, to provoke new types of questions, and to continue to explore novel methods in response to debates and challenges that extend well beyond academic walls.

**Individual Papers:****Thinking Strategically about Dance-making: The Application of Strategies for Diversifying Dance Designs**Maya Gavish (*Western Sydney University*)

Research on choreographic processes tends to focus on movement generation and manipulation. Often, the structuring phase which entails selection, organization and refinement of materials remains untouched. Therefore, this empirical study examines the thinking processes that are associated with structuring and explores how expert choreographers navigate their way through the sea of possibilities prior to choosing a 'final' dance design. The structuring processes of two Australian choreographers, Sue Healey and Gideon Obarzanek, were examined in an experimental setting. Each choreographer worked with a group of five dancers and had five days to create three different dance compositions out of movement material that each group had generated on Day 1. Their second task involved structuring their second piece with the aid of a design strategy (independent variable). Through observations and interviews quantitative and qualitative data was extracted, highlighting the methods experts employ for improving and diversifying their dance designs. A mixed method analysis revealed that structuring is highly correlated with problem finding and solving. Still, the participants used particular patterns of strategies, favoring change in the detail level. Rehearsing time had a major effect on the choreographers' inclination to inflict change and some effect on the choreographer-perceived quality of the outcome. Lastly, while the conscious use of design strategies did not seem to support experts' creativity, innovation was enabled through the application of process strategies. These guided the choreographers' overall approach through the solution space and forced changes in a specific direction which resulted in new forms.

**Dramatis Personae: Mask as Cognitive Artifact in the Commedia Dell'arte**Robin Dixon (*University of Sydney*)

*Commedia dell'arte* dominated continental European stages for over two centuries, but several aspects of the form remain obscure to contemporary historians. Our understanding of how *commedia* worked in performance is improving all the time, a clear example of the benefits of blending historical inquiry, textual analysis and practice-led research methods. However, despite the incorporation of *commedia*-inspired skills into acting curricula at institutions across the world, the original rehearsal methods and training techniques utilised by performers have not received due scholarly attention. Perhaps the most immediately recognisable feature of *commedia dell'arte* is the use of grotesque hand-made leather masks by the performers of specific stereotyped roles. These masks were a fundamental element of actor training and performances. Explanations of how they were used by performers have tended towards the prosaically functional or quasi-mystical. However, a thorough examination of these artifacts grounded in concepts of distributed cognition might offer compelling alternative hypotheses for how the improvisatory or 'flexible' nature of the form might have functioned in performance. This paper will examine how these masks, as important elements in the cognitive ecology of *commedia dell'arte*, were implicated in conventional patterns of actor movement and gesture. I will consider the ways in which the design, construction and wearing of each mask might have encouraged or circumscribed

specific types of movement, and the relationship between these types of movement and the almost unique cognitive demands of this form in performance: conventional characterisation, blending rehearsed and unrehearsed textual material, and the flexible processes of composition-in-performance.

### **Sailing as Extended Embodiment**

Ian Maxwell (*University of Sydney*)

To sail is to be interpolated in complexity: an intercorporeal, equipmental, and environmentally-embedded practice, unfolding in an unstable, dynamic context, overdetermined by multiple entangled factors, in which control is contingent, subject to vagaries of weather, technology, teamwork, and bodily capacities. *Feeling* one's way through these intensities grounds the possibility of the activity itself, set against the potential for its catastrophic failure. Sailorly embodiment extends through the equipment of the boat, through crewmate's bodies, into wind, water, and topography. The wind manifests in arms, the motion of the tide and currents in the thighs; the assemblage of material constituting the boat shifts, creaks, groans, yields, resists, responds, and sometimes breaks, registered in flesh, eye, and ear, in the constant, draining, shift of balance and weight, salt on lips, the grinding discomfort of chaffing wetness, the blast of sun and wind on exposed flesh. Through sheets and winch handles, the press of hip upon hip, crew members engage the world together in conjoined embodiment. The capacity to engage the practice of sailing, to be able to sail, enjoins these manifestations, effecting a (contingent, partial, finely-balanced, collective) agency: at best, a sense of radically continuity with world, others, and technology; the breakdown of these systems yields, at worst, injury, damage, and death. This paper adapts Fitzpatrick's schema for improvisational performance in *commedia dell'arte*, understanding sailing as a sequence of creative, improvisatory, temporal activities constituted in a dynamic orientation along, and mediation between, the three axes of intercorporeal embodiment, equipment, and environment.

### **The Multimodal Experience of (Performative, Embodied, Life-saving) Cues**

Kath Bicknell (*Macquarie University*)

Christensen et al (2013) argue that cognitive control is present in skilled action from novice to expert levels of performance, with strategic control increasing as task complexity increases. I ask how this capacity for strategic control may feature in developmental experiences. I do this by taking a body (mine) shaped by almost twenty years of cycling, infusing it with a phenomenological and auto-ethnographic method, and hanging it from a trapeze. My analysis takes Ericsson and Kintsch's (1995) psychological research on long-term working memory in experts and integrates it with theories of embodied cognition and skilled action. In doing so, I demonstrate that it's not just experts who rely on the strategic use of cues to trigger complex whole-of-body actions in time-critical scenarios. These processes operate in training and development, in verbal and non-verbal modalities, at novice levels. Further, cues can be multimodal, overlapping and draw on highly individualised, interactive and context specific features of the performance environment. They allow for the development of a shared mental model between instructor and student, strategic execution of creative manoeuvres (even on the first attempt), sophisticated levels of emotion

regulation and are set up in training scenarios with the aim of a more layered approach to cued control in performance and as task proficiency increases.

### **A Cognitive Ecological Approach to Stage Presence in Three Different Dance Forms**

Sarah Pini (*Macquarie University*)

Dance as a complex human activity provides a rich ground to understand the role of the body in cognition. Despite recent moves towards an enactive approach to dance (Warburton 2011, 2016; Merritt 2015, Cuykendall, & Shiphorst, 2018), the social, cultural and historical dimensions that inform the diversity of movement techniques and dancers' experiences have often been neglected by more cognitive studies that have focused on expertise in dance. This study proposes an interdisciplinary study of embodied cognition by addressing the phenomenon of stage presence. In its classic version stage presence is conceived as prerogative of the skilled performer, resulting from both regimens of training and intrinsic charisma. Some researchers argued instead that presence can emerge in the spatiotemporal and experiential realm of embodied situated interaction, shared between the performer, the performance score and the audience (Zarrilli 2009; Fischer-Lichte, 2012; Sherman 2016). Through ethnographic methods and participant observation, including direct involvement through enculturation and enskillement into different performance practices, this study investigates variations of embodied presence in three dance forms: Contemporary Ballet, in the case of the National Ballet of Marseille's staging of Emio Greco's piece *Passione*; Contact Improvisation and the *Global Underscore* in Italy; and *Body Weather*, a radical movement ideology in Australian dance company De Quincey Co. By reframing stage presence as a collaborative and emergent potentiality arising from interaction with the audience and the context, this work shed light on the complex dynamic nature of cognition by reframing the cognitive ecology of specific dance forms with the lived experience of stage presence.

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### **Mutual Manipulability, Extended Cognition, Enactivism: Open Challenges and Future Directions**

*Fri 3:30-5:00 room B*

David M. Kaplan (*Macquarie University*), Alexander James Gillett (*Macquarie University*), Michael D. Kirchhoff (*Wollongong University*), Richard Menary (*Macquarie University*), and Karola Stotz (*Macquarie University*)

The mutual manipulability approach to constitutive relevance in mechanisms has been vigorously debated in recent years across a broad range of philosophical contexts. Proponents have defended its usefulness as an objective means for determining components of mechanisms and as a promising tool to help resolve the debate over embodied and extended cognition. In recent years, a diverse set of challenges to the mutual manipulability approach has emerged. One group of prominent challenges centres on the claim that although mutual manipulability is often explicated in terms of interventionism, it may violate some of the basic tenets of the interventionist approach. Another set of challenges has focused on whether mutual manipulability is too restrictive and cannot account for the temporal aspects of constitution in dynamical systems in general and dynamically unfolding cognitive processes in particular. This symposium aims to bring together researchers for a range of difference perspectives to discuss these and other open challenges to the mutual manipulability approach and explore future directions on this important topic.

**Individual Papers:****Why Top-down Interventions Are Not**

David M. Kaplan (*Macquarie University*), Alexander J. Gillett (*Macquarie University*), Christopher Hewitson (*Macquarie University*), and Christopher Whyte (*Macquarie University*)

In this talk, we take as our starting point the idea that so-called top-down interventions do not, strictly speaking, involve ideal interventions on the phenomenon-variable, but rather ideal interventions on the input conditions that partially constitute the phenomenon-variable (Craver 2007; Harinen 2014). Although there is an important set of differences between the opposing experimental strategies at the core of the mutual manipulability approach, we argue that these are not well described in terms of notions such as “top-down” and “bottom-up”. More critically, we argue that this loaded terminology has led otherwise well motivated views to embrace controversial notions like top-down causation or make other problematic maneuvers. We identify the source of this confusion in Craver’s original discussion and in particular his now infamous diagrams, which do an admirably good job of depicting constitutive relevance relations but are prone to mislead if they are taken as literal depictions of how the experimental interventions for establishing constitutive relevance work. We instead argue for a “flat causal intervention hierarchy” in which the distinction between the two classes of interventions is discharged not in terms of interventions at different “levels” but rather the degree to which a specific candidate component in a given mechanism can be precisely targeted by the causal intervention. So-called bottom-up interventions are targeted causal interventions in the sense that they are always explicitly designed to target a specific candidate component, whereas so-called top-down interventions are not always (and sometimes cannot be) precisely targeted. This view simultaneously provides a powerful response to objections based on fat-handedness while critically maintaining a distinction between causal and constitutive relevance relationships. We see this as a friendly but necessary amendment to the view originally espoused by Craver (2007), and subsequently defended and elaborated by others including Kaplan (2012), Harinen (2014), and Krickel (2018).

**Defending the Use of the Mutual Manipulability Criterion in the Extended Cognition Debate**

Alexander J. Gillett (*Macquarie University*), Christopher Hewitson (*Macquarie University*), Christopher Whyte (*Macquarie University*), and David M. Kaplan (*Macquarie University*)

Mutual manipulability is a putative criterion for arbitrating boundary demarcation debates. Originally formulated in the mechanistic literature (Craver 2007), mutual manipulability distinguishes between genuine components of a system and the causal background through dual interventions. These interventions are usually characterised as ‘top-down’ and ‘bottom-up’. The central idea is that if a putative component is manipulable via both of these interventions, then it should be counted as a genuine component of the system. Mutual manipulability has recently been imported into the extended cognition debates to try and make the issue more empirically tractable (Kaplan 2012). There has been growing interest in this approach (e.g. Van Essen & De Jong 2016). However, the entire project has recently been thrown into disrepute by Baumgartner and colleagues (2016, 2017). They argue that mutual manipulability is metaphysically flawed and, perhaps even more worryingly, undermines both

internalist and externalist approaches to cognition. In this paper, we defend the notion that mutual manipulability is an effective arbiter in the extended cognition debates using a new proposal developed by Kaplan and colleagues (in prep.). Motivated by scientific practice, this work seeks to reframe the interventions at the heart of the mutual manipulability criterion in terms of the degree to which a specific candidate component in a given mechanism can be precisely targeted by the causal intervention. Not only does this proposal avoid the challenges raised by Baumgartner and colleagues, it also provides a response to a related but different set of issues raised by enactivists concerning how mutual manipulability handles the temporal aspects of constitution (Gallagher 2018; Kirchhoff 2016).

### **Cognitive Integration and Mutual Manipulability**

Richard Menary (*Macquarie University*)

Mutual Manipulability has been proposed as a way of resolving the extended mind debate (Kaplan 2012). In this paper I shall argue that cognitive integration (CI) is well suited to the mutual manipulation test, at least concerning what Mark Rowlands calls the manipulation thesis (1998): That cognitive processes are sometimes composed of the manipulation of environmental variables. For example, experimental interventions on whether or not the writing out of mathematical equations make a difference to mathematical cognition are quite tractable. However, CI also argues that cultural practices make a difference to how cognitive traits are acquired in development and it is this claim that I will put to the mutual manipulability test.

### **The Developmental Niche and Mutual Manipulability**

Karola Stotz (*Macquarie University*)

The manipulation thesis says that cognitive processes are sometimes composed of the manipulation of environmental variables. In this paper I shall apply the idea of mutual manipulability to the idea of the development niche, which is constituted by the heritable development resources that go beyond the genetic inheritance system. As such it is construed as part of the niche developmental system formed by the organism situated in its developmental niche. I will test the claim of developmental niche construction that developmental resources such as child care or cultural practices influence how and which phenotypic traits are acquired in development with the mutual manipulability approach.

## Paper Abstracts

Wednesday 10:45-12:15 Room A

**Alessio Bucci** (*University of Turin*):

### **Altered States of Consciousness: A Conceptual Analysis Based on Empirical Cases**

The notion of “altered states” has been employed in the scientific study of consciousness for decades (Ludwig, 1966; Tart, 1990). However, the incredible diversity of identifiable conscious states and the lack of a clear-cut definition of a baseline of consciousness make the notion unclear. In this paper I aim to provide some conceptual clarifications on what it means to be in an altered state of consciousness, focusing specifically on the example of being in a self-less conscious state, a feature that has received some attention in the literature recently. In order to do so, I will present some discussions of empirical cases, drawing on literature about psychedelic substances (Carhart- Harris et al., 2016; Letheby & Gerrans, 2017; Tagliazucchi et al., 2016), trance (Hove et al., 2016; Flor-Henry et al., 2017; Mainieri et al., 2017) and hypnagogic states (Goupil & Bekinschtein, 2012; Thompson, 2014; Windt, 2015). I will highlight similarities and differences among these cases and, in line with a recent theoretical analysis (Bayne, Hohwy & Owen, 2016), I will propose the adoption of a multidimensional mapping of conscious states. Finally, I will explore the implications of this approach for our understanding of consciousness as a unitary concept. In light of the above, I will argue that we should consider the notion of “altered states” to be misleading in its normative characterisation and that we should treat this notion as purely descriptive in relation to a somewhat arbitrary baseline.

**Katsunori Miyahara** (*University of Wollongong*), **Takuya Niikawa** (*Institute Jean Nicod*), **Hiroaki Hamada** (*Okinawa Institute of Science and Technology*), and **Satoshi Nishida** (*National Institute of Information and Communications*):

### **Expediting Neurophenomenology: Lessons from an Initial Attempt**

Neurophenomenology requires a robust method for collecting reliable subjective reports. Among the relevant methodological proposals, few attempts have been made to develop *short-term phenomenological training programs*—that is, a methodology to familiarize naïve subjects with the phenomenological method during a single visit to the lab. We report and discuss the first results of our attempt to develop a phenomenological training program of this nature. Our program consists of two stages. In the first stage, we present subjects with a geometrical illusion and instruct them to describe their visual experience as articulately as they can. This stage intends to induce an “epoché” in the subjects—that is, to make them turn their attention away from what appears in their experience (“intentional object”) back to how they appear (“intentional content”), how one is aware of them (“intentional act”), and other subjective feelings that do not belong to the object (“accompanying feelings”). In the second stage, we offer a tutorial to develop the subjects’ descriptive skills regarding the *non-objectual* aspects of conscious experience (intentional content, intentional act, subjective feelings). We conducted a psychological experiment with 10 subjects (and 3 controls) to test the effectiveness of this two-stage training program. The outcome was inconsistent in that only 5 subjects (and no controls) improved their ability to use the phenomenological method. However, we believe there are lessons to be learned from this result. We discuss our observations regarding *individual difference*, *transferability of phenomenological skills*, and *learning trajectory* and their practical implications.

**Alex Morgan** (*Rice University*):

**Gaining Perspective: On the Neurocomputational Mechanisms of Subjectivity**

Contemporary neurocomputational theories of consciousness hold that conscious states are produced by complex information processing mechanisms that serve to integrate disparate sources of information into a unified state that is then broadcast throughout the cognitive system. While these theories appeal to distinctive computational processes, these processes are not specified in terms of specific computational problems. This has bred worries that these theories massively over-generalize. For example, some have argued that current computational theories of consciousness entail that a massive matrix of XOR gates, or an entire nation like the USA, are conscious. The problem here is not that just that these consequences are highly counterintuitive, it's that they highlight a lacuna in existing theories: these theories fail to illuminate what it takes for an integrated informational state to qualify as a state of a conscious *subject*. I propose to fill this lacuna by appealing to research on the neural mechanisms of egocentric spatial representation. Signals encoded in various different modality-specific frames of reference are known to converge on the posterior parietal cortex (PPC), where they are remapped into a modality-independent, egocentric frame of reference. This egocentric framework is thought to mediate a stable representation of the egocentric locations of objects that is updated as an agent moves through space, thus grounding a distinction between the agent and mind-independent reality. I argue that it's in virtue of being encoded into this egocentric framework that an integrated informational state contributes to an agent's *subjective perspective* on the world.

**Lin Ying-Tung** (*National Yang-Ming University*):

**Field and Observer Perspectives in Episodic Simulation and the Sense of Self**

The connection between memory and self has been a central topic in philosophy of memory. This paper addresses the issue of how we identify ourselves in episodic simulation and explores what constitutes our sense of self in remembering and future thinking. Thomas Metzinger (2013, 2017) recently introduced the concept of the phenomenal unit of identification (UI) to characterize the phenomenal properties that give rise to the conscious experience of "I am this." Out-of-body experiences, dreams, and mind-wandering have been the central cases studied in order to understand self-identification, self-location, spatiotemporal perspective, and what constitutes UI. This paper brings attention to field-observer perspective shifting in episodic simulation and shows that this phenomenon is interesting for theoretical and empirical studies on identification in memory and the role of self-other representation in generating the sense of self. When remembering a past event or imagining a future event, episodic simulation can be formed from a field perspective or from an observer perspective. With a field perspective, the event is experienced as if the world is seen through one's own eyes; alternatively, with an observer perspective, one views the world and oneself from an external visuospatial perspective. Examining dimensions of phenomenal selfhood in observer-perspective episodic simulation, particularly in memory of skilled movement and social situation, will help elucidate UI as well as the relationship between field and observer perspectives. I argue that field and observer perspectives mutually contribute to our sense of self and identify the conceptual issues of the pluralism of perspectives (Sutton, 2014).

**Wednesday 10:45-12:15 Room B**

**Nick Byrd** (*Florida State University*):

**Not All Who Ponder Count Costs: Arithmetic Reflection Predicts Utilitarian Inclinations, but Syllogistic Reflection Predicts both Deontological and Utilitarian Inclinations**

Sacrificial moral dilemmas are supposed to pose a moral conflict between the desire to minimize total harm and avoid directly causing harm. Individuals who tend toward the consequentialist option that minimizes total harm tend to score higher on measures of reflective reasoning. However, these findings are based on conventional measures of dilemma judgments that treat direct harm avoidance and total harm-minimization as dependent, diametric opposites as well as mostly arithmetic versions of the Cognitive Reflection Test. To advance this literature, we employ process dissociation to assess these deontological and utilitarian response tendencies independently as well as new measures of reflection to assess different types of reflection independently. Two studies provide evidence that past research has overlooked three important relationships between reflective reasoning and moral dilemma judgments. First, arithmetic, but not logical reflection positively associates with relative moral dilemma judgments. Second, arithmetic reflection is positively associated with an independent measure of the utilitarian inclination to minimize total harm, but not associated with an independent measure of the deontological inclination to avoid causing harm. Third, both logical and actively open-minded reflection are positively and independently correlated with both independent utilitarian and deontological inclinations — inclinations that cancel each other out in relative dilemma judgment measurements. These findings update common suggestions in the literature that reflection is of one kind and is usually related only to utilitarian inclinations.

**Graham Wood** (*University of Tasmania*):

**Toward a Unified Cognitive Science of Moral Intuition.**

This paper describes how three distinct research programs in moral psychology can be unified in order to create a unified cognitive science of moral intuition. The three research programs are Moral Foundations Theory (Haidt & Joseph), Social Contract Theory (Cosmides & Tooby), and research motivated by the Linguistic Analogy (Dwyer, Huebner, & Hauser). This paper assumes the existence of two systems of cognition (Evans & Frankish) and assumes that the subject matter of the cognitive science of moral intuition are the structures, processes, inputs and outputs of System 1 (Stanovich & West). Importantly, this paper is not concerned with moral deliberation that may occur in System 2 (what some philosophers would characterise as the appropriate domain of moral deliberation). This paper is only concerned with moral intuitions, understood as moral judgments that were not arrived at via a process of conscious deliberation. Here the assumed purpose of a unified cognitive science of moral intuition is to give a descriptive account of the cognitive systems and processes that give rise to the actual moral intuitions in the minds of humans, independently of any obvious conscious moral deliberation.

**Noel Viana and Frederic Gilbert** (*University of Tasmania*):

**Stimulating the Brain or Altering the Self? The Effects of Neurostimulation for Alzheimer's Disease**

Alzheimer's disease (AD) leads to memory dysfunction and cognitive impairments, which have been shown to drastically affect the selfhood of afflicted individuals. Novel neurostimulation technologies tested to treat AD, such as deep brain stimulation, have also been associated with influencing the selfhood in different cohorts of patients (Parkinson's disease, Obsessive

Compulsive Disorder, etc.), both due to their beneficial and potential adverse side effects. Considering the risks and irreversibility of these neurostimulative modalities, it is critical to anticipate how new neurostimulative interventions may affect self-related concepts in a population whose selfhood is already threatened by the cognitive, psychological, and social implications of an AD diagnosis. Using DBS for AD as a case, we anticipate these potential effects through the lens of an extended social constructionist grounded tripartite model of selfhood, originally proposed by Harre and Sabat. By reconciling information from medical reports, psychological, philosophical, and sociological investigations on the impacts of DBS or AD on selfhood, we examine potential effects of DBS for AD on Self 1 or singularity through use of first-person indexicals, and gestures of self-reference, attribution, and recognition; Self 2 or past and present attributes, knowledge of these characteristics, and continuity of narrative identity; and Self 3 or the relational and social self. Anticipating these effects is crucial in ensuring adequate ethical oversight on informed consent procedures and care provision for people with AD enrolled or interested in enrolling in trials involving an invasive neurostimulation technology.

**Pablo López-Silva** (*University of Valparaíso*):

### **Are These My Own Thoughts? Attributions of Mental Agency and the Challenge from Psychopathology**

An attribution of mental agency is defined as the mental operation that assigns the voluntary initiation or authorship of a first personal phenomenal thought to a specific agent. It is not obvious that such an attribution is always self-referential, namely, that always represents myself as the author of the thoughts that pop into my own stream of consciousness; some psychotic delusions offer *prima facie* evidence for the claim that it is possible to externalize the agency of some thoughts from an experiential point of view. The main aim of a theory of attributions of mental agency is explaining the way in which their representational content comes about i.e., a mental state with the content [P is the author of a thought T] where P is a specific agent and T is a thought appearing in the phenomenal field of the subject making the attribution. Currently, two theories dominate this debate. On the one hand, a bottom-up theory stresses the role of the phenomenal richness of normal thinking in shaping the representational content of the final attributional state. On the other side, a top-down theory emphasizes the role played by second-order explanatory mechanisms in producing the kind of representational content that characterizes these attributions. After further explaining these two alternatives, this article presentation suggests that some of the most fundamental features of delusions of thought insertion propose an inescapable explanatory challenge to current theories of attributions of mental agency. The conclusion of the analysis is that none of these current theories is able to overcome successfully this challenge and therefore, that the debate about how to best characterize the phenomenon remains open.

**Wednesday 3:30-5:00 Room A****Peter Slezak** (*University of New South Wales*):  
**Intuition and Omniscience**

Kent Bach (1987) remarks "One might have thought the everyday phenomenon of referring to an individual by name to be something less than a mystery, but the debate on proper names keeps spreading and the epidemic of theories goes unabated." However, Pietroski (2003) suggests "despite a considerable literature, no one has shown that names do bear any interesting and theoretically tractable relation to their bearers." If Pietroski is correct, we are owed an explanation of how so many philosophers could have been so misguided.

Kripke (1972) famously acknowledges that he was led by his "natural intuition" to his influential view that proper names are rigid designators. Kripke wrote: "I think it is very heavy evidence in favour of anything, myself. I really don't know, in a way, what more conclusive evidence one can have about anything, ultimately speaking." However, Farkas (2003) characterizes the "deeply rooted" externalist intuitions as "baffling" and a "vexatious problem" and we may ask why philosophers feel that the "intuitive responses to a certain kind of thought-experiment appear to leave them little choice," as Boghossian (1998) puts it. The diagnosis I propose reveals why these intuitions are so compelling and, furthermore, that they illuminate other seemingly unrelated, recalcitrant philosophical puzzles.

**Corey Maley** (*University of Kansas*):  
**Analog Computation for Cognitive Science**

The view that the mind/brain is a computational system of some kind continues to be a guiding principle of cognitive science. But *analog* computation has not been made nearly as clear as its digital counterpart. According to Piccinini, for example, "analog computation is often contrasted with digital computation, but analog computation is a vague and slippery concept," (Piccinini, 2015, p. 123). Some attempts to make analog computation clearer have been given, and one standard place has been (Pour-El, 1974). Piccinini, for example, goes on to call this the "clearest notion of analog computation." On this view, analog computation essentially involves the manipulation of continuous variables to solve systems of differential equations. To be sure, this is something that analog computers were often used for. But it is only one part of the story. When we look to the design and use of actual analog computers used in the past, there were many *dis*continuous elements in their design *qua* computational system, such as piecewise-linear functions and step functions (Ashley, 1963; Peterson, 1967). In other words, it is simply not true that analog computers used only continuous representations. So what *is* essential about analog computation? The short answer is that analog computers manipulate analog representations, where analog representation is understood in the sense originally argued in (Lewis, 1971) and defended in (Maley, 2011). Here, analog representations are those representations that literally vary systematically with what they represent, where that variation happens discretely or continuously. An analog watch, for example, represents time by the movement of a second-hand, whether that movement is either a continuous sweep or comes in discrete ticks. The upshot for cognitive science is that this account makes sense of the ways in which researchers in mental imagery and numerical cognition have understood analog computation and representation. As for neuroscience, recent evidence is suggesting ways that individual neural spikes may not be the binary, all-or-nothing events that has been the dominant view, but instead that the precise waveform of the spike has functional consequences. For example, "taller" spikes have a larger downstream effect than "shorter" ones, and "wider" spikes have a larger effect than "narrower"

ones (Maley, 2018). These results (among other considerations) make it difficult to reconcile the view that neural computation has anything interestingly in common with digital computation. However, if we have a broader view of what makes something an *analog* computation beyond mere continuity, then we can make sense of how neurons might compute in a principled way.

**Larry Shapiro and Greg Nirshberg** (*University of Wisconsin–Madison*):  
**Structural and Indicator Representations: A Difference in Degree, Not Kind**

Many philosophers have seen in predictive coding models of cognition a style of representation – structural, map-like, representation – that, they claim, avoids the difficulties that beset the varieties of symbolic representation typical in more computationally-oriented theories of cognition (see, e.g., Gładziejewski 2015; Gładziejewski & Miłkowski 2017; O'Brien & Opie 2004; Williams 2018). More specifically, it is claimed that the semantic content of structural representations, unlike in the case of symbolic representations, is genuinely causally efficacious. Additionally, structural representations do not suffer from the disjunction problem that has proven so recalcitrant in discussions of symbolic representation. In this paper I consider these purported benefits of structural representation. I argue that structural representations do not differ as significantly from ordinary symbolic representations as their supporters insist. Accordingly, it should come as small surprise that defenders of structural representations face a similar challenge in accounting for the causal efficacy of semantic content; and that structural representations also fall prey to a form of the disjunction problem. From these complaints, one might draw the lesson that structural representations are just as “bad” as symbolic representations. I would draw the opposite conclusion, i.e. that symbolic representations are just as “good” as structural ones.

**Jon Opie and Gerard O'Brien** (*University of Adelaide*):  
**Commentary**

[Invited Session commentary]

### Wednesday 3:30-5:00 Room B

**Isaac Wiegman** (*Texas State University*):  
**The Motivational Structure of Emotions**

Among evolutionary theories of emotions, basic emotion theory has been one of the most widely accepted. Yet because of its relative inability to explain cultural influences on emotional actions, basic emotion theory now appears to be a stagnating research program. I think this appearance is deceiving. To demonstrate this, I offer two complementary evolutionary rationales for modifying the hypothesized control structure of basic emotions. First, whereas many basic emotion theorists assume an open-loop control structure for basic emotions, I argue that evolutionary considerations predict a closed-loop or feedback structure for many basic emotions. This is because feedback-control structures can dynamically adjust emotional behaviors in response to changing conditions and dynamic adjustments of this sort are required to solve certain recurring problems over evolutionary timescales. Second, recent work on gene-culture coevolution and self-domestication suggests an interesting set of hypotheses about how the cultural environment may have shaped psychological adaptations like emotions. In general, cultural norms may require individuals to drastically mold their emotional responses to their

cultural environment over the course of development. This suggests the addition of forward models to the control structure of many emotions, to allow for this kind of plasticity. These proposed changes to basic emotions do not fit neatly within the mechanisms of social influence traditionally discussed amongst basic emotion theorists (such as display rules, emotion regulation, and prepared learning mechanism). Nevertheless, with the proposed feedback-control structure, basic emotion theory can make plausible predictions concerning culturally influenced emotion concepts and their influence on emotional actions.

**Mizumoto Masaharu** (*Japan Advanced Institute of Science and Technology*):  
**Knowing Emotions of Others: A Cross-linguistic and Cross-cultural Study**

If you can say "I am sad", then you can also say "He is sad". We tend to think this is true of any language. But the famous phenomena in Japanese, called *person restriction*, give exceptions to such a principle, especially concerning predicates about the subjective feelings such as sensations and emotions. Thus, just by changing the grammatical subject of "watashi wa kanashii (I am sad)" into "kare (he)" is not enough to say that he is said, since the resultant sentence "kare wa kanashii" does not seem right to use in everyday conversations. This seems to suggest that the Japanese has some *linguistic* theory of mind, according to which you can know your own mental state directly, but other minds only indirectly, resulting in a weaker assumption of the ability of recognizing other minds. We therefore conducted a series of surveys to examine whether such linguistic difference is really reflected in people's assumption about the knowledge of other minds, or the recognition of emotion of others in particular, using native speakers of Japanese, English, and Chinese. There, we explicitly asked participants whether a person in a particular context *knows* the mind (emotion) of another person. What we found was that, language does not seem to directly affect the assumption of the recognition of emotion, but there are large differences between kinds of emotion (and sensation), like fear, desire, sadness, and pain, and such patterns vary significantly across cultures, in some cases with a huge effect size.

**Olivia Odoffin** (*Rutgers University*):  
**A Productivity Argument for Emotion**

Updated Abstract: A commonly observed feature of our emotional life is that the number of possible emotion states is infinite. What explains this observation? One plausible explanation is that emotions are compositional -- from a few limited emotion states we can generate the entire range of emotion states by composition, without limit. I argue that there is *prima facie* reason to think that complex emotions have compositional structure. To do this, I raise a productivity argument for emotion, similar to productivity arguments in favor of the compositionality of language. The result is to extend the domain of the compositional beyond language and cognition, providing further support for the claim that compositionality is a general feature of representational systems of mind.

**Jodie Valpied** (*University of Melbourne*):  
**Are Extraverts really Happier? Philosophical and Methodological Issues in the Study of Introversion-Extraversion and Positive Affect.**

*Thu 3:30-5:00 Room C*

Extraverted individuals are often cited in empirical research as possessing greater "positive affect" or happiness than introverted individuals, with this contributing to contemporary definitions of extraversion. This has often resulted in viewing extraversion as the healthier pole of the introversion-extraversion continuum. This has implications for how introverted personality

characteristics are valued and considered in research, practice and society, which in turn also affects the value given to tangible resources such as quiet spaces for reflection. This paper reviews the history of extraversion's theoretical link with positive affect, empirical findings regarding this relationship, and methodological issues that affect research in this area. It also considers philosophical and theoretical issues in defining positive affect, including hedonic versus eudaimonic approaches and circumplex models. A review of empirical research shows agentic extraversion is associated with highly activated states of positive affect (e.g. excitement), but not low activated states of positive affect (e.g. contentment). Numerous studies have also found relationships between extraversion and positive self-report bias in questionnaires on health and enjoyment. Further, some measures of extraversion have high content overlap with measures of positive affect, which may contribute to inflated associations between the two measures. Longitudinal studies show a relationship between eudaimonic well-being and introversion, rather than extraversion. Recent research also shows the importance of controlling for other personality factors, such as emotionality and openness to experience, when conducting research on introversion-extraversion. Introverted and extraverted personality styles represent complementary, adaptive ways of responding to the environment, both contributing to life happiness in different ways.

### Thursday 10:30-12:00 Room B

**Vicente Raja Galian** (*Western University*):

#### **Don't Trust the Body Snatchers! Predictive Processing and Dis-Embodied Cognitive Science**

In the last years, several voices from the embodied approach to cognition—specially from enactivism and ecological psychology—have considered Predictive Processing (Friston 2010) as their ally to offer a story about the role of the CNS in cognitive while staying true to the main tenets of embodiment (e.g., Anderson 2017, Bruineberg and Rietveld 2014, Clark 2015, Kirchhoff 2016, Kirchhoff 2017). According to them, Predictive Processing or, at least, some of its related concepts (the free-energy principle, predictive coding, and so on) constitute a good set of tools to integrate the activity of the CNS in an explanation of the embodied-embedded relation between organisms and their environment. I defend the opposite position. My main thesis is that even the most embodied-friendly interpretation of Predictive Processing violates three of the core tenets of most embodied approaches to cognition: (i) the rejection of computation, (ii) the de-localization of cognitive functions, and (iii) the centrality of action to understand cognition. These core tenets are especially relevant both for enactivism and ecological psychology. In this presentation, first, I will argue to support my main thesis. I will show that, as other cognitive architectures (e.g., ACT-R, SPA, ART, and so on), one based on Predictive Processing is completely incompatible with a radical embodied cognitive science. And second, I will offer a blueprint for an ecological cognitive architecture that would be actually compatible with the main tenets of embodied cognitive science and based on neural reuse and multi-scale dynamic systems (Raja 2018).

**Guilherme Sanches De Oliveira** (*University of Cincinnati*):

#### **Scientific Representation, Mental Representation, and Embodied Cognition**

Building models and simulations is a common scientific strategy for learning about real-world phenomena (Godfrey-Smith 2006). In recent decades, philosophers have put forward many different accounts of 'scientific representation' to explain exactly how and why models can advance scientific knowledge about the world. Yet, the philosophical debate about scientific

model-based representation has, by and large, proceeded in isolation from the debate about mental representation in psychology and cognitive science. This separation is detrimental to both debates. In this paper I sketch two independent accounts that show how recent views on embodied cognition can mitigate confusions about scientific representation. First, the 'weak embodiment account': targeting disagreements about whether scientific representation is reducible to mental representation (Boesch 2017; van Fraassen 2008; Callender and Cohen 2006), I draw from distributed and extended cognition (Hutchins 1995; Clark and Chalmers 1998) to propose that scientific models can be understood as external, socially-distributed, materially-extended mental representations. Second, the 'strong embodiment account': following anti-representationalist approaches to the mind (Chemero 2009; Gallagher 2017; Di Paolo, Buhrmann, Barandiaran 2017) I propose that scientific models are tools that facilitate embodied sense-making without having to 'represent' target phenomena. Both accounts are viable philosophical options that deserve more attention and, importantly, they demonstrate the relevance of the mental representation debate for philosophy of science. I conclude by suggesting that the converse is also true: having clarity about philosophical assumptions at play in modeling can also mitigate disagreement among cognitive scientists concerning what their own models and simulations reveal about real psychological phenomena.

**Martin Hartmann, Emily Carlson, Birgitta Burger and Petri Toiviainen** (*University of Jyväskylä*):  
**Music-induced Movement: Prediction of Perceived Similarity and Interaction Between Dyads**

We studied the relationship between music-induced movement and perceptual ratings of similarity and interaction of pairs dancing to music. We hypothesized that dancers' movements tend to be perceived as more similar when they mirror frequency and phase of movements, and as higher in interaction when they exhibit similar patterns of recurrence. 12 dyads were asked to move or dance freely to 2 pop pieces of 35 seconds. We collected optical motion capture data from their movements using retroreflective markers and a set of infrared cameras. Subsequently, we presented stick figure animations of the dyads to 33 participants and asked them to rate degree of interaction and movement similarity. Mean perceptual ratings were compared with two approaches for quantifying synchrony. Our first approach focused on multivariate phase locking via Canonical Correlation Analysis, whereas our second approach analyzed joint recurrence using nonlinear self-similarity matrices. For both approaches, we extracted marker velocities, reduced data dimensionality using Principal Component Analysis, and performed windowed correlation between dyads to obtain a mean synchrony measure. A systematic exploration showed that the first approach is a better predictor of perceived movement similarity ( $r = .69$ ), whereas the second approach yields optimal prediction for perceived interaction ( $r = .83$ ). Our results suggest a correspondence between perceived similarity and the presence of first-order kinematic isomorphism (between the dancers) on one hand and between interaction and second-order kinematic isomorphism on the other.

**Thursday 3:30-5:00 Room**

**Wayne Christensen** (*University of Warwick*):

**Meshed Cognitive and Automatic Control in Skilled Action**

One of the most striking and impressive human abilities is the capacity to respond rapidly and skillfully to complex, challenging situations. For instance, a cricket batsman adjusts to a surprising bounce and plays an unorthodox stroke that sends the ball through a gap in the fielders to the boundary. A jazz trumpeter improvises in continuous interplay with the drummer, each responding to and anticipating the other so closely that sometimes the drummer completes the trumpeter's phrases. Everyday skills like cooking a meal or driving a car are less spectacular but nevertheless can also involve a great deal of flexibility and context-sensitivity. These aspects of skill are not well understood. The most influential approach to skill proposes that it is largely automatic. In recent years the view that skill is largely automatic has been criticised by numerous authors. So far, however, the criticisms have been largely descriptive. But the systematic development of this view requires a critical examination of the rationales for skill automation employed by Fitts & Posner and Dreyfus & Dreyfus, and the construction of an alternative rationale that explains the persistence of cognitive control. I will argue that cognitive control is critical for skilled action because it enables highly flexible, context-sensitive responsiveness. I also explain how cognitive control can be sufficiently fast and flexible to contribute to fast-paced action.

**Angus McLachlan** (*Federation University*):

**The Ticklish Touch: Stimulus or Sign**

Attempts to explain tickling in terms of the raw sensations have foundered on the conundrum that light touches produce the most ticklish sensations, while robust poking and prodding are more likely to be associated with laughter. In an effort to resolve this issue an explanation of tickling will be offered that conceives it as a ritualised pattern of interaction in which the touch is relevant only as a sign within a social episode which will culminate in the recipient laughing. The meaning of the tickle can only be grasped within a suitable context that involves a familiar other who engages in tickling at an appropriate time and place. Most tickling episodes are marked by an element of domination in which the victim of tickling, apart from being touched, is also restrained. This conception of tickling is not equipped to embrace the findings of psychophysical research that a self-initiated touch induces less intense sensations than precisely the same form of touch delivered by someone or something other than the self. At the same time, it must be recognised that this psychophysical research has nothing to say about tickling as a form of interaction. Confirmation of the complete disjunction between research into "pure" sensation and tickling as a pleasurable episode can be found in the response of the neonate to a light touch on the sole of the foot: reflexive withdrawal accompanied by distress if the withdrawal is physically prevented.

**Markos Valaris** (*University of New South Wales*):

**Action Demonstratives and Knowledge of Action**

Discussion of demonstrative thought has focused almost exclusively on the case of perception. The central goal of this paper is to argue for another, and distinctive, type of demonstrative thought—namely, demonstrative thought about *actions*. More specifically, I propose that agents have an ability to individuate, keep track of, and think thoughts about their own ongoing actions

in a way that is neither descriptive, nor grounded in perception (including proprioception and kinesthesia). This view helps resolve a puzzle in recent work about action. It is widely acknowledged that agents often appear incapable of accurately reporting on the details of their own actions (Blomberg and Brozzo (2017); Brownstein (2014); Fournernet and Jeannerod (1998); Marcel (2003)). Most of us, for example, would be unable to give a detailed description of the movements of our hands and fingers in tying our shoelaces. And this can seem puzzling, since—intuitively, at least—knowing what you are doing seems to be a necessary condition for agency (Anscombe (1957)). If I don't know what my hands and fingers are doing, then in what sense are these really *my actions*? By developing an analogy with the more well-known case of perceptual demonstratives, I argue that this puzzle only arises if the knowledge agents have of their own actions is based on their grasping detailed descriptions of those actions. By contrast, if agents' thoughts about their own actions are demonstrative rather than descriptive, there need be no puzzle as to why agents are unable to give such descriptions.

**Christopher L. Hewitson and David Kaplan** (*Macquarie University*):

### **Motor Skill Acquisition often depends on a Combination of Implicit and Explicit Knowledge**

Despite recent enthusiasm for Bayesian and probabilistic approaches in cognitive science, the supporting evidence remains surprisingly limited. This is especially true in the context of sensorimotor learning. For example, although Körding and Wolpert (2004) demonstrated that humans can combine information about their own sensory uncertainty (the likelihood) and a statistical distribution of perturbations encountered in a visuomotor adaptation task (the prior) in a Bayes-optimal manner, many questions about Bayesian integration remain open at both behavioural and neural levels. In this talk, we describe recent experimental results that seek to expand the evidence base by probing the extent to which the integration of visual likelihood is learned during task performance and how the learned prior is encoded in the brain. To address the first question, we ran an experiment in which participants learned a distribution of visual perturbations, but no manipulation of visual uncertainty occurred during training. We then tested their ability to integrate visual likelihood and found that likelihood integration occurs extremely rapidly (within 5 trials), suggesting that task-based learning is not required. To address the second question, we tested whether the prior learned using one limb generalises to the opposite limb, and relatedly, whether this learning is represented in an extrinsic or intrinsic reference frame. We found that the learned prior is coded in extrinsic coordinates. These findings help us to better understand the nature of Bayesian integration during visuomotor learning and show how behavioural evidence can fruitfully constrain the space of possible underlying mechanisms.

**Friday 10:30-12:00 Room B**

**Kate Devitt** (*Queensland University of Technology*):

**Antagonising the Echo Chamber: Can a Social Network Counteract Cognitive Bias with Bayesian Rationality?**

Discussion forums (e.g. Reddit) and social media (e.g. Facebook) allow fast dissemination and analysis of ideas. However, because individuals curate content aligned to values and beliefs, forums can become echo chambers--existing beliefs are confirmed and disconfirming evidence ignored. Research in cognitive and motivational biases has shown that increasing the number and diversity of hypotheses considered can improve decision making. Bayesian rationality provides a normative framework for the treatment of evidence and alignment of belief. This presentation presents collaborative research between QUT and a global online travel agency (OTA) to generate, present and evaluate hypotheses in a new social platform to explicitly counteract cognitive bias and improve scientific organisational culture and strategic decision making. The platform links hypotheses 'posts' (pertinent to strategic business goals) to evidence 'comments' (e.g. news articles or technical updates). Users can vote hypotheses up or down producing a '*Degree of Belief (DoB)*' metric that indicates the likelihood a hypothesis is true given user belief in it. Individual items of evidence are evaluated by users--calibrated by outside experts--to produce a '*Weight of Evidence (Woe)*' metric. WoE takes both the *quantity* and *quality* of user interactions on the system into consideration, weighting evidence differently depending on context and purpose to reduce biases. Decision makers can then see if organisational belief in hypotheses aligns with evidence for or against them to make justified decisions. This presentation will present findings from using the platform for a global Hackathon including individual user behaviours and social decision making over time.

**Hoda Mostafavi** (*Macquarie University*):

**Person-reading: The Cultural Evolution of Social Cognition**

Evolutionary and philosophical accounts of social cognition have typically maintained that human interpersonal understanding is an individual accomplishment that is underpinned by an inherent capacity for mindreading. This is based on the view that social pressures in the ancestral environment selected for specialised internal mechanisms for representing the unobservable mental causes of behaviour. In this presentation, however, I argue that interpersonal understanding is primarily a product of cultural evolution. Following the literature in social psychology and recent pluralistic accounts of folk psychology, I show how we engage in various 'person-reading' practices based on culturally defined, social knowledge. While social knowledge has traditionally been characterised as internal knowledge structures known as cognitive schemas, I argue for a notion of schema as an embodied, dynamic and social process. I defend the person-reading account by providing it with an evolutionary and developmental platform. By adopting a more recent conceptual framework concerning evolutionary theory, I show how and why humans evolved as enculturated person-readers rather than native mindreaders. This is primarily because humans have evolved for the accumulation, maintenance and transmission of cultural traditions, knowledge and practices. As such, humans have become adaptively plastic, being able to respond flexibly to the complexities of social and physical environments. By following a sociocultural approach to development, I then show how children become enculturated person-readers. This developmental transition involves the use of symbolic

representational tools such as 'narrative schemas' that are acquired through scaffolded interactions in sociocultural activity.

**Linus Huang** (*Academia Sinica*):

### **Neurodemocracy: Self-Organization of the Embodied Mind**

How does the human mind emerge from distributed brain processes? Classical cognitive science posits central cognitive mechanisms to control and coordinate between perceptual and motor mechanisms. Proponents of embodied cognitive science, skeptical of the existence of central mechanisms, often assume that integrated sensorimotor processes can self-organize in the production of intelligent behaviors. While embodied cognitive scientists reject classical central mechanisms, they have not adequately addressed how self-organized control works. My paper will contribute to a better conceptual understanding of how self-organized control works. By analyzing the insights of recent neuroscientific models of decision-making and action-selection through the lens of formal social decision theory, I suggest that the basal ganglia, a set of subcortical structures, contribute to the production of coherent and intelligent behaviors through implementing "democratic" procedures". Unlike the classical architecture's central system, which is a micro-managing "neural commander-in-chief" constantly privy to all information and controlling other neural mechanisms with rich commands, the basal ganglia are a "central election commission". They delegate control of habitual behaviors to other distributed control mechanisms. Yet, when complex problems arise, the basal ganglia engage and determine the result on the basis of simple information (the votes) from across the system and the principles of Neuro-Democracy, as well as control other neural mechanisms with simple commands of inhibition and disinhibition. By actively managing and taking advantage of the wisdom-of-the-crowd effect, these democratic processes enhance the intelligence of the mind's final "collective" decisions.

**Mike Dacey** (*Bates College*):

### **Evidence against Default Models in Comparative Psychology**

Experiments in comparative psychology typically aim to test a default model against an alternative. This is often interpreted by analogy to null hypothesis statistical testing (NHST): the simpler model should be the default. For instance, Morgan's Canon dictates that researchers prefer models that posit the simplest processes. Morgan's Canon has faced considerable criticism lately, and the two proposed replacements set up the central tension of this paper. One replacement, *contextual null choice*, accepts the general default model framing while choosing nulls/defaults case by case. The other, *evidentialism*, rejects defaults altogether in favor of a more holistic inference to the best explanation. I argue for a version of evidentialism over the default model framing (even if one wishes to retain Morgan's Canon in a weaker form). The analogy between default models and NHST fails to respect the difference between statistical hypotheses and substantive hypotheses. Statistical hypotheses specify a distribution of a certain feature (the thing to be measured); substantive hypotheses are models that motivate the statistical hypotheses and, potentially, explain them. The inferential gap between statistical and substantive hypotheses looms large in comparative psychology, because in comparative work any model can be consistent with many possible specific experimental outcomes. In such cases, the failure of any statistical hypothesis does not entail the failure of any substantive hypothesis. I then argue that the default model framing distorts the weighting of evidence, and systematically biases experimental practices.

**Friday 3:30-5:00 Room A**

**Sophie Stammers** (*University of Birmingham*):

**Confabulation, the Stigma of Illness and Stories of Empowerment**

Confabulations are inaccurate reports, given sincerely, without the intention to deceive, present in some psychiatric conditions (Berios, 1998; Hirstein 2005), which carry various costs, as well as some benefits, for the confabulator (see Bortolotti 2017). Örvulv and Hydén (2006) argue that whilst confabulation enables patients to maintain a positive sense of identity, they do this at the cost of not accessing interpretive frameworks that would satisfactorily explain their situation. This raises a significant challenge in dementia care: caregivers who discourage confabulated storylines may help guide more effective action and reduce unfulfillable expectations, but they do so at the cost of reducing the patients' sense of identity and self-efficacy, significantly impacting wellbeing. In this paper, I reject the idea that it is only confabulators that lack access to interpretive frameworks which would satisfactorily explain their own situation: Bias and prejudice embedded in dominant societal narratives about mental health and old-age contribute to an over-simplistic view of psychiatric illness, and heighten the shame and disempowerment of care, compounding the provision of a satisfactory explanation from a general perspective. Responding to Örvulv and Hydén's challenge, therefore, requires replacing these narratives with less stigmatizing interpretations of illness, old-age and care, and providing alternative epistemic resources according to which, being in psychiatric care is a less shameful experience. This is, of course, a demanding task, and takes the onus for change beyond service providers and users. I discuss a number of strategies that may be more or less successful at making a positive impact.

**Lauren Olin** (*University of Missouri - St. Louis*):

**Mistaking Identities**

While violence in the context of mental illness is rare, individuals with delusions of misidentification (DMSs) are increasingly regarded as a sub-population of psychiatric patients that pose significant dangers towards those they know intimately. DMSs arise in a variety of psychiatric and neurologic illnesses, but are most common in Schizophrenias and neurodegenerative diseases like Alzheimer's and Parkinson's. The most familiar is Capgras Syndrome, in which someone or something of close personal significance is misidentified as an imposter or fake. But the category is increasingly inclusive, congealing thematically around the idea that the self or another familiar person, place, object, or creature has been duplicated or transformed. This talk first presents a range of actual cases in which individuals with DMSs have harmed close others, and argues that they problematize the widely held view that the mere presence of delusional beliefs is both demonstrative of criminal insanity, and responsibility mitigating. It then argues that considering cases of violence in the context of DMSs make salient three dimensions of moral and epistemic responsibility for delusional beliefs and the actions they motivate: (1) the contents of the delusional misidentifications, (2) the coherence of actions motivated by the delusional misidentifications, and (3) the extent to which individuals with DMSs can be said to have control over the contents of their beliefs and attitudes. I'll conclude with the suggestion that good theories about responsibility for violence in the context of DMSs will necessarily implicate good theories about the genesis and maintenance of delusional misidentifications more generally.

**Quinn Gibson** (*New York University, Shanghai*):  
**Monothematic Delusions: An Expressivist Two-factor Account**

According to the two-factor model of monothematic delusion (Davies et al. 2001), monothematic delusions (such as Capgras and Cotard delusions) are the result of both an aberrative experience and a selective breakdown in rationality. As Coltheart (2007) has argued, disordered experience alone is insufficient to account for delusional belief, since one can find non-delusional subjects who have the very same kind of aberrative experience as delusional subjects. However, how best to understand the relation between the aberrative experience and the delusion is controversial. Explanationists (Coltheart, Menzies, & Sutton 2010) hold that delusional beliefs are attempted explanations of aberrative experiences, or of their contents (Bayne & Pacherie 2004). Endorsement theorists hold that delusions are endorsements of the contents of aberrative experiences, viz., that the subject is credulously taking at face value an experience with the delusional content. However, both accounts face difficulties. The explanationist account over-rationalizes delusion formation: delusional hypotheses are not even *prima facie* plausible explanations of the experiences that underlie them. And the endorsement account relies on a tendentious and implausible epistemology of perception according to which there are perceptual experiences with such highly determinate contents as my wife has been replaced by an impostor. In response to these worries, we develop what we call an expressivist two-factor account. According to our account, delusional beliefs are quasi-rational but imprecise expressions of what is distressing about the delusional subject's abnormal experience. Such experiences are such that, for example, it is as if one's wife has been replaced by an impostor. However, owing to the second factor, delusional subjects mistake this metaphorical characterization of the experience for the literal truth. The result is a doxastic state with highly specific content that the subject then 'doubles down' on over time, making her credence in it more fixed and rigid.

**Katya Numbers** (*Centre for Healthy Brain Ageing, University of New South Wales*):  
**Mine or Yours? Responsibility and Remembering in Strangers and Romantic Couples.**

Transactive Memory Theory proposes that individuals in ongoing relationships develop a distributed memory system, such that they coordinate and divide responsibility for the encoding, storage, and retrieval of information from different domains according to their implicitly shared knowledge of each other. However, despite their proposed benefits, little research has examined the features and parameters of transactive memory systems in couples. In the current research, we examined how patterns of common and divided responsibility impacted whether information was remembered individually and jointly. In the present experiment, participants were grouped into pairs, and they participated as either: (1) intimate couples; (2) pairs of strangers; and (3) individuals paired with a partner who was tested separately. Individuals within each pair were assigned some overlapping and some distinct responsibility for remembering categories of words within a long list: some words were the responsibility of both individuals, some fell only in the domain of one partner or the other partner, and some were the responsibility of neither. Participants then received instructions to recall as many words as possible from the original list, irrespective of the responsibility instructions. We examined the role of the responsibility instructions on participants' recall of "own", "partner", "both" or "neither" items across 3 recall occasions, including both individual and joint recall, and whether this was moderated by participants' relationship, and knowledge of, or subjective impressions of, their partner's memory ability. These results provide insight into how patterns of shared and distinct responsibility in transactive memory systems can benefit memory performance.

## Poster Abstracts

Wednesday 18:15-11:00

**1. Kristy Armitage, Adam Bulley, and Jonathan Redshaw (University of Queensland):  
Developing an Extended Mind: Do Children use Physical Action to Reduce Cognitive Demand?**

Humans often physically modify the environment to increase the efficiency of our thinking, blurring the distinction between the mind and the external world. Although many philosophers accept the existence of this 'extended mind', the role of physical action in reducing cognitive load has seldom been studied empirically. Our project aims to examine the development of children's capacity to take physical action to reduce cognitive demand in tasks that would otherwise be solved using mental rotation. Children aged between 4 and 11 are presented with stimulus sheets on a rotatable turntable. Each stimulus sheet shows 16 stick figures that vary on two dimensions: (1) they have either a blue or red face, and (2) their arms are either pointed up or down. Sheets are presented with the stick figures in either an upright or inverted orientation, and children are asked to count either the blue figures, or the figures with arms up. They are instructed to count as quickly as possible and, critically, are given permission to rotate the turntable if they wish. Although counting arms is more cognitively demanding when the figures are inverted than when they are upright, counting blue faces is equally easy in both orientations. As a result, strategic cognitive offloading would be evident in children who only rotate the turntable in the inverted arms condition. Preliminary observations suggest that older children are more likely to demonstrate this behaviour than younger children. Our findings will be discussed in the context of the developing extended mind.

**2. Eran Asoulin (Macquarie University):  
Visual Illusions and Grammatical Illusions: Two Windows into the Mind**

Richard Gregory argues that visual illusions (like the Penrose Triangle or the Cafe Wall illusion) are useful for investigating the normally hidden processes of the visual system. Since many visual illusions are physically impossible, they help in isolating perceptual phenomena (the cognitive processes in the mind) from physical phenomena, thus aiding the study of the cognitive mechanisms of perception. Visual knowledge, which is implicit and allows for unconscious inferences, comes in two forms: specific knowledge of particular objects and kinds of objects, and general rules applying to almost all objects. Gregory argues that visual illusions are caused by the visual system being led astray by inappropriate or misapplied visual knowledge, and thus the study of visual illusions sheds light not only on visual knowledge but also on the underlying cognitive mechanisms of perception. I argue that the same is true in the much more recent work into grammatical illusions, most notably by Colin Phillips and his colleagues. The burgeoning research into grammatical illusions can play the same role that visual illusions play in helping us uncover the underlying mechanisms of human cognition. Grammatical illusions include comparative illusions (*More people have been to Russia than I have*) and illusions of subject-verb agreement (*The key to the cabinets are on the table*). Such sentences are judged as acceptable but are in fact a case in which language comprehension has been led astray by inappropriate or misapplied linguistic

knowledge. Thus, the study of grammatical illusions sheds light not only on linguistic knowledge but also on the underlying cognitive mechanisms of language.

**3. Mindaugas Briedis** (*Mykolas Romeris University*):

**Phenomenological Ethnography of Radiology: Enactive and Intersubjective Aspects**

This paper presents results of a field research conducted at one of the departments of radiology (BAFF research grant). It consists of two parts. The first part presents “enactive proofs” – observations and analysis of the externalization of radiologist memory through enaction of medical imaging and image consciousness. Meaningful organization of space and time (desk, screens, room) prepares for enaction which unfolds via “switching patterns” (prior to “categorical patterns” and “visual patterns”). The structure of image consciousness, in turn, tells us something about the enactive possibilities for switching of apprehensions between physical image substrate, image object and image content. Contents of radiologist memory then is not representational and externalization is not inferential, but rests on the sedimentation and enaction of categorical impressions. The second part is concerned with intersubjective ground for individual intentions and enactive sustenance of communication oscillating between individual enactive cognition and social, professional and even institutional responsibility. The externalization of professional memory via image consciousness functions in the community of radiologists, be it individual reading sessions, group meetings or teaching-learning environment in general. On the other hand, intersubjective relations in radiology praxis encompass not only medical personnel – experienced and novice radiologists, surgeons, clinicians and technicians, but also manufacturers of imaging technologies, medical scientists responsible for diagnostic normativity and even health care politicians. Then through the prism of intersubjective embodied cognition we can raise anew some phenomenologically and socially crucial questions, for example, “how something new comes into experience and/or praxis?”.

**4. Andrew Frain** (*Australian National University*):

**Exposing and Correcting the Epistemology of Applied Behavioural Economics in Australia**

The field of behavioural economics has growing sway across business and government, including the Australian Federal Government. An increasing number of Commonwealth departments have invested in dedicated behavioural economics teams, where the stated goal of those teams is generally to a) assist with the application of social science methods to policy development and evaluation, and b) to incorporate “behavioural insights” into the policy development process. These behavioural insights are generally drawn from a certain stream of social psychology; one that is generally focused on systematic error in human decision making (i.e. cognitive biases). This stream of social psychology has long been critiqued as being unjustifiably individualistic in its epistemological foundations. More recently, concerns have also been raised as to the impact of that individualism in government approaches to social change and wellbeing. The present talk seeks to bring to light the individualistic intellectual heritage of modern applied behavioural economics, including the practical implications of that heritage. The talk then turns to alternatives. Specifically, we explore the possibility of a behavioural economics that is not bounded by individualism and instead embraces a more fully *social* understanding of knowledge,

perception, and human decision making. On this basis we introduce the prospect of a more philosophically balanced flavour of behavioural economics.

**5. Irimi Giannopulu and Damian Cox (*Bond University*):  
The Philosophy of Enrobotment**

This paper is a philosophical examination of the concept of enrobotment. When we succeed in treating an object as a robot, we treat the object as a centre of independent agency, something that has putative motives and reasons. We also treat it as a routine-driven and limited agent. Enrobotment names the process of assuming this position with respect to another. We can enrobot a machine, a toy, another person, ourselves. Enrobotment is an encounter between a "self" and an "other." Fundamental to the concept or enrobotment is that of the shadow. Every complex and adaptive object has a shadow: persons have shadows; robots have shadows. A shadow is the elusive character of an object, the aspect of it that is not transparent to observers and which remains mysterious to them. When a child, for example, plays with a toy robot as a robot, she encounters something which is not wholly transparent and explicable to her. Something of the robot – what it does, why it does it, what it means – eludes her internal representations of the object. When we enrobot ourselves, we understand ourselves as routine-driven responders to environmental stimuli. But we possess a shadow and so our enrobotment, no matter how extreme, does not make us transparent to ourselves. The paper seeks to clarify these ideas and show how they help us understand the nature of the interaction between people and artificial centres of agency.

**6. Alexander Gillett, McArthur Mingon, and Graham Thomas (*Macquarie University*):  
Homebound: 'Feeling at Home' in the Affective Niche**

Humans live in a heterogeneous variety of different environments. Not only does our species survive and thrive in the tundra, deserts, jungles, and cities; but we make our homes here and feel a deep sense of belonging. The neuroanthropologist John Allen (2015) has argued that the sense of 'feeling at home' is a crucial aspect of human cognitive evolution. He defines this as comprising three main points: [1] homeostasis; [2] rest and relaxation; and [3] empathy/social-synchrony. We argue that although Allen's account is useful, it is only part of the explanatory story. Drawing on recent theoretical and empirical contributions in the cognitive sciences and philosophy, we outline a deeper account of how the experience of feeling at home is produced by *affective niche constructing activities* – and how this can be explained in more detail using a distributed affectivity approach (Columbetti & Krueger 2015; Sutton 2018). In particular, we focus on the way in which humans learn and use cultural practices to [1] engage in emotional regulation and [2] alter and augment our experience of feeling at home. We highlight how our model captures both individual and cultural variability of this rich sense of situated belonging, and the many ways in which human beings come to think of the various spatial environments they inhabit as 'home'.

**7. Stephen Hill** (*Massey University*):

**Foraging for Memories: Towards a Simple Paradigm for Exploring Distributed Memory Processes**

Distributed/embedded cognition theories claim that the outcomes (and the processes used to arrive at those outcomes) of cognitive activity are often strongly dependent upon the resources available in the local environment and the ways in which those resources are used by cognizers. Indeed, it has been argued by some that, at least some, cognitive processes involve extra-neural and extra-bodily resources and thus these processes cannot be simply individuated by what goes on in the brain; cognitive capacities, such memory, are enabled by distributed, softly assembled mechanisms not just neural circuits. If this is the case a proper understanding of cognition must include a sophisticated treatment of the role of the environment. Yet, experiments typically do not allow participants to make much use of (manipulate, move about in, alter) the environments in which cognitive activity occurs. The existence (and use of) environmental resources are rarely explicitly mentioned. In order to begin to rectify this oversight we have recently developed a simple 'shopping task' memory paradigm where we track how variations in both the encoding/learning environment and the retrieval environment not only affect memory performance but also the deployment of environment-modifying memory strategies. We present some early findings and discuss how reconceptualising memory as involving the assembly of transient extended cognitive systems has forced us to explore novel variables such the rate of information of gain, patch switching, and useability constraints.

**8. Antonios Kaldas** (*Macquarie University*):

**Pulling Attention Apart from Consciousness**

In recent years, there has been an ongoing debate over whether attention is necessary and sufficient for conscious. I apply two novel approaches to this question. First, I consider the natures and quantitative limits of the capacities of both attention and consciousness, teasing apart significant differences and their implications. Second, I consider the role of working memory in this debate, particularly in relation to whether content stored in working memory is a duplicate of content stored elsewhere, or whether working memory content is just activated content from elsewhere, and the implications for the question of the relationship between attention and consciousness. Interesting test cases, such as gist perception, visual iconic memory, and two-point tactile discrimination help to bring out the devil in the detail of these issues. I conclude that there may be more than one answer to the question of whether attention is necessary and sufficient for consciousness, depending on the kind of attention and the kind of consciousness you are interested in.

**9. Nicholas Lee** (*University of Southern Queensland*):

**Redefining Migration: A Phenomenological Perspective**

The phenomenon of migration is often defined in positivistic, spatio-temporal terms. It will here be argued that such a definition is problematic. By referring to those sections of Martin Heidegger's *Being and Time* that outline the human characteristic of experiencing the present in light of one's future projections, an alternative, phenomenological definition of migration will be proposed: *Migration is the experiencing of the world as foreign with the*

*framing projection that one will remain permanently within that world.* It is suggested that in order to define the essential features of "migration", broadly understood, one must define it from the phenomenological or first-person standpoint. It will also be demonstrated that the definition provided acts as a useful umbrella term, under which one may accommodate different "species" of migration. Finally, the phenomenological definition of migration will be defended against the charge that its movement away from objectively measurable, spatio-temporal criteria reduces migration to little more than a metaphor.

**10. Fernando Marmolejo-Ramos** (*University of Adelaide*):

#### **Embodied Concept Mapping: Blending Structure-mapping and Embodiment Theories**

Metaphors are cognitive and linguistic tools that allow reasoning. They enable the understanding of abstract domains via elements borrowed from concrete ones. The underlying mechanism in metaphorical mapping is the manipulation of concepts. This article proposes another view on what concepts are and their role in metaphor and reasoning. That is, based on current neuroscientific and behavioural evidence, it is argued that concepts are grounded in perceptual and motor experience with physical and social environments. This definition of concepts is then embedded in the structure-mapping theory (SMT), a model for metaphorical processing and reasoning. The blended view of structure-mapping and embodied cognition offers an insight into the processes through which the target domain of a metaphor is embodied or realised in terms of its base domain. The implications of the proposed embodied SMT model are then discussed and future topics of investigation are outlined.

**11. Thomas McCarthy** (*University of Queensland*):

#### **The Early Development of Future-Directed Epistemic Actions**

The extended mind hypothesis states that the barrier between our mind and the external world is malleable. Epistemic actions, which alter the environment to aid and augment cognitive processes, play a crucial role in the extended mind. Epistemic actions can have effects in the present, or can be performed to alleviate cognitive demands in the future. One example of a future-directed epistemic action is external reminder setting, whereby an individual modifies the environment in order to improve future memory performance. Adult humans, for instance, often set alarms, create to-do lists, and otherwise mark the environment to remind our future selves to perform particular actions. To date, however, no research has been conducted into the development of spontaneous reminder setting in children. In our novel paradigm, children aged 4 to 11 years watch an experimenter hide a number of targets in a field of 25 opaque cups. Children are told that they must wait 30 seconds before searching for the hidden targets, and during the wait they are asked to hold onto a pen (which they have previously used to draw on the cups in another context). We measure whether children spontaneously use the pen to mark the target cups during the waiting period, thus engaging in future-directed epistemic action. Results will be discussed in the context of the extended mind hypothesis and previous research on metacognitive development.

**12. Karen Murphy and Olivia Creux (*Griffith University*):**  
**Is there a link between Media-Multitasking, Working Memory and Response Inhibition Performance?**

Media multitasking is defined as using multiple forms of media or devices simultaneously. Thus, media multitasking relies on executive functions for successful task performance. The aim of this study was to examine the link between media multitasking, and the executive functions of working memory and response inhibition. Participants completed the Digit Ordering Task (working memory), a Spatial Stroop Task (response inhibition) and a Go-No-Go task (involving both working memory and response inhibition). Higher media multitasking scores were associated with better working memory scores and more efficient performance on the Go-No-Go task. Response inhibition (performance on the No-Go trials of the Go-No-Go task) was not related to media multitasking behaviour. Higher levels of media multitasking were associated with poorer accuracy on the Spatial Stroop task, indicating poorer response inhibition for those who frequently media multitask. The Spatial Stroop task used locational arrows and the Digit Ordering and the Go-No-Go tasks used alphanumeric characters as stimuli. Hence, it is possible that the superior performance for high media multitaskers in the Digit Ordering and the Go-No-Go tasks arise from participants' training (media multitasking) with these types of stimuli. That is, the more efficient operation of these executive functions by those who engage in more media multitasking might be linked to the frequency with which they encounter this type of information during media multitasking.

**13. Ross Pain (*Australian National University*):**  
**Representationalism, 4E Cognition, and the Predictive Brain**

There have been a number of recent attempts at developing philosophical interpretations of predictive processing accounts of cognition. One issue these attempts seek to address is whether or not the predictive processing story is consistent with extended, enactive, embedded and embodied theories of cognition, or whether it is better suited to representational interpretations. The purpose of this paper is to explore this issue. I develop three positions that have been advocated respectively by Hohwy (2013, 2016, 2017), Clark (2013, 2015a, 2015b, 2016a, 2016b, 2017) and Hutto (2017), which I call strong cognitivism, weak cognitivism, and non-cognitivism. Strong cognitivists claim that cognition: (i) is bounded by states of the brain, sensory receptors and spinal cord; and (ii) involves representational models that encode information about the world. Weak cognitivists reject (i), but retain (ii). Non-cognitivists reject both (i) and (ii). I compare and contrast these views, and examine their key points of difference.

**14. Hannah Rapaport Nick Benikos, Wei He, Elizabeth Pellicano and Paul Sowman**  
*(Macquarie University):*  
**The Development of Predictive Coding in Preschool Children**

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 will use Magnetoencephalography (MEG) to measure brain function in 3 to 6 year-olds. Specifically, we will investigate the development

of predictive coding: how the brain uses previous experience to generate predictions about future events. Participants will listen to a 15-minute sequence of tones, which vary in their predictability and thus elicit different brain responses. This research will contribute to our understanding of early brain development and will also serve as an important baseline for studying predictive coding in neurodevelopmental conditions, such as autism.

**15. Geoffrey Roche:**

**Of Crustaceans and Corydrane: On the Neurochemical Substratum of Sartre's Philosophical Practice**

In February 1935, Jean-Paul Sartre took up an invitation from psychiatrist Daniel Lagache to participate in an experiment using the classic psychedelic drug mescaline. Sartre subsequently experienced a prolonged state of drug-induced delirium, and for decades later experienced vivid hallucinations of a lobster accompanying him wherever he went. In later life Sartre was also an enthusiastic user of amphetamines to stimulate his writing, consuming large amounts of the over-the-counter preparation Corydrane.

While Sartre's drug use is well known, to date few critics have seriously suggested a substantial relationship with his philosophical work. Carole Haynes Curtis has argued that Sartre's first mescaline experience had a profound impact on both Sartre's novel *Nausea*, and on his lugubrious assessment of the nature of Being. In response, Thomas Smith dismisses Haynes-Curtis's argument, arguing that Sartre did not need a drug experience to arrive at his conclusions, suggesting that anxiety and depression were sufficient stimulation for his thought.

In this paper I defend Haynes-Curtis's position, and proceed to address serious epistemic and ontological problems with Sartre's philosophy of mind; problems that, are, ironically, well illustrated by the very intoxications that inspired his thinking. I argue for the following two claims: firstly, that his account of the nauseating nature of Being suggest mescaline induced revelation (or rather pseudo-revelation), rather than the final output of cogent philosophical analysis; secondly, what mescaline and amphetamines did to Sartre (classic amphetamine abuse symptomatology, lifelong hallucinations) ought to be impossible were his dualist philosophy of mind a sound model.

**16. Lyn Tieu (Western Sydney University/Macquarie University), Nichola Shelton (Western Sydney University) and Alexandre Cremers, (University of Amsterdam):**

**Asymmetries in Children's Understanding of Modified Numeral Quantifiers**

Few studies have examined the emergence of modified numeral quantifiers such as *at least two* and *more than two* in child language. According to Geurts & Nouwen (2007), superlative quantifiers (*at least n*, *at most n*) have a richer semantics involving modality, and should therefore be acquired later than comparative quantifiers (*more than n*, *less than n*). In addition, downward-entailing quantifiers (*less than n*, *at most n*) are expected to be harder than upward-entailing quantifiers (*more than n*, *at least n*) (Guerts 2003). Previous acquisition studies report that 5-year-old children perform at chance on superlative quantifiers (Musolino 2004) and that 11-year-olds are still in the process of mastering the superlative quantifier *at most two* (Geurts et al. 2010). We designed and conducted two Covered Box Task experiments (Huang et al. 2013) to test participants' understanding of the modified numeral quantifiers *exactly two*, *less than two*, *more than two*, *at least two*, and *at most two*.

The two experiments, involving 49 4-year-old children and 50 adult native speakers of English, reveal that some 4-year-olds in fact already demonstrate adult-like understanding of the superlative quantifier *at least n*, and that even in this younger age range, asymmetries in the understanding of modified numeral quantifiers (comparative vs. superlative, upward-entailing vs. downward-entailing) (Geurts et al. 2010) are already emerging. Such findings indicate the need for a theory that can capture such basic distinctions.

**17. Christopher Whyte** (*Macquarie University*):

**Integrating the Global Neuronal Workspace into a Predictive Processing Framework: Towards a Working Hypothesis**

Hohwy (2013) proposed an account of conscious access that integrates the global neuronal workspace into the framework of predictive processing, a view that I term the predictive global neuronal workspace (PGNW). While promising, Hohwy's PGNW is empirically underdeveloped and theoretically underexplored. The aim of this poster is to advance three lines of argument in support of the PGNW. The first places the PGNW in close contact with experimental work and cashes out a set of empirical predictions. The second defends the PGNW against King and colleagues (2014) who argue that conscious processing is beyond the purview of prediction error minimisation. The third contrasts the PGNW with an alternative approach to the integration of global workspace theory and predictive processing proposed by Chanes and Barrett (2016). Ultimately, I argue that the PGNW has more empirical support.

**18. Mateusz Wozniak** (*Monash University*):

**The Structure of the Self in Predictive Processing and Free Energy Theories of the Mind**

Predictive processing (PP), especially in its version involving free energy principle, has recently become the dominant framework used to explain the self in cognitive science. However, a closer inspection of theories in this field shows that while they agree on the general picture of how the mind works, they also significantly diverge, making many of them incompatible with each other. I want to make a case for two points, which should help clarify the field of predictive processing theories of the self. First, that all of these theories explain the self at the level of the representational structure. As a consequence, also the PP theories attempting to explain the self as a specific experience (e.g. sense of self, self-consciousness) fundamentally rely on theoretical choices regarding the representational level. Second, that the crucial point of disagreement between various PP theories of the self, which is however only implicitly present in the literature, is about the structure of the representational self. I will argue that recent PP accounts of the self can be classified into two categories: the ones which envisage the self as a single hidden cause, and others which propose the self as a hierarchical structure of causes. I will discuss pros and cons of these two approaches, and propose an alternative account, which combines strengths of both of these approaches, while avoiding their pitfalls.