icon

12th International Conference on Cognitive Neuroscience




CONFERENCE HANDBOOK

Sunday 27 - Thursday 31 July 2014
Brisbane Convention and Exhibition Centre
Brisbane Australia

www.icon2014.org

River Quay precinct, South Bank

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WELCOME

Welcome to the 12th International Conference on Cognitive Neuroscience 2014 being held for the first time in Australia. The Australian Cognitive Neuroscience Society (ACNS) is very pleased to be hosting the ICON Conference this year and we are delighted to welcome you to Brisbane, Australia.

The ICON 2014 Conference brings together researchers from diverse backgrounds, all with a focus on the relationships between the brain, mind, and behaviour.

We have an exciting speaking programme with nine Keynote Speakers and over 90 presenters in our Symposium Programme covering a broad range of topics in Cognitive Neuroscience.

With more than 550 people attending, we hope this conference will stimulate new collaborations and open new horizons.

Thank you to all those presenting their work in keynote lectures, symposia, oral or poster presentations – you all are playing a valuable part in the success of the Conference.

Events such as this are not possible without the support of key sponsors and exhibitors. We encourage you to visit the exhibition booths and support our supporters.

Enjoy all that Brisbane has to offer by exploring South Bank during the lunch breaks, as well as attending the social events designed to showcase Brisbane's best.

Associate Professor Ross Cunnington
University of Queensland
ICON 2014 Co-Chair
ACNS Past-President

Associate Professor Frini Karayanidis
University of Newcastle
ICON 2014 Co-Chair
ACNS Treasurer

CONTENTS

CONFERENCE ORGANISERS

BEFORE AND AFTER CONFERENCE:

ICON 2014 Conference
c/- Absolute Events & Marketing
PO Box 584
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Absolute Events & Marketing
EXCEEDING EXPECTATIONS

Phone: + 61 7 3848 0089, 0404 488 910 or 0450 006 224
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For information and assistance at any time during the Conference, please see the Absolute Events & Marketing staff at the Registration Desk or any of the volunteers (who are easily identifiable in ICON 2014 brain shirts).

DURING CONFERENCE:

Onsite Registration Desk
Plaza Auditorium Foyer
Brisbane Convention & Exhibition Centre
Grey Street
SOUTH BANK QLD 4101

Phone: 0450 006 224 or 0474 656 558 – General Enquiries
0404 488 910 – Susan Harris, Conference Manager
Fax: 07 3112 3900

DISCLAIMER
Information in this brochure is correct at the time of printing. The Conference Organisers reserve the right to alter details as needed.

CONFERENCE COMMITTEES

ORGANISING COMMITTEE

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Olivia Carter, Melbourne University, Australia
Paul Corballis, Auckland University, New Zealand
Pat Michie, University of Newcastle, Australia
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Robert Hester, University of Melbourne, Australia
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PROGRAMME
SUNDAY 27 JULY 2014

SUNDAY 27 JULY 2014	
2.00pm – 7.30pm	Registration Desk Open
CONFERENCE OPENING AND PLENARY SESSION	
5.30pm – 6.00pm	Plaza Auditorium – **Chair:** Ross Cunnington
	OFFICIAL OPENING **Associate Professor Ross Cunnington**, The University of Queensland, Australia
6.00pm – 7.00pm	**KEYNOTE LECTURE 1** ***Eye Movements And Visual Stability*** **Professor Jason Mattingley**, The University of Queensland, Australia *Supported by* CAMBRIDGE RESEARCH SYSTEMS
7.00pm – 8.30pm	**Welcome Reception**

This Conference Programme is correct at the time of printing, however, the Organising Committee reserves the right to alter the Programme if necessary.

PROGRAMME
MONDAY 28 JULY 2014

MONDAY 28 JULY 2014				
8.00am	Registration Desk Open			
PLENARY SESSION				
9.00am – 10.00am	Plaza Auditorium – **Chair:** Blake Johnstone			
	KEYNOTE LECTURE 2 ***Towards A Personalized Cognitive Neuroscience: The Myconnectome Project*** **Professor Russell A Poldrack**, University of Texas at Austin, USA			*Supported by* ccd ARC CENTRE OF EXCELLENCE IN COGNITION AND ITS DISORDERS
10.00am – 10.30am	**Morning Tea with Exhibitors**			*Supported by* BESA
CONCURRENT SESSIONS				
	S01 - Frontal-Striatal Interaction In Reward-Guided Decision Making	**S02 - Multi-Frequency Brain Network Dynamics In Human Memory**	**S03 - Implications Of Age-Related Cerebrovascular Changes On Brain Structure And Function**	**OP1 - Methods Development**
	Plaza Auditorium	Room P6	Room P7	Room P8
	Chair: Matthew Rushworth	**Chair:** Brett Foster	**Chair:** Monica Fabiani	**Chair:** Paul Corballis
10.30am – 10.50am	***Making Decisions Between Multiple Options*** **Matthew Rushworth**, University of Oxford, UK (SO1 001)	***A Graph Theory Approach To Human Episodic Memory: Outlining The Spectrotemporal Basis Of Episodic Memory Retrieval*** **Arne Ekstrom**, University of California Davis, USA (SO2 001)	***Cerebrovascular Influences On Cognitive And Brain Aging*** **Monica Fabiani**, University of Illinois at Urbana-Champaign, USA (SO3 001)	***The Contribution of TMS-EEG Coregistration in the Exploration of the Human Connectome*** **Carlo Miniussi**, IRCCS Centro San Giovanni di Dio Fatebenefratelli, Italy (OP1 001)
10.50am – 11.10am	***Dysexecutive Syndrome: The Cortical- And Thalamo-Striatal Pathways And Disorders Of Goal-Directed Action*** **Bernard Balleine**, University of Sydney, Australia (SO1 002)	***Oscillatory Dynamics Of The Medial And Lateral Parietal Lobe During Episodic Retrieval And Resting-State*** **Brett Foster**, Stanford University, USA (SO2 002)	***Imaging Associates of Post-Stroke Depression: A Longitudinal Cohort Study*** **Leeanne Carey**, Florey Institute of Neuroscience and Mental Health, Australia (SO3 002)	***Exploring The Topology Of Network Convergence: Integration And Segregation In The Human Connectome*** **Peter Bell**, Brain and Mind Research Institute, Australia (OP1 002)
11.10am – 11.30am	***Learning From Errors: The Role Of The Dorsal Cingulate In Feedback-Based Adaptive Behaviour*** **Rob Hester**, University of Melbourne, Australia (SO1 003)	***Oscillatory Memory Signals In The Hippocampus During Encoding, Retrieval And Sleep*** **Bernhard Staresina**, Cambridge University, UK (SO2 003)	***Interrelationships Among Self-Reported Orthostatic Hypotension, Cognitive Decline, White Matter Hyperintensities In An 8-Year Longitudinal Study Of A Young-Old Cohort*** **Kaarin Anstey**, Australian National University, Australia (SO3 003)	***Tracking Brain Plasticity in Cochlear Implant Patients Using the Event-Related Optical Signal (EROS)*** **Chun-Yu Tse**, The Chinese University of Hong Kong, Hong Kong (OP1 003)
11.30am – 11.50am	***Active Mechanisms of Learning And Decision-Making*** **Rei Akaishi**, Tokyo Metropolitan Institute of Medical Science, Japan (SO1 004)	**11.30am – 11.40am** **Q&A**	***The Role Of Arterial Pulsatility And White Matter Microstructure In Age-Related Cognitive Decline*** **Todd Jolly**, University of Newcastle, Australia (SO3 004)	***Analysis Of EEG/MEG Map Topographies And Source Distributions On The Epoch Level Using Non-Parametric Randomization Tests*** **Michael Wagner**, Compumedics, Germany (OP1 004)
11.50am – 12.00pm	**Q&A**		**Q&A**	**Q&A**
12.00pm – 1.00pm	**Lunch at Leisure**			

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PROGRAMME
MONDAY 28 JULY 2014

MONDAY 28 JULY 2014				
CONCURRENT SESSIONS				
	S04 - The Role of Brain Oscillations in Perception, Attention, and Memory	**S05 - Neural Indices Of Primitive Intelligence: From The Midbrain To Cortex**	**S06 - Cross-Modal Integration And Plasticity Of Sensory Systems In The Normal And Peripherally Deprived Brain**	**D01 - Translational Cognitive Neuroscience: Understanding Attention And Multitasking On The Roadway**
	Plaza Auditorium	Room P6	Room P7	Room P8
	Chair: Simon Hanslmayr	**Co-Chairs:** Pat Michie & Manuel Malmierca	**Chair:** Franco Lepore	**Chair:** David Strayer
1.00pm – 1.20pm	***Decreased Beta Power As A Predictor of Memory Encoding*** **Simon Hanslmayr**, University of Birmingham, UK (S04 001)	***Stimulus-Specific Adaptation In The Subcortical Auditory Brain*** **Manuel S. Malmierca**, University of Salamanca, Spain (S05 001)	***Cross-Modal Compensation And Plasticity In The Blind And Deaf : These Two Modalities Do Not Always Show Similar Outcomes*** **Franco Lepore**, University of Montréal, Canada (S06 001)	**David Strayer**, University of Utah, USA (D01 001) **Paul Atchley**, University of Kansas, USA (D01 002) **Jason McCarley**, Flinders University, Australia (D01 003)
1.20pm – 1.40pm	***Pre-Stimulus Oscillations Determine Conscious Access In The Attentional Blink Task*** **Denes Szucs**, University of Cambridge, UK (S04 002)	***Early Occurrence Of Auditory Change Detection In The Human Brain*** **Sabine Grimm**, University of Leipzig, Germany (S05 002)	***Surface Vs Structural Properties Of Multisensory Object Representations*** **Krish Sathian**, Emory University, USA (S06 002)	
1.40pm – 2.00pm	***Oscillatory Brain States and Variability in Visual Short-Term Memory*** **Nicholas Myers**, University of Oxford, UK (S04 003)	***Mismatch Responses To Frequency Deviants In The Surface EEG Of Awake, Freely Moving Rats: A Platform For Examining Pharmacological And Developmental Animal Models Of Schizophrenia*** **Lauren Harms**, University of Newcastle, Australia (S05 003)	***Enhanced Visual Cognition In The Congenitally Deaf*** **Stephen G. Lomber**, University of Western Ontario, Canada (S06 003)	
2.00pm – 2.20pm	***Alpha and Beta Entrainment Affects Simple and Complex Perception*** **Simon Hanslamyr**, University of Birmingham, UK (S04 004)	***Primitive Intelligence Of The Human Brain As Indexed By The Mismatch Negativity (MMN)*** **Risto Näätänen**, University of Arhus, Denmark (S05 004)	***"Seeing" And Reading With The Ears: From Basic Research To Visual Rehabilitation*** **Amir Amedi**, Hebrew University Jerusalem (S06 004)	
2.20pm – 2.30pm	**Q&A**	**Q&A**	**Q&A**	
PLENARY SESSION				
2.30pm – 3.30pm	Plaza Auditorium – **Chair:** Paul Corballis			
	KEYNOTE LECTURE 3 ***The Wandering Mind: Mental Time Travel, Theory Of Mind, And Language*** **Professor Michael C. Corballis**, University of Auckland, New Zealand		*Supported by* The University Of Queensland AUSTRALIA	
3.30pm – 4.00pm	**Afternoon Tea with Exhibitors**			
4.00pm – 6.00pm	**POSTER SESSION 1** Rooms P9, 10 & 11 (Combined)			
	ATTENTION	**COGNITION & EXECUTIVE PROCESSES**	**LANGUAGE**	**MEMORY & LEARNING**	**MOTOR BEHAVIOUR**	**SENSATION & PERCEPTION**

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PROGRAMME
TUESDAY 29 JULY 2014

TUESDAY 29 JULY 2014				
8.00am	**Registration Desk Open**			
PLENARY SESSION				
9.00am – 10.00am	Plaza Auditorium – **Chair:** Michael Breakspear			
	KEYNOTE LECTURE 4 ***Hubs In Brain Structure And Function*** **Professor Olaf Sporns**, Indiana University, USA		*Supported by*	QIMR Berghofer Medical Research Institute
10.00am – 10.30am	**Morning Tea with Exhibitors**		*Supported by*	SIEMENS
CONCURRENT SESSIONS				
	S07 - Understanding High-Level Vision, Attention And Decision Making By Means Of Frequency-Tagging EEG	**S08 - The Dynamic Brain**	**S09 - New Approaches To The Neural Basis Of Mathematical Cognition**	**OP2 - Cognition, Memory & Learning**
	Plaza Auditorium	Room P6	Room P7	Room P8
	Chair: Bruno Rossion	**Chair:** Leonardo Gollo	**Chair:** Brian Butterworth	**Chair:** Ross Cunnington
10.30am – 10.50am	***Objective Evidence For Perceptual Integration By Means Of Frequency-Tagging EEG*** **Bruno Rossion**, University of Louvain, Belgium (S07 001)	***Anticipated Synchronization In Neuronal Populations: Reconciling Information Directionality With Negative Time Lag*** **Claudio R. Mirasso**, Institute for Cross-Disciplinary Physics and Complex Systems, Spain (S08 001)	***Microstructural Measures Of The Developing Brain And Its Response To Learning: Evidence From Neuroimaging*** **Chris Clark**, University College London, UK (S09 001)	***Temporally Sustained Activity in Lateral Prefrontal Cortex Supports Decision Making*** **Matar Haller**, University of California, Berkeley, USA (OP2 001)
10.50am – 11.10am	***Using Frequency Tagging To Measure Visual Perception And Selective Attention In Health And Disease*** **Professor Jason Mattingley**, University of Queensland, Australia (S07 002)	***(How The Thalamus Changes) What The Cat's Eye Tells The Cat's Brain*** **Luis M. Martinez**, Institute of Neuroscience, Alicante, Spain (S08 002)	***Simple Calculation In The Brain: Evidence From Direct Cortical Electro-Stimulation*** **Carlo Semenza**, University of Padova, Italy (S09 002)	***Investigating Neural Correlates of Dual-Tasking and Task-Switching: A Meta-Analytic Approach*** **Britta Worringer**, RWTH Aachen University, Germany (OP2 002)
11.10am – 11.30am	***Behavioural, Electrophysiological, And Genetic Approaches To Studying Top-Down Visual Attention In Insects*** **Bruno van Swinderen**, Queensland Brain Institute, Australia (S07 003)	***Computational Models Of Perceptual Uncertainty And Decision Making*** **Leonardo L. Gollo**, Queensland Institute for Medical Research, Australia (S08 003)	***Training The "Mathematical Brain": Evidence From Functional Brain Imaging And Neuro-Modulation Techniques*** **Teresa Iuculano**, Stanford University, USA (S09 003)	***Effects Of Acute Ketamine Infusion On Visual Working Memory Encoding: A Study Using ERPs*** **Corinna Haenschel**, City University London, UK (OP2 003)
11.30am – 11.50am	***A Window Onto The Basic Elements Of Perceptual Decision Making In The Human Brain*** **Redmond O'Connell**, Trinity College Dublin, Ireland (S07 004)	***Dwelling Quietly in the Rich Club: Brain Network Determinants of Slow Cortical Fluctuations*** **Michael Breakspear**, Queensland Institute for Medical Research, Australia (S08 004)	***The Genetics Of The Neural Bases Of Low Numeracy*** **Brian Butterworth**, University College London, UK (S09 004)	***Modeling Managment Of Access To Working Memory As A Self-Evalution Process For Intrinsically Motiveted Prediction*** **Catherine Wacongne**, INSERM, France (OP2 004)
11.50am – 12.00pm	**Q&A**	**Q&A**	**Q&A**	**Q&A**
12.00pm – 1.00pm	**Lunch at Leisure**			

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PROGRAMME
TUESDAY 29 JULY 2014

TUESDAY 29 JULY 2014				
CONCURRENT SESSIONS				
	S10 - TMS And TDCS As A Tool In Cognitive Neuroscience: How Does Transcranial Stimulation Influence Behavior?	**S11 - The Menzies Foundation Symposium: A Window Into Normal Cognition: Insights From Synaesthesia**	**S12 - Working Memory 2014: 40 Years On Since Baddeley & Hitch**	**D02 - How Do We Improve Medical Translation? Developing Translational Approaches Towards Exploring Cognitive And Behavioural Endophenotypes In Animal Models Of Disease**
	Plaza Auditorium	Room P6	Room P7	Room P8
	Chair: Hartwig Siebner	**Chair:** Anina Rich	**Chair:** Eva Feredoes	**Chair:** Jess Nithianantharajah
1.00pm – 1.20pm	***Transcranial Electrical Stimualtion (Tdcs, Tacs, And Trns) As Tools To Interfere With Cognitive Functions: Shifting Excitability And Shaping Oscillations*** **Michael A. Nitsche**, University Medical Center Goettingen, Germany (S10 001)	***Implicit Shape-Color Associations In Synesthesia*** **David Brang,** Northwestern University, USA (S11 001)	***The Role Of Attention In Working Memory Maintenance*** **Nahid Zokaei**, University of Oxford, UK (S12 001)	**Jess Nithianantharajah**, University of Edinburgh, UK (DO2 001) **Anthony J Hannan**, Florey Institute of Neuroscience and Mental Health, Australia (DO2 002) **Caitlin E McOmish**, Columbia University Medical Center, USA (DO2 003)
1.20pm – 1.40pm	***Non-Invasive Brain Stimulation In Cognitive Neuroscience: A "Noisy" Explanation*** **Carlo Miniussi**, University of Brescia & IRCCS Centro San Giovanni di Dio Fatebenefratelli, Italy (S10 002)	***What Can Synaesthesia Teach Us About Sound Symbolism*** **Katie Bankieris**, University of Rocherster, USA (S11 002)	***The Neural Mechanisms Of Top-Down Control During Visual Working Memory*** **Eva Feredoes**, University of Reading, UK (S12 002)	
1.40pm – 2.00pm	***Non-Invasive Brain Stimulation In Cognitive Neuroscience: A "Connectivity" Account*** **Hartwig R. Siebner**, Copenhagen University Hospital Hvidovre, Denmark (S10 003)	***Grapheme-Colour Synaesthesia: More Than A Vivid Memory?*** **Derek Arnold**, University of Queensland, Australia (S11 003)	***Alpha Activity As A Mechanism To Preserve Working Memory Integrity*** **Mathilde Bonnefond**, Radboud University, Netherlands (S12 003)	
2.00pm – 2.20pm	**2.00pm – 2.10pm** **Q&A**	***A Conceptual Mediation Hypothesis Of Synaesthesia: What Can Yellow Tuesdays Tell Us About How We Represent Objects?*** **Anina N. Rich**, Macquarie University, Australia (S11 004)	***The Hippocampus Is Necessary For Binding Object Identity To Location In Visual Working Memory*** **Yoni Pertzov**, Hebrew University, Jerusalem (S12 004)	
2.20pm – 2.30pm		**Q&A**	**Q&A**	
PLENARY SESSION				
2.30pm – 3.30pm	Plaza Auditorium – **Chair:** Rob Hester **KEYNOTE LECTURE 5** ***Imaging And Stimulating Adaptive Brain Plasticity*** **Professor Heidi Johansen-Berg**, University of Oxford, UK			
3.30pm – 4.00pm	**Afternoon Tea with Exhibitors**			
4.00pm – 6.00pm	**POSTER SESSION 2** Rooms P9, 10 & 11 (Combined)			
	ATTENTION	**COGNITION & EXECUTIVE PROCESSES**	**EMOTIONAL & SOCIAL PROCESSES**	**LANGUAGE** / **METHODS DEVELOPMENT** / **SENSATION & PERCEPTION**
7.00pm – 10.30pm	**CONFERENCE DINNER** Riverlife, Kangaroo Point. Free river transfer departs 6.00pm and 6.40pm from Southbank A Jetty (behind the Wheel of Brisbane).			

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PROGRAMME
WEDNESDAY 30 JULY 2014

WEDNESDAY 30 JULY 2014				
PLENARY SESSION				
9.00am – 10.00am	Plaza Auditorium – **Chair:** Mark Williams			
	KEYNOTE LECTURE 6 ***Temporal Decoding Of Brain Signals: A Window Into Conscious And Non-Conscious Operations*** **Professor Stanislas Dehaene**, Collège de France, Paris, France			
10.00am – 10.30am	**Morning Tea with Exhibitors**			
CONCURRENT SESSIONS				
	S13 - Segregation And Integration Of Cortical Laminar Information Streams And Their Role In Attention	**S14 - Consciousness, Integrated Information And The Free Energy Principle**	**S15 - Task Set Representation And Updating: Aging, Training And Reward Motivation**	**OP3 - Language**
	Plaza Auditorium	Room P6	Room P7	Room P8
	Co-Chairs: René Scheeringa & Andre Bastos	**Chair:** Jakob Hohwy	**Chair:** Jutta Kray	**Chair:** Paul Corballis
10.30am – 10.50am	***The Possibility To Image Functional Changes In Cortical Laminae Using fMRI*** **Markus Barth**, The University of Queensland, Australia (S13 001)	***Can The Free Energy Principle Be Used To Generate A Theory Of Consciousness*** **Jakob Hohwy**, Monash University, Australia (S14 001)	***Progression Of Age-Related Decline In Task-Switching Performance And White Matter Microstructural Integrity: A Longitudinal Study*** **Frini Karayanidis**, University of Newcastle, Australia (S15 001)	***Ventral and Dorsal Pathways for Prosodic Intentions*** **Daniela Sammler**, Max Planck Institute for Human Cognitive and Brain Sciences, Germany (OP3 001)
10.50am – 11.10am	***Structure/Function/Model Analyses Of The Neocortical Laminar Activity Profile In Awake-Behaving Primates*** **Saskia Haegens**, Columbia University, USA (S13 002)	***Integrated Information Theory and the Sources of Meaning*** **Guilio Tononi**, University of Wisconsin, USA (S14 002)	***Is The Transfer Of Task-Switching Training In Older Adults Dependent On The Type Of Training? The Impact Of Working Memory And Inhibitions Demands*** **Jutta Kray**, Saarland University, Germany (S15 002)	***DCDC2 Polymorphism Is Associated With Cortical Thickness In Left Supramarginal And Angular Gyri*** **Fahimeh Darki**, Karolinska Institute, Sweden (OP3 002)
11.10am – 11.30am	***The Relation Between Oscillatory EEG Activity And The Laminar Specific BOLD Signal*** **René Scheeringa**, Donders Institute for Brain, Cognition and Behaviour, Netherlands (S13 003)	***Integrated Information And Free Energy – Peas In A Pod?*** **Anil Seth**, University of Sussex, UK (S14 003)	***How Effective Are Monetary Incentives For Context Updating In Younger And Older Adults?*** **Hannah Schmitt**, Saarland University, Germany (S15 003)	***Electrophysiological Evidence Of Statistical Learning In Preverbal Infants*** **Ghislaine Dehaene-Lambertz**, INSERM U992, France (OP3 003)
11.30am – 11.50am	***Visual Areas Exert Bottom-Up And Top-Down Influences Through Distinct Frequency Channels*** **Andre M. Bastos**, Ernst Strüngmann Institute (ESI) for Neuroscience, Germany (S13 004)	***Integrated Information And Free Energy – Obstacles To Their Combination*** **Naotsugu Tsuchiya**, Monash University, Australia (S14 004)	***Reward Motivation Enhances Coding Of Task-Set Information In Frontoparietal Cortex*** **Jo Etzel**, Washington University, USA (S15 004)	***Functional Near Infrared Spectroscopy (fNIRS) To Investigate Language Patterns Development Over Ages*** **Julie Tremblay**, Sainte-Justine Hospital Research Center, Canada (OP3 004)
11.50am – 12.00pm	**Q&A**	**Q&A**	**Q&A**	**Q&A**
12.00pm – 1.00pm	**Lunch at Leisure**			

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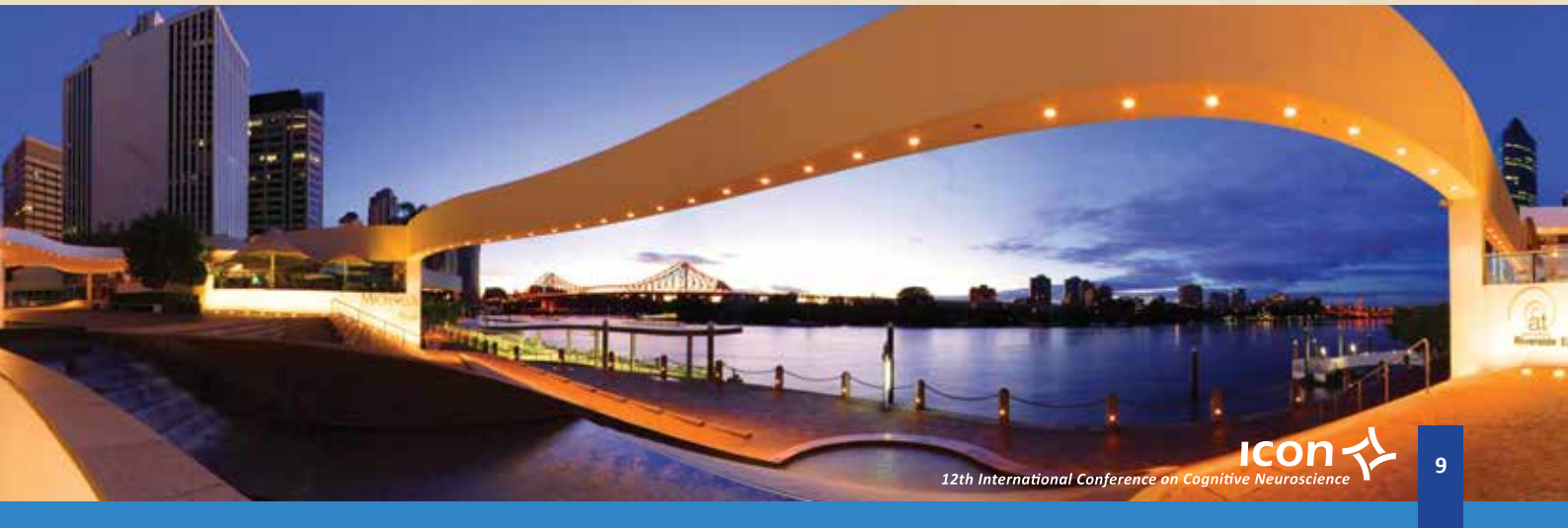


PROGRAMME
WEDNESDAY 30 JULY 2014

WEDNESDAY 30 JULY 2014				
CONCURRENT SESSIONS				
	S16 - Brain Processes Associated With Cognitive Control	**S17 - Sensorimotor Foundations Of Understanding And Interacting With Others**	**S18 - Mechanisms Of Cognitive Decline In Normal Aging**	**OP4 - Sensation & Perception**
	Plaza Auditorium	Room P6	Room P7	Room P8
	Chair: Gabriele Gratton	**Chair:** Emily Cross	**Chair:** Shulan Hsieh	**Chair:** Mark Williams
1.00pm – 1.20pm	***The Role of Feedback in Visual Processing*** **Diane M. Beck**, University of Illinois at Urbana-Champaign, USA (S16 001)	***Dissociable Routes To Empathy For Pain And Variance In Empathic Processes*** **Paola Sessa**, University of Padova, Italy (S17 001)	***Differential Effects Of Aging On Recollection And Familiarity: An ERP Study*** **Axel Mecklinger**, Saarland University, Germany (S18 001)	***Hallucinated And Correctly Detected Stimuli Evoke Similar Activity Patterns In Early Visual Cortex*** **Auréliane Pajani**, Laboratory of Cognitive Sciences & Psycholinguistics, France (OP4 001)
1.20pm – 1.40pm	***Lateralisation of the Event-Related Brain Potential Reveals Neural Correlates of Attention, Distractor Suppression, and Visual Short-Term Memory*** **Paul M. Corballis**, University of Auckland, NZ (S16 002)	***Is The Human Mirror System Located Within Broca's Area? A Selective Meta-Analysis Of fMRI Studies Of Action Observation And Execution*** **Pascal Molenberghs**, The University of Queensland, Australia (S17 002)	***The Boundary Condition For Compensatory Responses By The Elderly In A Flanker-Task Paradigm*** **Shulan Hsieh**, National Cheng Kung University, Taiwan (S18 002)	***Qualitatively Different Neural Mechanisms For Conscious And Subliminal Multiple Word Integration*** **Simon van Gaal**, University of Amsterdam, Netherlands (OP4 002)
1.40pm – 2.00pm	***Investigating Brain Networks In Task Preparation*** **Gabriele Gratton**, University of Illinois at Urbana-Champaign, USA (S16 003)	***The Impact Of Social Information On How We Perceive And Interact With Other Agents*** **Emily Cross**, Bangor University, UK (S17 003)	***The Effects Of Age On Episodic Memory - What Stays Up And What Goes Down?*** **Michael D. Rugg**, University of Texas at Dallas, USA (S18 003)	***The Emerging Perceptual Representation Of Faces Decoded From Human Neuromagnetic Recordings*** **Thomas Carlson**, Macquarie University, Australia (OP4 003)
2.00pm – 2.20pm	***A Functional and Structural Network View of Task-Switching Dynamics in Ageing*** **Pauline Baniqued**, University of Illinois at Urbana-Champaign, USA (S16 004)	***Racial Bias In Neural Empathy To Observed Pain*** **Ross Cunnington**, The University of Queensland, Australia (S17 004)	***Effects of Age on the Balance Between Habitual and Goal-Directed Action*** **K. Richard Ridderinkhof**, University of Amsterdam, Netherlands (S18 004)	***Effects Of Attention And Perceptual Uncertainty On Cerebellar Activity During Visual Motion Perception*** **Oliver Baumann**, The University of Queensland, Australia (OP4 004)
2.20pm – 2.30pm	**Q&A**	**Q&A**	**Q&A**	**Q&A**
2.30pm – 3.00pm	**Afternoon Tea with Exhibitors**			
PLENARY SESSION				
3.00pm – 4.00pm	Plaza Auditorium – **Chair:** Frini Karayanidis **KEYNOTE LECTURE 7** ***Schizophrenia As A Cognitive Disorder: Insights From Cognitive Neuroscience*** Emeritus Professor Pat Michie, University of Newcastle, Australia			
4.00pm – 6.00pm	**POSTER SESSION 3** Rooms P9, 10 & 11 (Combined)			
	COGNITION & EXECUTIVE PROCESSES	**EMOTION & SOCIAL PROCESSES**	**MEMORY & LEARNING**	**METHODS DEVELOPMENT** / **MOTOR BEHAVIOUR** / **SENSATION & PERCEPTION**
6.00pm till late	**ICON KICK ON** Dandy's Rooftop, The Fox Hotel, South Brisbane			

This Conference Programme is correct at the time of printing, however, the Organising Committee reserves the right to alter the Programme if necessary.


Plaza Auditorium

PROGRAMME
THURSDAY 31 JULY 2014

THURSDAY 31 JULY 2014				
PLENARY SESSION				
9.00am – 10.00am	Plaza Auditorium – **Chair:** Ross Cunnington			
	KEYNOTE LECTURE 8 ***Probabilistic Models Of Sensorimotor Control And Decision Making*** **Professor Daniel Wolpert**, University of Cambridge, UK *Supported by* The University Of Queensland AUSTRALIA | QBI Queensland Brain Institute			
10.00am – 10.30am	**Morning Tea with Exhibitors**			
CONCURRENT SESSIONS				
	S19 - ECoG Signatures Of Human Cognition	**S20 - The Interplay Of Attention And Prediction In The Human Brain**	**S21 - Cognitive Modeling And Cognitive Neuroscience: A Symbiotic Relationship**	**OP5 - Motor, Social & Emotional Processes**
	Plaza Auditorium	Room P6	Room P7	Room P8
	Chair: Josef Parvizi	**Chair:** Marta Garrido	**Chair:** Renate Thienel	**Chair:** Ross Cunnington
10.30am – 10.50am	***Combined ECoG, fMRI, And Electrical Brain Stimulation: A New Era For Localization Of Functions*** **Josef Parvizi**, Stanford University, USA (S19 001)	***On The Role Of Expectation In Visual Perception: A Top-Down View Of Early Visual Cortex*** **Peter Kok**, Donders Institute for Brain, Cognition and Behaviour, Netherlands (S20 001)	***Focal Striatum Lesions Impair Decision Threshold Adjustment In Humans*** **Professor Birte Forstmann**, University of Amsterdam, Netherlands (S21 001)	***Neural Activity To Viewed Dynamic Gaze Is Affected By Social Decision*** **Aina Puce**, Indiana University, USA (OP5 001)
10.50am – 11.10am	***ECOG Signature Of Large-Scale Functional Connectivity In The Brain*** **Jean-Philippe Lachaux**, INSERM Lyon, France (S19 002)	***Expectation And Attention In Hierarchical Auditory Prediction*** **Srivas Chennu**, University of Cambridge, UK (S20 002)	***Simultaneously Modeling The Cognitive And Neural Mechanisms Involving Different Types Of Expertise In Mental Rotation*** **Alexander Provost**, University of Newcastle, Australia (S21 002)	***Re-Assesssing The Pre-Attentive Nature Of Integrating Emotional Faces And Voices: An Event-Related Potential (ERP) Study*** **Tam Ho**, Max Planck Institute for Human Cognitive and Brain Sciences, Germany (OP5 002)
11.10am – 11.30am	***The Past, The Present, And The Future Of ECoG*** **Robert T. Knight**, University of California Berkeley, USA (S19 003)	***Effective Connectivity Reveals Right-Hemisphere Dominance In Audiospatial Perception: Implications For Models Of Spatial Neglect*** **Marta I. Garrido**, University of Queensland, Australia (S20 003)	***Analyzing The Multimodal Signature Of Task-Unrelated Thoughts*** **Matthias Mittner**, University of Amsterdam, Netherlands (S21 003)	***Neural Correlates Of The Attribution Of Agency For Self-Made And Others' Actions: The Role Of The Medial Portion Of The Anterior PFC In Attributing Expected Consequences To The Self*** **Simmy Poonian**, The University of Queensland, Australia (OP5 003)
11.30am – 11.50am	**11.30am – 11.40am** **Q&A**	***Attention For Learning: The Striatal Cholinergic System In Reward-Based Learning*** **Angela J. Langdon**, Princeton University, USA (S20 004)	***Age-Related Changes In White Matter Pathways Underlying Response Threshold Adjustment*** **Renate Thienel**, University of Newcastle, Australia (S21 004)	***Functional Segregation Of Self And Other In Joint Action. A Dual-EEG Study With Piano Duos*** **Giacomo Novembre**, University of Western Sydney, Australia (OP5 004)
11.50am – 12.00pm		**Q&A**	**Q&A**	**Q&A**
12.00pm – 1.00pm	**Lunch at Leisure**			

This Conference Programme is correct at the time of printing, however, the Organising Committee reserves the right to alter the Programme if necessary.

ABOUT THE ICON 2014 LOGO

The ICON 2014 Committee is delighted to have commissioned award winning Indigenous artist, Laurie Nilsen, to design a conference logo with an Australian twist.

Laurie trained in the graphic arts and uses drawing, painting and sculptural mediums often featuring barbed wire as a medium encompassing cultural, political and environmental concerns. Although most of his work tackles issues that concern Aboriginal people, he recognises these concerns also affect non-Aboriginal people.

Laurie was a foundation member of the Campfire Group Artists in the early 1990s and currently works with the proppaNOW Collective. Laurie has been the recipient of numerous art awards including winning the 2007 Telstra National Aboriginal & Torres Strait Islander Art Award for 3D work.

His work is held in numerous private and public collections, and he was one of the first 'urban' Aboriginal artists to have work acquired by the National Gallery of Australia.

Different aspects of the brain are highlighted showcasing various disciplines....all with traditional Aboriginal/Indigenous painting art styles and this logo has become a signature part of the marketing and branding for ICON 2014.

PROGRAMME
THURSDAY 31 JULY 2014

THURSDAY 31 JULY 2014				
CONCURRENT SESSIONS				
	S22 - Cognition And Connectomics	**S23 - Formal Theories Of Dorsal Anterior Cingulate Cortex Function**	**S24 - Prediction In Perception**	**OP6 - Attention**
	Plaza Auditorium	Room P6	Room P7	Room P8
	Co-Chairs: Alex Fornito & Michael Breakspear	**Chair:** Clay Holroyd	**Co-Chairs:** Juanita Todd & Robert O'Shea	**Chair:** Pat Michie
1.00pm – 1.20pm	***Transitory Networks Supporting Cognitive Control*** **Luca Cocchi**, Queensland Brain Institute, Australia (S22 001)	***E Cingulus Pluram: Multiple Computational Roles Of Anterior Cingulate Activity*** **William H. Alexander**, Gent University, Belgium (S23 001)	***We Make Predictions About Eye Of Origin Of Visual Input: Visual Mismatch Negativity From Binocular Rivalry*** **Robert P. O'Shea**, Southern Cross University, Australia (S24 001)	***tDCS Of Prefrontal Cortex Improves Multitasking*** **Hannah Filmer**, The University of Queensland, Australia (OP6 001)
1.20pm – 1.40pm	***Connectomic Methods For Functional Imaging*** **Andrew Zalesky**, University of Melbourne, Melbourne, Australia (S22 002)	***Dorsal Anterior Cingulate Cortex And The Adaptive Regulation Of Reinforcement Learning Parameters: Neurophysiology, Model And Robotic Implementation*** **Mehdi Khamassi**, CNRS Paris, France (S23 002)	***Prediction Of Vision From Invisible Stimuli*** **Bradley N. Jack**, Southern Cross University, Australia (S24 002)	***Task Demands Modulate The Effects Of Perceptual Expectations In Early Visual Cortex*** **Elexa St. John-Saaltink**, Radboud University Nijmegen, Netherlands (OP6 002)
1.40pm – 2.00pm	***How Brain Structure Constrains Brain Function*** **Olaf Sporns**, Indiana University, USA (S22 003)	***Anterior Cingulate Cortex And The Expected Value Of Control*** **Amitai Shenhav**, Princeton University, USA (S23 003)	***When Auditory Mismatch Negativity Deviates From Simple Probabilistic Inference*** **Juanita Todd**, University of Newcastle, Australia (S24 003)	***Temporal Expectation Improves Real-Time Decoding of Visual Feature Representations as Measured By Magnetoencephalography*** **Nicholas Myers**, University of Oxford, UK (OP6 003)
2.00pm – 2.20pm	***Multi-Task Functional Connectivity And Flexible Hubs*** **Michael W Cole**, Rutgers University, USA (S22 004)	***Hierarchical Control Over Effortful Behavior By Dorsal Anterior Cingulate Cortex*** **Clay Holroyd**, University of Victoria, Canada (S23 004)	***Neural Entrainment During Musical Rhythm Perception Is Correlated With Individual Differences In Temporal Prediction During Sensorimotor Synchronization*** **Peter Keller**, University of Western Sydney, Australia (S24 004)	***Interactive Effects of Task Set and Working Memory on Attentional Capture*** **Oscar Jacoby,** The University of Queensland, Australia (OP6 004)
2.20pm – 2.30pm	**Q&A**	**Q&A**	**Q&A**	**Q&A**
2.30pm – 3.00pm	**Afternoon Tea with Exhibitors**			
PLENARY SESSION				
3.00pm – 3.30pm	Plaza Auditorium – **Chair:** Jason Mattingley (ACNS President)			
	ACNS YOUNG INVESTIGATOR LECTURE ***Mapping Context-Dependent Changes In Brain Functional Networks Using Event-Related Graph Analysis*** Associate Professor Alex Fornito, Monash University, Australia		*Supported by* ACNS	
3.30pm – 4.30pm	Plaza Auditorium – **Chair:** Richard Ridderinkhof			
	KEYNOTE LECTURE 9 ***The Role Of The Subthalamic Nucleus In Strategic Decision-Making: A Model-Based Approach*** Professor Birte Forstmann, University of Amsterdam, Netherlands		*Supported by*	
4.30pm – 5.30pm	**CLOSING ADDRESS** **Associate Professor Frini Karayanidis, University of Newcastle, Australia**			

This Conference Programme is correct at the time of printing, however, the Organising Committee reserves the right to alter the Programme if necessary.

SOCIAL PROGRAMME

WELCOME RECEPTION – SUNDAY 27 JULY

Conference delegates will kick start the conference days with this all-important networking event. It is the time to catch up with your colleagues, meet new contacts, as well as having the chance to chat with exhibitors.

When: Sunday 27 July – 7.00pm – 8.30pm
Where: Exhibition Foyer, Plaza Level, BCEC on Grey
Dress: Smart business attire

ICON CONFERENCE DINNER – TUESDAY 29 JULY

Make sure to join us at the Conference Dinner to see the Brisbane city lights illuminate the night.

This informal event includes all food, drinks (alcoholic and non-alcoholic) and entertainment. It will be held at Riverlife on the banks of the Brisbane river overlooking the city skyline and at the base of the heritage-listed Kangaroo Point Cliffs.

With different entertainment and quiet zones, you can catch up with your colleagues or enjoy the a fun night dancing away to the sounds of the DJ.

Haven't got a ticket?

If you wish to attend but have not pre-booked a ticket, a ***limited*** number of tickets may be available until 6.00pm on Monday 28 July. Please see the Registration Desk staff with your request.

When: Tuesday 29 July – 7.00pm – 10.30pm
Where: Riverlife, overlooking the Brisbane river and city. River transfers provided or Riverlife is a 20 minute stroll from the Conference venue
Cost: $99 per ticket - includes delicious Aussie dinner, beverages (alcoholic and non-alcoholic) and entertainment
Dress: As this is an outdoor venue, we recommend warm clothing (although heaters will be throughout the venue).

Getting There:

Free River Transfer to the Dinner

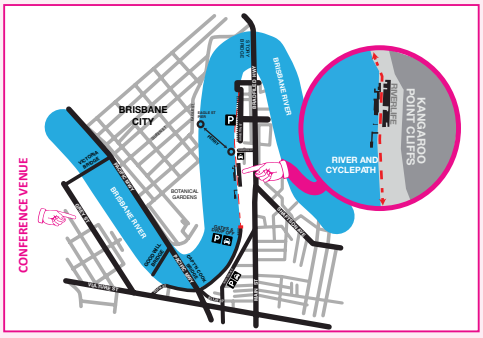
Make your way to the conference dinner via a short cruise down the Brisbane River on Mirimar Cruises.

Departure times: 6.00pm and 6.40pm from Southbank A Jetty (behind the Wheel of Brisbane). Please note if you miss these transfers you will need to make your own way to Riverlife

Board the river transfer swapping your ticket for a glow bracelet which give you access to food and beverage… so don't forget your ticket!

Getting Home:

At the end of the night you are free to make your way back to your hotel at your leisure.



ICON KICK ON – WEDNESDAY 30 JULY

Spend the last night of the Conference socialising while taking in views of the Brisbane skyline. Join us for a fun and casual night on Dandy's Rooftop Bar at The Fox Hotel – featuring a cocktail bar and spectacular views of the city nightscape. ICON delegates have exclusive use of this area on Wednesday night.

The night includes entertainment (vocalist and guitarist from 6.00-9.00pm and DJ from 9.00pm), finger food and drinks at special prices.

When: Wednesday 30 July – from 6.00pm
Where: Dandy's Rooftop, The Fox Hotel, 71-73 Melbourne St, South Brisbane (2 blocks from BCEC on Grey)
Includes: The night includes entertainment (vocalist and guitarist from 6.00pm – 9.00pm and DJ from 9.00pm), finger food and drinks available at special prices
Cost: Free entry
No need to pre-register – just turn up from 6.00pm

KEYNOTE SPEAKERS

Professor
Michael C. Corballis
University of Auckland, New Zealand

Supported by The University Of Queensland AUSTRALIA

Professor Michael Corballis is Emeritus Professor of Psychology at the University of Auckland and honorary Doctorate LLD of the University of Waterloo, Ontario. He has been awarded the Office of the New Zealand Order of Merit for services to psychological science, and is a Fellow of the American Psychological Society, the Association of Psychological Scientists, and the Royal Society of New Zealand. Professor Corballis has published over 200 articles and over 60 book chapters in experimental psychology and cognitive neuroscience, on such topics as visual cognition, memory, language, brain asymmetry, and human evolution. He has authored several books: his most recent are The Recursive Mind (Princeton University Press, 2011), Pieces of Mind (Scribe Publications, Melbourne, 2012), and The Wandering Mind (Auckland University Press, 2013).

Professor
Birte Forstmann
University of Amsterdam, Netherlands

Supported by The University of Newcastle AUSTRALIA

Professor Birte Forstmann is Professor of Cognitive Neurosciences at the Cognitive Science Centre, University of Amsterdam, and tenured research fellow of the European Research Council. She completed her PhD in 2006 at the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig, Germany. Professor Forstmann's general research goal is to understand the brain mechanisms that allow people to adapt quickly to changes in their environment. Her work is motivated by a single strong conviction that behavioral data and brain measurements need to make contact with psychological theory via concrete mathematical models of latent cognitive processes, and combines mathematical modeling with functional magnetic resonance imaging (fMRI), diffusion tensor imaging (DTI), ultra-high resolution 7T MRI, and electroencephalography (EEG).

Professor
Jason Mattingley
University of Queensland, Australia

Supported by CAMBRIDGE RESEARCH SYSTEMS

Professor Jason Mattingley is Foundation Chair in Cognitive Neuroscience at the Queensland Brain Institute and School of Psychology, University of Queensland. He is an Australian Research Council Laureate Fellow, has been awarded the Australian Psychological Society's Distinguished Contribution to Psychological Science Award, and is an elected Fellow of the Academy of Social Sciences in Australia. Professor Mattingley's research is directed at understanding the neural and cognitive mechanisms that underlie selective attention in health and disease, with a particular focus on how attentional processes influence multisensory integration, motor planning, neural plasticity and consciousness. He has published extensively in high impact journals including Science, Nature, Neuron, Current Biology and Nature Neuroscience.

Professor
Stanislas Dehaene
Collège de France, Paris, France

Professor Stanislas Dehaene is Chair of Experimental Cognitive Psychology at Collège de France and Director of the INSERM-CEA Cognitive Neuroimaging Unit. He has authored over 100 scientific publications in major international journals, as well as acclaimed books (including The Number Sense, which has been translated in eight languages), and has received international prizes including the McDonnell Centennial Fellowship and the Louis D prize of the French Academy of Sciences. Professor Dehaene's research interests concern the cerebral bases of specifically human cognitive functions such as language, calculation, and reasoning. His main scientific contributions include the study of the organization of the cerebral system for number processing. He was also the first to demonstrate that subliminal presentations of words can yield detectable cortical activations in fMRI, and has used these data to support an original theory of conscious and nonconscious processing in the human brain.

Professor
Heidi Johansen-Berg
University of Oxford, UK

Supported by HMRI Hunter Medical Research Institute

Professor Heidi Johansen-Berg is Professor of Cognitive Neuroscience and Wellcome Senior Research Fellow at the University of Oxford Centre for Functional MRI of the Brain (FMRIB), Nuffield Department of Clinical Neurosciences. She heads the Plasticity Group, a multi-disciplinary team of scientists with an interest in how the brain changes with learning, experience or recovery of function following damage. Professor Johansen-Berg's group use a variety of neuroimaging and brain stimulation approaches to study plasticity, predominantly in the motor system. As well as shedding light on how the healthy brain resopnds to change, her work also has implications for understanding and treating disease, testing new methods for rehabiltiation after stroke, and assessing whether taking up exercise could slow the effects of age on the brain.

Emeritius Professor
Pat Michie
University of Newcastle, Australia

Professor Pat Michie is Emeritus Professor of Psychology and co-director of the Schizophrenia Program of the Priority Research Centre in Translational Neuroscience and Mental Health at the University of Newcastle, Australia. She is an elected Fellow of the Australian Academy of Social Sciences and Chair of the National Committee of Brain and Mind of the Australian Academy of Science. Professor Michie's primary research area is cognitive neuroscience, particularly the neural basis of auditory information processing, attention and executive functions in healthy individuals, in people with schizophrenia and those at risk of psychosis. Her research using mismatch negativity (MMN) provided the first evidence for MMN as a potential early marker for schizophrenia and is currently focussed on animal models of schizophrenia using MMN as an endophenotype. She has also published extensively on auditory and visual selection attention, stop-signal inhibition and task-switching.

KEYNOTE SPEAKERS

Professor
Russell A Poldrack
University of Texas at Austin, USA

Supported by ccd ARC CENTRE OF EXCELLENCE IN COGNITION AND ITS DISORDERS

Professor Russ Poldrack is Professor of Psychology and Neurobiology and Director of the Research Imaging Centre, University of Texas at Austin, USA. He has held previous academic positions at Harvard Medical School and UCLA, and has received early career achievement awards from the American Psychological Association and the Organization for Human Brain Mapping. Professor Poldrack's research uses neuroimaging to examine the brain systems involved in learning and memory, executive control, and decision making, centered around the questions of how new skills are acquired, how existing skills are expressed, and how people exert executive control during thought and behavior. His research is strongly focused on translation of basic cognitive neuroscience into the clinical domain, with collaborations on studies of schizophrenia, ADHD, Tourette Syndrome, and drug addiction.

Professor Olaf Sporns
Indiana University, USA

Supported by QIMR Berghofer Medical Research Institute

Professor Olaf Sporns is Provost Professor and Director of the Computational and Cognitive Neuroscience Group in the Department of Psychological and Brain Sciences, Indiana University, USA. He has been awarded Junior Faculty and Distinguished Faculty Awards from Indiana University's College of Arts and Sciences, and was recently awarded a John Simon Guggenheim Memorial Fellowship. Professor Sporns' research area is theoretical and computational neuroscience, with an emphasis on complex systems, brain connectivity, and neurorobotics. Over his career, Professor Sporns has authored 150 peer-reviewed publications as well as the recent books Networks of the Brain and Discovering the Human Connectome, both published by MIT Press.

Professor
Daniel Wolpert
University of Cambridge, UK

Supported by The University Of Queensland AUSTRALIA | QBI Queensland Brain Institute

Professor Daniel Wolpert is Professor of Engineering in Computational and Biological Learning and Wellcome Trust Senior Investigator, University of Cambridge, UK. He is an elected Fellow of the Royal Society and of the Academy of Medical Sciences, he was awarded the Minerva Foundation Golden Brain Award, and has recently been appointed to a Royal Society Research Professorship in Neurobiology. Professor Wolpert's research interests are computational and experimental approaches to human sensorimotor control. His research uses engineering approaches to understand how the human brain controls movement, including both computational modelling and experimental approaches using robotic and virtual reality interfaces. Research areas include motor planning and optimal control, probabilistic (Bayesian) models, motor predictive and modular approaches to motor learning.

ACNS YOUNG INVESTIGATOR

Associate Professor
Alex Fornito
Monash University, Australia

Supported by ACNS Australasian Cognitive Neuroscience Society

Alex is currently Associate Professor in the School of Psychological Sciences and Deputy Director of Monash Clinical and Imaging Neuroscience at Monash University, Australia. His work focuses on the integration of complex network science, behavioural and molecular genetics, and neuroimaging data to understand brain structure and function in healthy and psychiatric populations.

GENERAL INFORMATION

ACCOMMODATION

If you nominated a hotel via the registration process, your accommodation has been booked. Any alterations to these bookings must now be made directly with your hotel. Room accounts are your own responsibility to be paid on departure.

BANKING

Banking services are available near the venue during normal business hours. ATMs are located within walking distance of the Conference venue.

BUSINESS CENTRE

The Brisbane Convention & Exhibition Centre (BCEC) reception desk offers business services such as photocopying and faxing.

CAR PARKING

BCEC has undercover parking for 1500 vehicles, with direct lift access to the Centre's convention and exhibition facilities. For faster exit the Centre has installed a new automated parking system which allows you to enter and exit the car park using your credit card. This makes exiting the car parks an easier, faster process.

CATERING

All conference catering will be served to registered Conference delegates within the Exhibition area.

CHILD CARE FACILITIES

Neither the Conference Organisers nor the BCEC provide child care facilities. Delegates should check with their accommodation venue for details on available child care facilities.

DISCLAIMER

All information is correct at time of printing but the Organisers reserve the right to alter the details as needed. For up-to-date information, visit www.icon2014.org. Any program updates will be displayed onsite at the Conference.

DRESS CODE

Smart casual business attire is appropriate for all conference sessions and social functions. As the session rooms may get a bit cool at times, we recommend you bring a jumper with you.

EXHIBITOR/PRODUCT DISCLAIMER

Neither the Conference Organisers nor the Organising Committee endorse or take responsibility for any services or products displayed or promoted at this conference.

LIABILITY

Neither the Conference Organiser nor the Organising Committee accepts any responsibility for loss or damage, theft, injuries/accidents or any other relevant matters. Delegates should make their own arrangements with respect to personal insurance.

LUGGAGE STORAGE

There will be limited luggage storage available at the BCEC Information Desk on the Ground Floor of BCEC on Grey entrance. Please do not take luggage into session rooms or leave unattended as BCEC Security staff will remove it. Please also be aware that any luggage stored is at your own responsibility and the Conference Organiser nor the BCEC will take responsibility.

MAIL

The Conference Organisers accept no responsibility for delegate mail. Please have mail sent to your accommodation.

MESSAGES

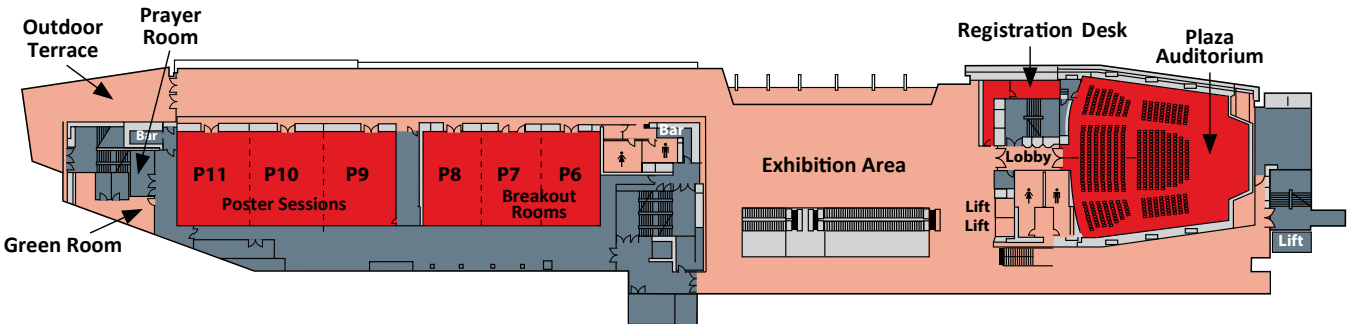
A delegate message board is located near the Registration Desk. If required, callers can leave a message with Registration Desk staff on phone 0450 006 224 or 0474 656 558, fax +61 7 3112 3900 or email icon2014@absoluteevents.com.au. These messages will be available for collection from the message board. Under no circumstances will sessions be interrupted to deliver messages.

As messages cannot be delivered personally, delegates are asked to check the message board regularly.

NAME BADGES

Delegates are required to wear their name badge at all times as they allow access to all Conference sessions and catering. Those not wearing name badges will be asked to see Registration Desk staff for re-issue.

VENUE FLOORPLAN



GENERAL INFORMATION

NO SMOKING POLICY

Delegates should be aware that smoking is banned within the BCEC. Designated smoking areas are clearly signed. Please be aware that, due to heavy fines, food and beverage is not allowed to be consumed in these designated smoking areas.

PAYMENT OPTIONS/MONEY

The only credit cards accepted by the Conference are MasterCard, Visa and American Express. Any outstanding payments will need to be made onsite by one of these credit card options. It is Conference policy that all registrations must be paid prior to admittance.

PERSON WITH DISABILITIES

Should you require these services, please advise the Conference Organisers and we will do all we can to make your attendance as comfortable as possible. BCEC is a fully accessible venue.

PRAYER ROOM

For those requiring a prayer room, this is located at the Plaza Green Room at the end of the Plaza Concourse. Signage will be available to make it easy to find.

REGISTRATION DESK

The Registration Desk will be located in the Plaza Auditorium Foyer of the BCEC and will be open every day of the Conference. Please collect your registration documents as soon as possible after your arrival. The Registration Desk will be open during the following times:

Sunday 27 July 2014	2.00pm – 7.30pm
Monday 28 July 2014	8.00am – 6.00pm
Tuesday 29 July 2014	8.00am – 6.00pm
Wedenesday 30 July 2014	8.00am – 6.00pm
Thursday 31 July 2014	8.00am – 5.30pm

Please contact staff at this desk with any queries. For enquiries outside of these times, please contact the Conference Management Team:

0450 006 224 – Amy Mailander, Conference & Event Co-Ordinator
0474 656 558 – Rebecca Wood, Conference & Event Assistant
0404 488 910 – Susan Harris, Conference Manager

SATCHEL

Pre-registered delegates will receive a Conference satchel which includes information relevant to the Conference. Onsite delegates may not receive a satchel.

SESSION ATTENDANCE

You may attend any of you preferred sessions without pre-registering, If you are moving between sessions, please be understanding of the presenters and audience and keep disruption to a minimum.

SESSION CHAIRS

Upon registering, Session Chairs should receive a Chairperson's kit and notes. If you did not receive this information, please see the staff at the Registration Desk.

SPEAKERS' PREPARATION AREA

The Speakers' Preparation Room is located on the Concorde Level and will be open during the following times:

Sunday 27 July 2014	1.00pm – 4.00pm
Monday 28 July 2014	8.00am – 4.00pm
Tuesday 29 July 2014	8.00am – 4.00pm
Wedenesday 30 July 2014	8.00am – 4.00pm
Thursday 31 July 2014	8.00am – 1.00pm

All speakers are required to register at the Registration Desk, then check in at the Speakers Preparation Area **at least two hours before their session**, or as early as possible. This will ensure presentations can be opened and pre-loaded onto the central Conference computer system.

If you emailed your presentation to the Conference Office prior to the Conference, please still check in with the Speakers' Preparation Area to ensure that you don't have any changes.

An audio visual technician will be available to assist with presentations and will advise any speakers of further instructions.

Speakers and Chairpersons are required to be in their presentation room **10 minutes prior** to the commencement of their session.

SPECIAL DIETARY REQUIREMENTS

Any delegates who requested a special dietary requirement will have a sticker on the name tag pocket and the venue has been advised of your request. Please identify yourself to the waitstaff person at the Special Dietary Requirements Area. While the Conference Organisers will aim to cater to any special dietary meals advised onsite, please be aware that, due to the late notification, it may not be possible.

TELEPHONE/FAX SERVICES

Public telephones are located in the foyer area of BCEC. Fax services are available from the Information Desk.

VENUE

BCEC on Grey
Brisbane Convention & Exhibition Centre
Grey Street
SOUTH BANK QLD 4101
Phone: +61 7 3308 3000

WI FI

The Brisbane Convention & Exhibition Centre is able to provide wireless internet coverage throughout the venue. BCEC LINK – free wireless for delegates. Casual wireless internet is available at no cost to visitors of the Centre and is designed for web browsing and checking web based email. It is not designed for accessing VPNs or downloading large files and the speed is limited to 256k.

TRAVEL AWARDS

STUDENT TRAVEL AWARDS

Congratulations to the recipients of the ICON 2014 Student Travel Awards

INTERNATIONAL STUDENT TRAVEL AWARDS

Deepika Bagga, INMAS, India
Pauline Baniqued, University of Illinois at Urbana-Champaign, USA
Lieke Braadbaart, University of Aberdeen, UK
Sven Dähne, Berlin Institute of Technology, Germany
Fahimeh Darki, Karolinska Institute, Sweden
Adrian Fischer, Otto von Guericke University Magdeburg, Germany
Inge Leunissen, KU Leuven, Belgium
Nicholas Myers, University of Oxford, UK
Natacha Paquette, University of Montreal, Canada
Catherine Wacongne, Collège de France, France

ACNS AUSTRALASIAN STUDENT TRAVEL AWARDS

Peter Bell, University of Sydney
Johanna Bergmann, University of New South Wales
Scott Coussens, University of South Australia
Justin Gaetano, Southern Cross University
Moran Gilat, University of Sydney
Lauren Hollier, University of Western Australia
Jared Horvath, University of Melbourne
Bradley Jack, Southern Cross University
Oscar Jacoby, University of Queensland
Eugene Poh, University of Queensland
Matthew Tang, University of Western Australia
Huizhen Tang, Macquarie University
Tamsyn Van Rheenen, Swinburne University

ACKNOWLEDGEMENTS

The Student Travel Awards are provided through generous support of the Australasian Cognitive Neuroscience Society – www.acns.org.au.

ELIGIBILITY

The ICON Student Travel Awards were open to any full-time students from anywhere in the world currently enrolled in undergraduate or higher-degree (Masters, PhD) research degrees, not including Post-Doc or part-time students. Applicants were required to submit an abstract to present research at the ICON Conference to be eligible for a Travel Award.

Through this same process, additional awards were provided for students in Australia and New Zealand by the Australasian Cognitive Neuroscience Society (ACNS). Paid members of the ACNS Society, and enrolled at a university in Australia or New Zealand, were eligible for an ACNS Student Travel Award.

CRITERIA

The aim of the Student Travel Awards was to provide support for outstanding full-time students to present their research at the ICON Conference. Applications were judged according to the student's research as outlined in the Conference abstract submission, and based on research achievements relative to opportunity as outlined in a brief CV summary.

WHAT'S HAPPENING

LUNCH OPTIONS

Looking for somewhere to go for the lunch break? We have organised some great discounts for you at various outlets throughout South Bank (short stroll away from BCEC on Grey).

In your name tag pocket you will have received a **South Bank Concierge Programme** VIP card – this card unlocks incredible conference exclusives throughout the South Bank precinct such as receiving 10% off at participating retailers plus so much more. The card offers exclusive options for ICON 2014 delegates so remember to take it with you when heading out for lunch. To maximise your benefits as an ICON 2014 delegate, visit **www.southbankconcierge.com.au**

If you'd rather stay within BCEC, there are two in-house options:

Olio Café & Bar

- Located in the Grey Street Ground Floor Foyer offering take-away coffee and snacks, daily specials, Mediterranean style tapas menu and bar (Open Monday - Wednesday 7am-3pm and Thursday - Saturday 7am-7.30pm)

Merivales Cafe Bar & Restaurant

- Located in the Merivale Street Main Foyer, offers gourmet sandwiches, cakes, pastries and coffee (Open from Monday – Friday from 8.00am - 3.00pm).

OWN A PART OF THE ICON CONFERENCE

What better way to remember the ICON 2014 Conference than by having a limited edition t-shirt featuring the exclusive image commissioned especially for the Conference.

Award winning Australian Indigenous artist, Laurie Nilsen, was commissioned to design the conference logo with an Australian twist. Different aspects of the brain are highlighted showcasing various disciplines....all with traditional Aboriginal/Indigenous painting art styles.

You'll never see anyone else using this brain as it is a limited edition artwork.

A limited amount of t-shirts are available for purchase from the Conference Registration Desk for just $30 each.

MOBILE APP

Tap into the Mobile App for the latest updates. You'll be able to find the agenda, sessions and speakers all at the touch of your fingertips. This handy onsite tool works on iPhone, iPad, and Android devices and is brought to you by BESA.

Scan the QR code or go to this website http://goo.gl/aUV1Y to access.

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POSTER PRESENTERS - SET UP & DISMANTLE

- On the day of your allocated poster presentation, you must put up your poster on the poster board at the set up time indicated below. ALL posters must be put up during the set up time - this allows other delegates to view your poster throughout the day
- Posters must be taken down during the following times. **IMPORTANT: Posters remaining on the boards after this time will be discarded.**

A reminder of key times:

POSTER SESSION 1 - MONDAY 28 JULY	
Set Up Time	8.00am – 9.00am
Poster Session*	4.00pm – 6.00pm
Dismantle Time	6.00pm – 7.00pm
POSTER SESSION 2 - TUESDAY 29 JULY	
Set Up Time	8.00am – 9.00am
Poster Session*	4.00pm – 6.00pm
Dismantle Time	6:00pm – 7:00pm OR 8.00am – 8.30am on Wednesday 30 July
POSTER SESSION 3 - WEDNESDAY 30 JULY	
Set Up Time	8.30am – 9.30am
Poster Session*	4.00pm – 6.00pm
Dismantle Time	6:00pm – 7:00pm

* *When poster presenters need to be standing with their posters*

To set up your poster, find your topic area on the poster boards (each row will have a sign indicating the topics in that row) and find the board with your poster number on it.

For the enjoyment of delegates, a cash bar will be available during all Poster Sessions.

WI FI

The Brisbane Convention & Exhibition Centre is able to provide wireless internet coverage throughout the venue. BCEC LINK – free wireless for delegates Casual wireless internet is available at no cost to visitors of the Centre and is designed for web browsing and checking web based email. It is not designed for accessing VPN's or downloading large files and the speed is limited to 256k.

BRISBANE TOURING

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Like to book some touring around Brisbane? See the local sights or get your photo taken with a koala and much much more. On Monday and Tuesday, representatives from the Brisbane Marketing's Visitor Information Centre will be available in the exhibition area, so take the opportunity to book a local tour.

KEYNOTE ABSTRACTS

SUNDAY 27 JULY 2014

KEY001: Eye Movements And Visual Stability

Keynote Speaker: Professor Jason Mattingley, The University of Queensland, Australia

Overview

Humans, like many animals, use eye movements to selectively sample the visual environment, bringing objects of interest onto the fovea for fine-grained analysis. Each time a saccade is made, the retinal image is abruptly displaced. The challenge for the visual system is to maintain perceptual stability in the face of such displacements. One way in which stability might be achieved is by using information about the direction and extent of an impending saccade to update internal representations of the locations and features of objects in the visual world. Neurons at various levels of the visual system, including the midbrain, parietal and prefrontal cortices, alter their responses if an impending saccade will bring a stimulus into their receptive field. Such changes in neural activity provide a potential mechanism for ensuring visual stability across saccades. In this talk I will discuss work in which we have examined the contribution of parietal cortex to visual updating across saccades. I will also present results from a series of psychophysical studies showing that object perception in peripheral vision is enhanced at the goal of an intended saccade, and that presaccadic updating preserves the elementary features of objects at their predicted postsaccadic locations. Our findings suggest a mechanism by which object recognition might be enhanced in the periphery during active search of visually cluttered environments.

MONDAY 28 JULY 2014

KEY002: Towards A Personalized Cognitive Neuroscience: The MyConnectome Project

Keynote Speaker: Professor Russell A Poldrack, University of Texas at Austin, USA

Overview

Cognitive neuroscience has focused heavily on characterizing those functions that are consistent across individuals, and to a lesser degree on variability between individuals. In my talk I will outline an alternative approach that begins to characterize the variability within individuals over time, which is crucial to an understanding of psychiatric disorders defined by extreme variability in emotional or cognitive function. I will discuss the MyConnectome project, which has collected a broad range of phenotypes (including imaging and -omics) on a single healthy individual over the course of 18 months, in an attempt to characterize the nature of variability in brain function and its relation to ongoing metabolic changes. This work suggests a new approach to understanding neurocognitive variability as a phenotypic feature of interest.

KEY003: The Wandering Mind: Mental Time Travel, Theory Of Mind, And Language

Keynote Speaker: Professor Michael C. Corballis, University of Auckland, New Zealand

Overview

About half the time, the mind wanders away from on-going tasks, and from the present. This includes mental time travel into past and possible future events, and into the minds of others. Spontaneous activity of the brain is also revealed in dreams and hallucinations, and may well be responsible for creative thinking, the discovery of new and unusual combinations of ideas. It has been argued mind wandering, at least in the form of mental time travel, is unique to humans, but I will summarize data from hippocampal recording suggesting that even rats appear to “play back” earlier experiences, and even “preplay” new ones. Behavioral evidence from birds and great apes increasingly shows evidence of episodic-like memory and episodic prospection. What is unique to humans is language, which is an adaptation allowing us to relay to others events and information removed from the present with a high degree of precision. Through stories, soap operas, gossip, and even conference presentations, language enables us to share our mind wanderings, understand other minds, and generate social cohesion and culture in the form of folklore, creation myths, and religions. But language is also a barrier; the 7,000 languages of the world are for the most part mutually unintelligible, serving as much to keep groups apart as to unite people within them.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S01: Frontal-Striatal Interaction In Reward-Guided Decision Making

Chair & Speaker: Matthew Rushworth, University of Oxford, UK
Bernard Balleine, University of Sydney, Australia
Rob Hester, University of Melbourne, Australia
Rei Akaishi, Tokyo Metropolitan Institute of Medical Science, Japan

Overview

We know that the frontal lobes are important for reward-guided decision-making but the mechanisms that underlie this role are currently a topic of investigation. The aim of this symposium is to bring together a group of researchers using disparate approaches (single neuron recording, experimental lesions, neuroimaging, computational neuroscience, and learning theory) but with a common focus on determining how several areas in the frontal cortex, including the medial frontal cortex and anterior cingulate cortex, come to have a critical role in reward-guided decision-making. As well as attempting to understand the neural mechanisms in these areas another common interest shared by the speakers is the understanding of the interactions between these brain regions and the striatum during decision-making. Using a variety of rodent models Bernard Balleine will explain the key circuits on which goal-based decision-making depends. Using a combination of model-based analysis, fMRI & TMS-EEG, Rei Akaishi will propose a mechanism for mediating learning and decision making. Matthew Rushworth will summarize recent fMRI and lesion experiments showing how these mechanisms operate when multiple choices are available simultaneously. Rob Hester will examine the role of these areas in error-based learning and cognitive control processes.

SO1 001: Making Decisions Between Multiple Options

Matthew Rushworth, University of Oxford, UK

There has been considerable interest in how the brain makes decisions but most investigations of the neural mechanisms of decision making have entailed giving animals or people only a limited numbers of options to choose between. Typically all the options are presented at the same time. In the real world, however, choices can be made between several options and foraging animals' choices are made in in the context of sequences of encounters with prey/food in a quite distinct scenario to the one that is typically studied in the laboratory. I will describe how decision making when there are multiple options differs in important ways from binary decision making. Representations of potential choices in the ventromedial prefrontal cortex (vmPFC) interact in surprising ways even when there are three options. I also demonstrate that humans can alternate between two modes of choice, comparative decision-making and foraging, dependent on distinct neural mechanisms in vmPFC and anterior cingulate cortex (ACC) employing distinct reference frames; in ACC choice variables are represented in invariant reference to foraging/searching for alternatives. The cost of foraging is also represented in ACC. While vmPFC encodes values of specific well-defined options, ACC encodes the average value of the foraging environment and cost of foraging.

Biography

Matthew Rushworth is a Professorial Research Fellow in the Department of Experimental Psychology and Centre for Functional Magnetic Resonance Imaging of the Brain (FMRIB), University of Oxford, UK. He has previously worked in London and in Montreal.

His recent work has been concerned with the operation of neural circuits in prefrontal and cingulate cortex during decision making and social interaction. He is also interested in the understanding functional interactions between brain areas during decision making and the anatomical connections that mediate those functional interactions.

SO1 002: Dysexecutive Syndrome: The Cortical- And Thalamo-Striatal Pathways And Disorders Of Goal-Directed Action

Bernard Balleine, University of Sydney, Australia

The cortico-striatal pathway has long been known to play an important role in executive functions, particularly in decision-making involving goal-directed actions, and changes in this pathway have been linked to the cognitive symptoms associated with various forms of psychiatric disorder, neurodegenerative conditions and addiction. Recent research in animal models has established that this pathway is essential for striatal plasticity associated with the acquisition of new actions; damage to this pathway renders actions less deliberated and more impulsive or habitual. Furthermore, although the acquisition of new actions doesn't involve the thalamo-striatal pathway, its damage renders the learning process associated with such actions vulnerable to interference when environmental contingencies change resulting in the catastrophic loss of prior learning; i.e. what is usually called a memory impairment. Together, therefore, these pathways are necessary to encode and to retain goal-directed actions; for the development of new strategies and their integration with old solutions.

Biography

Professor Balleine is a Professor and Australian Laureate Fellow and head of the Behavioural Neuroscience laboratory, Sydney. His research aims to understand the neural bases of learning and motivational processes that control volitional, goal-directed action, an issue that has direct bearing on our understanding of executive functions and decision-making. Current research focuses include: [1] The prefrontal cortex-basal ganglia network and goal-directed learning in neurodegeneration, focal brain damage and addiction; [2] The amygdala and its interactions in regulating how the reward value of events is encoded; [3] The thalamo-striatal projection in the integration of cognitive and emotional processes for decision-making.

SO1 003: Learning From Errors: The Role Of The Dorsal Cingulate In Feedback-Based Adaptive Behaviour

Rob Hester, University of Melbourne, Australia

One tenet of human learning that permeates society is the understanding that punishing an error will reduce the likelihood of it being repeated. Manipulating the level of punishment for an error has also been shown to result in corresponding levels of behavioural change, whereby larger penalties increase the likelihood of adaptive behavioural change. Models of error-related neural activity have argued for a relationship between outcome-related dorsal anterior cingulate (dACC) activity and adaptive changes in performance, via reinforcement learning mechanisms (e.g., Brown and Braver, 2005; Holroyd and Coles, 2002).

Recent evidence has highlighted an association between the magnitude of error-related dACC feedback activity and subsequent learning performance. However, existing data does not clarify whether the dACC activity is a monitoring signal reflecting outcomes that were worse than expected, or, the value of an outcome to subsequent adaptive behaviour. The latter is of particular interest due to the range of clinical conditions that feature poor decision-making that reflects a tendency to learn from positive, but not negative, feedback. To understand the influence of 'abnormal' reward sensitivity on behaviour in clinical conditions such as addiction, we have examined how experimental manipulation of both performance expectations (or prediction errors) and adaptive value has on dACC activity and its relationship to learning from errors. Our human fMRI data in healthy participants suggests that the dACC is more sensitive to the adaptive value of information rather than reflecting a prediction error, whereas the insular cortex and striatum show the opposite pattern.

Biography

Rob Hester is a Associate Professor in the School of Psychological Sciences, University of Melbourne, Australia, where he holds an ARC Future Fellowship. His research uses cognitive neuroscience methods (particularly fMRI) to examine the neural and behavioural mechanisms underlying cognitive control (e.g., impulse control) in healthy adults, as well as applying these methods to understanding disorders of control in clinical conditions such as drug dependence.

S01 004: Active Mechanisms of Learning and Decision-Making

Rei Akaishi, Tokyo Metropolitan Institute of Medical Science, Japan

Humans are known to actively interact with the environment. However, current models of learning and decision-making tend to treat human subjects as passive agents. In the first part of the talk, I will show that human subjects are actively making inferences about the external environment in a perceptual decision making task. Because there was no immediate feedback, this internal inference is unchecked and carried over to the subsequent trials. In the second part of the talk, I will describe how the internal inferences interact with the external feedback in tasks requiring learning of causal relationship between events. When the external feedback is delivered, subjects combine the internal and external information in a manner akin to hypothesis testing in science. Medial area 32 and 25 are specifically involved in confirmation of the internal hypothesis and lateral orbitofrontal cortex is involved in switching to an alternative hypothesis.

Biography

Rei Akaishi is a Post-Doctoral Research Fellow in the Tokyo Metropolitan Institute of Medical Science, Japan. He has previously worked in Oxford and Tokyo. His research has been concerned with how people learn and make decisions especially in the complex environment where knowledge of the structure of the environment is critical. He is especially interested in the spontaneous process in which people actively infer the structure of the surroundings and make use of these inferences in decision and learning. His research is also unusual in combining multiple techniques such as fMRI, TMS, EEG, combined TMS-EEG.

S02: Multi-Frequency Brain Network Dynamics In Human Memory

Arne Ekstrom, University of California Davis, USA
Chair & Speaker: Brett Foster, Stanford University, USA
Bernhard Staresina, Cambridge University, UK

Overview

A central challenge to understanding human memory is elucidating how the brain efficiently consolidates and retrieves the details of prior experience across distributed functional networks. While the medial temporal lobe (MTL) plays a well-established role in memory function, contemporary neuroscience has highlighted the importance of interactions between the MTL and distributed neocortical regions, both sensory and associative in function. Mechanisms for coordinating such distributed functional networks have progressively focused on long-range rhythmic synchrony between regions. While theta band oscillations have become synonymous with memory systems, a wide diversity of oscillatory motifs exists across the cerebral cortex. This symposium will present recent findings chiefly from human intracranial recordings that highlight the role of multi-frequency brain dynamics in facilitating memory network function. Specific topics covered include hippocampal oscillatory dynamics and memory behavior (Staresina); frequency specific hippocampal-neocortical oscillatory interactions and episodic memory content (Ekstrom) and parietal cortico-cortical oscillatory dynamics during autobiographical retrieval and resting-state (Foster). Collectively, these data suggest that multi-frequency brain dynamics provide important mechanisms for temporal coordination of distributed memory networks, and provide a wide repertoire of dynamical states that may accommodate the rich informational content of human memory.

S02 001: A Graph Theory Approach To Human Episodic Memory: Outlining The Spectrotemporal Basis Of Episodic Memory Retrieval

Arne Ekstrom, University of California Davis, USA

The neural basis of episodic memory is often thought to hinge critically on key brain regions within the medial temporal lobe such as the hippocampus. Yet several prominent models of episodic memory also posit key roles for hippocampal-cortical and cortical-cortical interactions in mediating episodic memory. Employing graph theory, pairwise phase consistency (PPC), and multilobular intracranial EEG recordings, our findings suggest that successful episodic memory retrieval involves increased connectivity across multiple medial temporal and cortical locations. We also find that successful memory retrieval involves increased functional connectivity, as indexed using PPC, specifically between the medial temporal lobes and parietal and frontal brain areas. These findings suggest that the medial temporal lobes act as a hub for successful memory retrieval. Finally, we show that retrieving spatial layout vs. temporal order details of recently experienced events results in distinct differences in the frequencies at which the networks resonate rather than specific anatomically-mediated interactions. Employing a similar data set collected in human participants using fMRI and functional connectivity analyses, we present further evidence for the hippocampus acting as a hub for correct episodic memory retrieval. Together, these findings present a new perspective on human episodic memory, emphasizing interactions between multiple cortical areas at different spectral frequencies as important to successful episodic memory retrieval.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S02: Multi-Frequency Brain Network Dynamics In Human Memory cont'd

Biography

Arne Ekstrom is an assistant professor at UC-Davis Center for Neuroscience. His research focuses on addressing the neural basis of human episodic memory. One particular focus of the lab regards the neural basis of how we construct the rich spatiotemporal context that often accompanies vivid event recall. Analytic approaches to this issue involve high-resolution functional magnetic imaging coupled with multivariate pattern voxel techniques and multilobular intracranial EEG coupled with graph theory.

S02 002: Oscillatory Dynamics Of The Medial And Lateral Parietal Lobe During Episodic Retrieval And Resting-State

Brett Foster, Stanford University, USA

Although historically associated with visuo-spatial sensory-motor behavior, the human parietal lobe has more recently been shown to play an important role in episodic memory retrieval. This talk will summarize recent work studying the electrophysiological dynamics within and between medial and lateral parietal cortex during episodic retrieval and the resting-state. Consistent with our previous work, the posterior cingulate cortex (PCC) and retrosplenial cortex (RSC) display increased high-frequency broadband (HFB) power during autobiographical retrieval, and active HFB suppression during working memory (arithmetic calculation). Strikingly, the temporal profile of these responses is closely matched by HFB activity in the angular gyrus (AG). Furthermore, during suppression of the PCC/RSC and AG, more dorsal parietal regions display pronounced increases in HFB power. Subsequently, resting-state connectivity analysis showed that slow modulations (< 1 Hz) of HFB amplitude were highly correlated between the same PCC/RSC and AG electrodes. Indeed, the strength of these resting-state correlations positively correlated with the degree of task-related response within activated parietal subregions. Further analysis reveals that resting-state HFB correlations are mediated distally by theta band phase-phase synchrony and locally by theta-HFB phase-amplitude coupling. These findings provide important and complementary data for further understanding the cortical networks supporting episodic retrieval, and more generally the electrophysiological basis of resting-state network activity.

Biography

Brett Foster is a senior postdoctoral research fellow at Stanford University in the Laboratory for Behavioral and Cognitive Neurology. His research focuses on using intracranial recordings and stimulation in human neurosurgical patients to study human cognitive neurophysiology. His current work specifically focuses on the cognitive functions of the medial parietal cortex, particularly with regards to episodic memory retrieval.

S02 003: Oscillatory Memory Signals In The Hippocampus During Encoding, Retrieval And Sleep

Bernhard Staresina, Cambridge University, UK

While neuropsychological findings and functional imaging in healthy participants have intimately linked the human hippocampus to learning and memory, little is known about the oscillatory mechanisms underlying hippocampal functions. The first set of findings reported here examined hippocampal oscillations during successful associative encoding and retrieval. Interestingly, the same frequency patterns distinguished successful from unsuccessful performance during both stages – an increase in gamma power and a concomitant decrease in alpha power.

This raised the question whether and how hippocampal mechanisms would differ between the modes of encoding (pattern separation) and retrieval (pattern completion). Consistent with computational models, we found that the phase of a slow delta/theta oscillation around stimulus onset systematically differed between encoding and retrieval, suggesting that ongoing phase is used to code different mnemonic states in the hippocampus. The second part of the talk describes hippocampal oscillations during sleep. The most prominent electrophysiological signatures related to consolidation processes during sleep are slow oscillations, spindles and high gamma bursts/ripples. Here we used cross-frequency-coupling analyses to assess whether and how these phenomena exist and interact in the hippocampus during different sleep stages. We found that during slow-wave-sleep, the phase of the slow oscillation systematically grouped and modulated spindles and gamma bursts. The relation of these mechanisms to episodic memory performance will be discussed.

Biography

Bernhard Staresina is a Sir Henry Wellcome Postdoctoral Fellow at Stanford University, Cambridge University and the University of Bonn. His research aims to elucidate the role of the Medial Temporal Lobe (MTL) in episodic memory. Combining fMRI in healthy participants and iEEG in epilepsy patients, his recent work has focused on multivariate and oscillatory phenomena underlying the encoding and retrieval of memories.

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Award winning Australian Indigenous artist, Laurie Nilsen, was commissioned to design the conference logo with an Australian twist. Different aspects of the brain are highlighted showcasing various disciplines....all with traditional Aboriginal/Indigenous painting art styles.

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SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S03: Implications Of Age-Related Cerebrovascular Changes On Brain Structure And Function

Chair & Speaker: Monica Fabiani, University of Illinois at Urbana-Champaign, USA
Leeanne Carey, Florey Institute of Neuroscience and Mental Health, Australia
Kaarin Anstey, Australian National University, Australia
Todd Jolly, University of Newcastle, Australia

Overview

It is well established that aging is associated with structural brain changes and cognitive decline. However, the extent to which these age-related changes can be explained by cerebrovascular changes is yet to be determined. Monica Fabiani and Todd Jolly co-chair this symposium on cerebrovascular health in ageing, its association with brain structure and function and implications for age-related cognitive decline. Leeanne Carey will present findings on the changes to limbic-cortical networks and associated grey matter regions at 3 and 12 months post-stroke and how these changes provide insights into post-stroke depression. Kaarin Anstey will cover work that provides evidence of the importance of postural hypotension as a cardiovascular risk factor and its implications on cognitive aging. Monica Fabiani will show how lifestyle factors affect the cerebrovascular system and how this relationship impacts on age-related changes in brain structure and function. Todd Jolly will provide evidence for a link between intracranial arterial pulsatility and white matter microstructure and how they affect age-related deficits in cognitive control.

S03 001: Cerebrovascular Influences On Cognitive And Brain Aging

Monica Fabiani, University of Illinois at Urbana-Champaign, USA

Normal aging is characterized by changes in a number of cognitive processes, including aspects of sensory and working memory. These age-related changes in cognitive functions are accompanied by changes in the underlying brain anatomy, as well as by changes in cerebrovascular health. In turn, the status of the cerebrovascular system is heavily influenced by lifestyle factors, such as cardiorespiratory fitness (CRF). In my talk I will review some recent research from our laboratory aimed at examining the interrelationships between CRF, arterial elasticity (arteriosclerosis) and blood flow within the brain, age-related changes in brain anatomy and function and neuropsychological tests of working-memory.

Biography

Prof. Fabiani is a cognitive neuroscientist with over 20 years of experience in the study cognitive and brain changes during adulthood and aging. In this research she uses a number of neuroimaging tools, including electrophysiology (ERP and EEG), functional and structural MRI, as well as behavioral and neuropsychological methods. In addition, she has contributed to the development of diffuse fast optical imaging methods (the even-related optical signal, EROS) and has applied optical and MRI-based techniques to a number of studies investigating, among others, issues related to neurovascular coupling and cerebrovascular health in aging.

S03 002: Imaging Associates of Post-Stroke Depression: A Longitudinal Cohort Study

Leeanne Carey, Florey Institute of Neuroscience and Mental Health, Australia

Stroke and post-stroke depression are common and have a profound and ongoing impact on an individual's quality of life. However, reliable biological correlates of post-stroke depression and functional outcome have not been well established. Our aim was to identify biological factors, molecular and imaging, associated with post-stroke depression and functional outcome. A prospective, longitudinal cohort of 200 stroke survivors, the START - STroke imAging pRevention and Treatment cohort were investigated on admission, 24-hours, 3-days, 3-months and 12-months post-stroke for blood-based biological associates and at Day 3-7, 3-months and 12-months for depression and functional outcomes. A subgroup (n=50) were investigated for functional and structural brain changes in putative depression-related brain networks based on changes in intrinsic functional connectivity and white matter fibre tractography at 3 and 12 months. In addition to depression and functional outcomes, these patients were also tested for cognition and activity participation outcomes. In this session I will characterise associations between post-stroke depression and functional and structural connectivity in limbic-cortical networks at 3 and 12-months post-stroke. Evidence of associations between depression and functional and structural brain changes will provide new insights for models of post-stroke depression.

Biography

Professor Leeanne Carey heads the Neurorehabilitation and Recovery research group in the Stroke Division, Florey Institute of Neuroscience and Mental Health and is an Australian Research Council Future Fellow. Dr Carey's research program focuses on stroke rehabilitation and recovery: in particular how the brain adapts and how we might try to harness that potential in rehabilitation. She uses tools such as MRI to investigate changes in the brain and how this knowledge may be used to better understand recovery and target rehabilitation most optimally to individual stroke survivors. Research includes the impact of depression and cognition on stroke recovery.

S03 003: Interrelationships Among Self-Reported Orthostatic Hypotension, White Matter Hyperintensities And Hippocampal Volume In An 8-Year Longitudinal Study Of A Young-Old Cohort

Kaarin Anstey, Australian National University, Australia

Background: We hypothesised that orthostatic hypotension (OH) would be associated with white matter hyperintensities (WMH), hippocampal volumes and that depression would moderate this effect. Method: The sample comprised the oldest cohort of the PATH Through Life Project, aged 60-64 at baseline (n = 1920). Self-reported OH was recorded at waves 2 and 3. Brain MRI data were collected at three time points, 4 years apart (n=478, n=407, n=360) and depressive symptoms were measured by the Goldberg scale at each wave. Those with a history of stroke, epilepsy, diagnosed with dementia were excluded. Results: OH was reported by 22% of the sample at Wave 2 and was associated with depression at waves 2 and 3 (p<001). There were no cross-sectional associations between OH or depression, or OH and WMH at wave 2, or between OH and hippocampal volumes at waves 2 or 3. Eight-year changes in hippocampal volumes were predicted by OH at wave 2 (left hippocampus: OH*time =42.40; p=0.13 OH*time2=-5.31; p=.014; right hippocampus OH*time=38.68; p=.021 OH*time2=-5.27; p=.013). These associations were attenuated after adjustment for depression and other relevant covariates over time.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S03: Implications Of Age-Related Cerebrovascular Changes On Brain Structure And Function cont'd

Depression was the strongest predictor of volumetric change in the hippocampus (left hippocampus: depression*time =17.24; p=.004 depression*time2=-2.0; p=.006; right hippocampus: depression*time=15.71; p=.013 depression*time2 =--1.90; p=.013) although smoking and diabetes also contributed significantly to models. Conclusions: OH needs to be considered when evaluating the contribution of blood pressure to brain changes in older-age. These findings yield insights into the complex relationships between cardiovascular risk, depression and brain ageing.

Biography

Professor Kaarin Anstey is a Public Policy Fellow, Director of the Centre for Research on Ageing Health and Wellbeing, and the Dementia Collaborative Research Centre at the Australian National University. Her research interests include chronic disease and mental health, prevention of cognitive decline and dementia, life-span approaches to wellbeing, and impact of cognitive decline on productive ageing. She leads the PATH Through Life Project, an epidemiological study focussing on identifying risk and protective factors that influence mental health, cognitive decline and brain ageing from early to late adulthood, and an NHMRC Grant focussing on validating off-road tests for older drivers.

S03 004: The Role Of Arterial Pulsatility And White Matter Microstructure In Age-Related Cognitive Decline

Todd Jolly, University of Newcastle, Australia

Normal ageing is associated with a decline in many cognitive processes. However, it remains unclear whether age-related cognitive decline represents a normal maturation step or is mediated by subclinical pathological processes. We examined whether age-related decline in task switching performance can be explained by microstructural disruption within cerebral white matter and whether this white matter disruption may reflect perivascular damage occurring as a result of increased arterial blood flow pulsations. Seventy cognitively intact participants aged 43-87 years completed neuropsychological testing, a cued-trials task-switching paradigm with event-related potential recordings and MRI scanning (T1 structural, T2 weighted FLAIR sequence). Measures of blood flow were derived using a flow quantification phase-contrast sequence and microstructural white matter changes were calculated using DTI analyses on the diffusion-weighted imaging sequence. Findings suggest that age-related decline in task-switching performance is mediated by changes in white matter microstructure which, in turn, are influenced by the level of arterial pulsatility. We further examine whether the relationship between age-related decline in task-switching performance and white matter microstructure is specific to fronto-parietal and fronto-basal ganglia pathways associated with cognitive control.

Biography

Todd Jolly's research uses converging neuroimaging methodologies, including structural MRI, DTI and ERPs, to investigate the cognitive, vascular and structural brain changes associated with normal aging and mild ischaemic stroke. This is part of a collaborative, cross-disciplinary study between Psychology and Neurology researchers at the Priority Research Centre for Translational Neuroscience and Mental Health (CTNMH) at the University of Newcastle. His work is funded by the Hunter Institute of Medical Research and an Australian Postgraduate Award. Jolly is trained in FSL/freesurfer and completed the functional connectivity workshop at the Martinos Center at MGH in 2012.

S04: The Role of Brain Oscillations in Perception, Attention, and Memory

Chair & Speaker: Simon Hanslmayr, University of Birmingham, UK
Denes Szucs, University of Cambridge, UK
Nicholas Myers, University of Oxford, UK

Overview

There has been considerable interest in the past few years on the role played by neural oscillations throughout the cognitive processing spectrum, ranging across perception, attention, as well as short- and long- term memory. Experiments have examined the role of frequency, phase, and amplitude but also whether such oscillations arise naturally or from external entrainment, e.g., flicker, transcranial stimulation (magnetic and electrical). Our symposium will review a range of findings from a diverse set of approaches, suggesting that oscillations have a profound effect on human cognition. We will present evidence that entrainment at 10-16Hz (alpha, beta) has important implications for not only the complex attentional blink phenomenon but even on perception of a single target. Experiments using long-term memory paradigms will present convergent results from multi-modal imaging and rTMS studies demonstrating that decreases in beta oscillations causally mediate memory encoding. We will also show that the pre-stimulus oscillatory state of the brain including spontaneous fluctuations in the power and phase of alpha band oscillations affect not only working memory but even the conscious experience of stimuli.

S04 001: Decreased Beta Power As A Predictor Of Memory Encoding

Simon Hanslmayr, University of Birmingham, UK

In the past decades, research on brain oscillations and memory formation has strongly focused on the question of how synchronization, especially in the theta and gamma range, gives rise to the formation of memories. The role of power decreases, presumably reflecting local desynchronization, however has been mostly neglected although they are one of the most prominent features in EEG/MEG recordings during memory formation. Therefore, very little is known about the functional role of these power decreases for memory processing and how they mechanistically relate to the formation of memories. In this talk, recent studies from our lab will be presented where we investigated this issue and show that power decreases in the beta range are crucially important for memory formation. Specifically, results will be presented showing that beta power decreases occur in regions highly relevant for memory encoding such as the left inferior frontal cortex and are correlated with energy consumption therein. Moreover, memory formation is selectively impaired of these brain regions are artificially synchronized via repetitive transcranial magnetic stimulation in the beta frequency range. These results support a recently proposed model which assumes that power decreases reflect local desynchronization of neural assemblies and thereby enhance the information coding capacity of the memory system.

Biography

Since his PhD, which he received in 2005 from the University of Salzburg, Simon Hanslmayr's research is primarily concerned with the question of how brain oscillations mediate complex cognitive functions such as attention and episodic memory.

He has published 48 peer-reviewed papers in this area, some of which appeared in prestigious Journals such as Current Biology and The Journal of Neuroscience. Since 2010 Simon Hanslmayr is an independent PI of his own research group, funded by a prestigious Emmy-Noether Award from the German Research Council, and currently holds a Senior Lecturer position at the University of Birmingham.

S04 002: Pre-Stimulus Oscillations Determine Conscious Access In The Attentional Blink Task

Denes Szucs, University of Cambridge, UK

We used the attentional blink paradigm in combination with event-related brain potentials to examine whether the ongoing state of the brain before a stimulus can determine both conscious access and the post-stimulus neural events associated with consciousness. In a first study participants discriminated two target letters from digit distractors whilst their brain activity was being recorded. T2-detected trials were predicated by a fronto-central positive going deflection that started more than 200msec before the stream began. Accurate T2 detection was also accompanied by enhanced post-stimulus neural activity, as reflected by a larger P3b component. Prestimulus and post-stimulus markers of T2-detection were highly correlated with one another. We conclude that conscious experiences are shaped by potentially random fluctuations in neural activity. In a follow-up study we hypothesized that entraining ongoing oscillations with sensorial stimulation could influence temporal attention to assume an optimal processing state. In the pre-RSVP period, a rhythmic stream of auditory stimuli was employed to entrain temporal attention at the same frequency of the upcoming RSVP, whereas an arrhythmic stream was used as a control condition. T2 accuracy was improved following rhythmic entrainment. Enhanced perception was associated with increases in the posterior T2-evoked N2. Moreover, a frontal-right positivity and long-lasting oscillatory variations in the beta band were found to be crucial for the attentional system to exploit rhythmicity in the environment. Overall, the results suggest that endogenous fluctuations in the brain – before relevant stimuli appear – may be shaped by sensorial events in order to generate optimal cognitive performance.

Biography

Denes Szucs is senior lecturer at the Department of Psychology, University of Cambridge; Deputy Director of the Center for Neuroscience in Education and Official Fellow of Darwin College, Cambridge. Denes connects his basic research interests of neural oscillations in adults with the study of cognitive and emotional development of children. He has funded research programmes on EEG oscillations in the attentional blink; on developmental dyscalculia, working memory development and mathematics anxiety. Denes has been awarded a prestigious James McDonnell Foundation Investigator Award in 2013.

S04 003: Oscillatory Brain States and Variability in Visual Short-Term Memory

Nicholas Myers, University of Oxford, UK

Our capacity to remember and manipulate objects in visual short-term memory (VSTM) is severely limited. Moreover, current theoretical models predict that the precision of a memory representation can change substantially from trial to trial. We argue that fluctuations in neural excitability during stimulus encoding may contribute to this variability. Specifically, we hypothesized that the spontaneous state of slow oscillations (in the alpha band, 8-14 Hz), as an indicator of the state of cortical excitability, should correlate with trial-by-trial fluctuations in visual short-term memory. In EEG recorded from human observers during a visual short-term memory task, we found that the pre-stimulus desynchronization of alpha oscillations predicted the accuracy of memory recall. A model-based analysis indicated that this effect arises from a modulation in the fidelity of memorized items, but not the likelihood of remembering them, lending support to recent computational models of VSTM. We speculated that the pre-stimulus state of the visual system may modulate a cascade of state-dependent processes in the evoked signal, ultimately affecting behaviour. This proposal was borne out in a correlation of the visual evoked response with prestimulus alpha power and memory performance. Finally, the phase of posterior alpha oscillations preceding the memory item also predicted memory accuracy. Our results indicate that spontaneous changes in cortical excitability can have profound consequences for visual memory.

Biography

Nick is a PhD student at the University of Oxford, working with Anna Nobre and Mark Stokes at the Oxford Centre for Human Brain Activity. Nick studies the control of visual working memory, and how brain oscillations may act to organize such control. He uses modelling, EEG, MEG, and fMRI to look at these questions. He is also interested in how neural synchronization and working memory change during normal ageing and in Alzheimer's disease.

S04 004: Alpha And Beta Entrainment Affects Simple And Complex Perception

Simon Hanslamyr, University of Birmingham, UK

Recent literature has been replete with reports of the involvement of brain oscillations in many higher-order human information processing functions, including perception, attention, and visual short-term memory (VSTM).

Since many such reports have focussed on demonstrating the mechanisms by which such oscillations work, e.g., phase resetting, frequency cross-coupling, there remains an important need to show how such mechanisms actually affect daily human behaviour. The present talk will focus on two such affects in the domains perception and attention. With regard to the latter, we use the attentional blink (AB) paradigm to show that this ubiquitous phenomenon occurs only in a relatively narrow oscillatory frequency range, alpha and beta. With regard to the former, we show that rapid serial visual presentation (RSVP) in the alpha range affects even single-target perception. These findings are consistent with the theoretical view that brain oscillations in the 8-20 Hz frequency range index the state of communication between the thalamus and cortex; a vital channel for perception in the human brain.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S05: Neural Indices Of Primitive Intelligence: From The Midbrain To Cortex

Co-Chair: Emeritus Professor Pat Michie, University of Newcastle, Australia
Co-Chair & Speaker: Manuel S. Malmierca, University of Salamanca, Spain
Sabine Grimm, University of Leipzig, Germany
Lauren Harms, University of Newcastle, Australia
Risto Näätänen, University of Arhus, Denmark

Overview

The ability of the auditory system to detect change in background sounds even in the absence of active attention is remarkable. Recent research indicates that this extraordinary sensitivity relies on a capacity to model regularities in background sounds, and that these perceptual achievements are based on properties that are encoded at the earliest stages of the auditory pathway. The term 'primitive intelligence' has been used to capture the ability of the auditory system to not only model simple and complex acoustic regularities but also to predict future events and detect violations of these predictions. In human electrophysiology, 'primitive intelligence' was first identified via the mismatch negativity or MMN — an event-related potential (ERP) evoked by the occurrence of a deviant sound. In this symposium, the four speakers will demonstrate 1) that embryonic aspects of the principles underpinning this remarkable capacity of the auditory system are evident already at the midbrain in both rodents (Malmierca) and humans (Grimm) and 2) that higher order aspects reflecting detection of events deviating from modelled regularities are only evident at a cortical level in both rodents (Harms) and humans (Näätänen). The latter properties also provide tools for investigating clinical conditions, such as schizophrenia.

S05 001: Stimulus-Specific Adaptation In The Subcortical Auditory Brain

Manuel S. Malmierca, University of Salamanca, Spain

Stimulus-specific adaptation (SSA) is the reduction in the responses to a common sound relative to the same sound when rare. It has been described in auditory cortex (AC; Ulanovsky et al., 2003) and in the auditory midbrain and thalamus (inferior colliculus (IC) and medial geniculate body (MGB). I will present our recent findings on recordings from single neurons in the IC and MGB of rats to an oddball paradigm. Our data indicates: 1) Most neurons in the non-lemnical divisions of the IC and MGB show strong SSA (Malmierca et al. 2009, Antunes et al., 2010); 2) the magnitude of adaptation in many IC neurons increases proportionally with frequency contrast and low probability of occurrence for deviant tones (Ayala et el., 2012). 3) SSA varies within the neuronal receptive field (Duque et al., 2012). 4) GABAergic (Pérez-González et al., 2012) and/or glycinergic inhibition plays a role in shaping SSA in the IC. 5) AC modulates the responses of neurons in a gain control manner but SSA in the MGB is not inherited from AC (Antunes et al., 2011) and 6) Acetylcholine modulates SSA. Our results suggest that SSA can be generated in a bottom-up manner throughout the auditory pathway and are congruent with the notion that subcortical SSA can contribute upstream to the generation of MMN. Funding: Supported by the Spanish MINECO (BFU2009-07286) and (EUI2009-04083) in the frame of the ERA-NET NEURON to M.S.M. D.D. held a fellowship from the Spanish MEC (BES-2010-035649).

Biography

Professor Manuel Malmierca, MD completed his doctoral training in Neuroanatomy at the University of Oslo. After postdoctoral training in Neurophysiology at the University of Newcastle-upon-Tyne, and a senior Research Fellowship at the University of Salamanca, he established and now directs the Auditory Neurophysiology Laboratory at the Institute of Neuroscience at the University of Salamanca and chairs the Neuroscience PhD program. He is an editor and a member of the editorial boards of journals such as Hearing Research, JARO and PLOS One. His primary research interest is in determining which subdivisions and relay stations of the auditory brain exhibit stimulus specific adaptation.

S05 002: Early Occurrence Of Auditory Change Detection In The Human Brain

Sabine Grimm, University of Leipzig, Germany

The ability to detect novel information quickly, such as rare or non-regular auditory events, reflects a basic organizational principle of the auditory system. In humans, change detection based on acoustic regularity modeling has been linked to an EEG-derived brain response, MMN. MMN has its main generators in auditory cortex and peaks at 100-200 ms from change onset. Yet, recent single- and multi-unit recordings in animals have shown much earlier (20-50 ms) novelty-related responses at multiple levels of the auditory pathway (A1, medial geniculate body, inferior colliculus). Multiple findings obtained in our laboratory using EEG and/or MEG to measure the Frequency Following Response (FFR), Middle Latency Response (MLR), and MMN will be presented which suggest that human auditory regularity encoding and novelty detection occurs at multiple latencies and stages along the auditory pathway. Violations of simple regularities can be already detected at the level of the brainstem or generators of the MLR, probably reflecting activity in the vicinity of primary auditory cortex.

Violations of more complex regularities do not elicit differential activation before the MMN time range, reflecting the differential activation of later stages. In congruence with animal findings, results support the view that novelty detection occurs at multiple stages of the auditory system, from lower levels of the auditory pathway in the brainstem to higher-order cortical areas. Funding: Supported by Consolider-Ingenio 2010 (CDS2007-00012), National Program for Fundamental Research (PSI2012-37174), ERANET NEURON project PANS (EUI2009-04086), Bial Foundation 12/30 (Portugal), Catalan Government (SGR2009-11), and ICREA Academia Distinguished Professorship awarded to Carles Escera.

Biography

Dr Sabine Grimm recently took up the position of Assistant Professor at the Institute of Psychology, University of Leipzig where she also completed her doctoral training in 2006. Subsequent to the award of her PhD, she held a prestigious Postdoctoral Fellowship at the University of Barcelona in the Cognitive Neuroscience Group under the guidance of Professor Carles Escera. She has published numerous papers and reviews on early deviance detection in the auditory system.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S05 003: Mismatch Responses To Frequency Deviants In The Surface EEG Of Awake, Freely Moving Rats: A Platform For Examining Pharmacological And Developmental Animal Models Of Schizophrenia

Lauren Harms, University of Newcastle, Australia

There is still controversy about whether mismatch responses to oddball sounds extracted from surface EEG recordings in the rat meet the criteria for deviance detection. Here I will describe a series of recent experiments that attempt to resolve this controversy. The impetus for this research is the fact that reduction in MMN amplitude is one of the most robust neurobiological observations in patients with schizophrenia. Therefore, we aimed to develop a rat model to facilitate investigations of the underlying neurobiology and pharmacology of MMN and obtain insights into the cause(s) of reduced MMN in patients.

The methodology that we adopted includes control conditions that control for differences in adaptation, probability and stimulus attributes but also prevent the modeling of regularity in sound sequences. Using these controls, we find evidence of deviance effects in both early (20 - 50 ms) and late (>60 ms) components of the rat ERPs to high frequency sounds but not low frequency sounds (see also Nakamura et. al, 2011). Together with previously published data, these data demonstrate that robust mismatch responses can be observed in the awake rat, enabling future investigations of the major neurotransmitter and cellular mechanisms underlying deviance-detection in rats and of MMN in an animal model of an environmental risk factor for schizophrenia. Funding: Supported by NHMRC project grant APP1026070, Near Miss Grant from University of Newcastle, CAPEX grant from Faculty of Science & IT, University of Newcastle; Grant-in-Aid from Schizophrenia Research Institute.

Biography

Dr Lauren Harms was awarded her PhD in the field of Neuroscience from Queensland Brain Institute, The University of Queensland in 2012. Throughout her PhD and in her current role as a Postdoctoral Research Fellow at the University of Newcastle, her research has focused on developmental animal models of schizophrenia and how these can be used to model specific cognitive and electrophysiological features of schizophrenia.

S05 004: Primitive Intelligence Of The Human Brain As Indexed By The Mismatch Negativity (MMN)

Risto Näätänen, University of Arhus, Denmark

A large number of recent studies show that in audition, surprisingly complex cognitive processes occur automatically and mainly in the sensory-specific cortical areas. These processes include, among other things, stimulus anticipation and extrapolation, as well as sequential stimulus-rule, stimulus pattern, and pitch-interval extraction. Moreover, these complex automatic perceptual-cognitive processes, first found in waking adults performing a primary task in vision, occur similarly even in sleeping newborns, anesthesized rats, and deeply sedated healthy adult humans, suggesting that they form the common perceptual-cognitive core of cognitive processes in general, shared by different species, ontological stages, and states of consciousness. Consequently, these studies also suggest that MMN could be used in the objective assessment of cognitive abilities in healthy human subjects and in different clinical populations by recording it in paradigms targeting such complex sensory-cognitive processes. This might complement the objective assessment of cognitive abilities already demonstrated by some previous studies recording MMN to simple auditory changes.

Biography

Professor Risto Naatanen received his training in cognitive electrophysiology in the laboratories of Prof. D. B. Lindsley at UCLA, Los Angeles, CA. in 1965-6. He defended his Doctoral Thesis work on brain mechanisms of selective attention in the University of Helsinki in 1967 and served as Professor of General Psychology in the same university in 1975-83 when he was appointed as Academy Professor of The Academy of Finland for 1983-2007. Currently, he is Professor of Cognitive Neuroscience in the University of Tartu, Estonia and Visiting Professor at the Centre of Functionally Integrative Neurosciences (CFIN) in the University of Århus, Denmark.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S06: Cross-Modal Integration And Plasticity Of Sensory Systems In The Normal And Peripherally Deprived Brain

Chair & Speaker: Franco Lepore, University of Montréal, Canada
Krish Sathian, Emory University, USA
Stephen G. Lomber, University of Western Ontario, Canada
Amir Amedi, Hebrew University Jerusalem

Overview

The brain is well wired at birth in order to treat the unisensory and multisensory information to which it is exposed. However, it undergoes substantial transformations to adapt to its specific environment and capabilities. In the first presentation we show, using functional Magnetic Resonance Imaging (fMRI), how haptic stimuli recruit in a functionally specific manner brain structures related to visual objects and spatially related imagery. In the second, we compare deaf and hearing cats on a battery of visual cognitive tasks and show not only normal performance but, even more importantly, cross-modal compensation and superior performance for discriminating visually complex images of conspecific and human faces. The third presentation illustrates how super-performance for discriminating haptic and auditory stimuli in blind humans can be attributed to the recruitment of visually related areas as well as how auditory cortex is activated by visual stimuli, including faces in the deaf. The fourth presentation examines both how the blind treat sound and touch and how the technological development of Sensory Substitution Devices (SSD) using sound and touch can allow the rehabilitation of these sensory deprived individuals so that they can be more independent and 'see' in a manner similar to bats and dolphins.

S06 001: Cross-Modal Compensation And Plasticity In The Blind And Deaf : These Two Modalities Do Not Always Show Similar Outcomes

Franco Lepore, University of Montréal, Canada

It has been shown by various researchers that the early loss of a sensory system due to peripheral damage leads to the cross-modal takeover of the brain structures of the deprived system. In agreement with these findings, we showed that in blind individuals, the visual cortex is recruited by auditory and haptic stimuli and a proprioceptically defined angle discrimination. In the deaf, the auditory cortex is similarly colonized by visual inputs. We moreover show that the recruitment is carried out in a functionally specific manner : in the blind, the dorsal 'where' areas are recruited by localization tasks (identifying the position of a sound) and the ventral 'what' areas by identifying its pitch or vocal content. Similarly, in the deaf, discriminating randomnly moving dots recruits dorsal areas whereas identifying the shape created by similar but coherent stimuli recruits ventral areas. Using a prosthesis for substituting vision by audition (PSVA) and Transcranial Magnetic Stimulation (TMS), we confirmed these function related activations. We also show, using anatomical MRI and DTI, that structural modifications of various areas and axonal pathways permit us to explain these functional findings. At the behavioural level, we showed that blind subjects are better at auditory discrimination of simple or complex sounds as well as tactile and proproceptically definded objects. We could, however, not confirm this supra-performance in the deaf for discriminating faces and in fact the visual take-over of auditory areas interferes with language discrimination when complex visual stimuli are simultaneously presented.

Biography

Dr. Franco Lepore is professor and Chair of the CERNEC as well as the holder of a Canada Research Chair in Cognitive Neurosciences. He has worked on the theme of cross-modal plasticity of sensory systems in both blind and deaf individuals using imaging approaches (EEG, MEG, PET, MRI/fMRI) and the study of cognitve functions in humans, as well as rehabilitation using an auditory SSD in the blind and cochlear implants in the deaf, and single-cell recording in animals. He is funded by numerous agencies, including the Canadian Institutes of Health Research for the research to be presented

S06 002: Surface Vs Structural Properties Of Multisensory Object Representations

Krish Sathian, Emory University, USA

Visual imagery can be divided into object and spatial subtypes. Object imagery involves pictorial images that integrate surface properties, such as color and texture, with structural information about shape. In contrast, spatial imagery involves more schematic images, and tends to ignore surface properties while focusing on structural information and spatial transformations. We propose that haptic activation of the visually shape-selective lateral occipital complex (LOC) reflects a model of multisensory object representation in which the role of visual imagery is modulated by object familiarity. Functional magnetic resonance imaging (fMRI) studies from our laboratory support this model: visual object imagery shared similar patterns of effective connectivity with haptic perception of familiar (fHS) but not unfamiliar (uHS) shapes, whereas visual spatial imagery showed the opposite pattern, sharing effective connectivity patterns with uHS but not fHS. Individuals vary in their preference for visual object or spatial imagery. We showed that these imagery preferences also exist in haptically-derived representations, and that imagery preferences are stable across the visual and haptic modalities.

Ongoing studies in our laboratory suggest that auditory imagery can also be divided into two subtypes: "surface" imagers incorporated loudness patterns into their representation of melodies (equivalent to visuo-haptic object imagery) whereas "structural" imagers focused on the melodies at the expense of loudness patterns (equivalent to visuo-haptic spatial imagery). Thus, individual propensities for surface vs. structural representations characterize multiple sensory modalities, and are important considerations for sensory substitution approaches to individuals with sensory deprivation in one or other modality.

Biography

Dr. Krish Sathian is Professor of Neurology, Rehabilitation Medicine & Psychology at Emory University and Director of the VA Center of Excellence in Visual and Neurocognitive Rehabilitation, Atlanta, GA. He obtained his medical degree at Vellore, India, and a PhD in neuroscience from the University of Melbourne, Australia. His research in multisensory perception and neurorehabilitation is funded by the NIH, NSF and VA. A recipient of the Grafton Elliot-Smith award of the Australian Neuroscience Society, he serves as President of the American Society of Neurorehabilitation and is on the Editorial Boards of the Journal of Neuroscience and PLoS ONE.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S06 003: Enhanced Visual Cognition In The Congenitally Deaf

Stephen G. Lomber, University of Western Ontario, Canada

When the brain is deprived of input from one sensory modality, it often compensates with supernormal performance in one or more of the intact sensory systems. In the absence of acoustic input, it has been proposed that "deaf" auditory cortex may be recruited to perform visual cognitive functions. To test this hypothesis we examined the visual capabilities of adult congenitally deaf cats and adult hearing cats on a battery of visual cognitive tasks to define which visual abilities are involved in cross-modal compensation. The animals were tested on their abilities to both learn and recall pattern and object discriminations consisting of simple patterns (geometric black shapes), simple objects (geometric black objects), natural scenes (2-dimensional pictures), and faces (both human and conspecific). Both the deaf and hearing cats learned to discriminate the simple patterns, simple objects, and natural scenes at similar rates. However, the deaf cats were significantly faster at learning (fewer trials and errors to criterion) both the human and conspecific faces compared to the hearing cats. Abilities to recall any of the visual discriminations were no different between the hearing and deaf cats. These results demonstrate that deaf subjects possess enhanced visual cognitive abilities compared to hearing subjects. The next step in these experiments will be to examine the contributions of "deaf" auditory cortex to these enhanced visual cognitive functions.

Biography

Dr. Stephen G. Lomber is a Professor of Physiology and Psychology at the University of Western Ontario, where he is also an investigator in the Brain and Mind Institute and National Centre for Audiology. Dr. Lomber examines cortical plasticity utilizing animal models of human hearing, deafness, and the restoration of hearing with cochlear implants. Dr. Lomber has received numerous research and teaching awards, including the 2012 Dean's Award for Research Achievement from the Schulich School of Medicine and Dentistry. He has authored over 90 original research publications and two books – Reprogramming the Cerebral Cortex and Virtual Lesions.

S06 004: "Seeing" And Reading With The Ears: From Basic Research To Visual Rehabilitation

Amir Amedi, Hebrew University Jerusalem

My research focuses on blindness, which constitutes a unique model for answering fundamental questions in neuroscience. The work ranges from basic science, querying brain plasticity and sensory integration, to technological developments, allowing the blind to be more independent and even "see" using sounds and touch similar to bats and dolphins (a.k.a. Sensory Substitution Devices, SSDs), and back to applying these devices in research. The central hypothesis is that visual areas can process sound and touch to a similar extent as they process vision, but only when subjects learn to fully extract the relevant information encoded by these alternative senses. With proper training, many visual areas or networks can change the type of sensory input it uses to retrieve behaviorally (task)-relevant information within a matter of weeks. We also show that visual-like selectivity can develop without any visual experience. This may also have implications for clinical rehabilitation. To achieve this, we are currently developing several SSDs which encode the most crucial aspects of vision along with targeted, structured training protocols both in virtual environments and in real life scenarios.

For the results of such training and summary of the concept see: http://www.youtube.com/watch?v=jVBp2nDmg7E. Finally, SSDs can also be used in conjunction with invasive approaches for visual rehabilitation: the SSDs are used in training the brain to "see" prior to surgery, and in providing explanatory and augmentry signals (e.g. adding color, depth and, increased resolution).

Biography

Dr Amir Amedi is an internationally acclaimed brain scientist working towards enabling the blind to see through technologies he and his team develop to help the world's 45 million blind either using novel training approaches after bionic eyes implants or using non-invasive approaches. He is an Associate Professor at the Department of Medical Neurobiology at the Hebrew University's Faculty of Medicine and the new ELSC Brain Center. An alumnus of the University, he received his Ph.D. at the Interdisciplinary Center for Neural Computation and recently spent two years as an Instructor of Neurology at the Harvard School of Medicine

PANEL DISCUSSION OVERVIEW
AND SPEAKER BIOGRAPHIES

D01: Translational Cognitive Neuroscience: Understanding Attention And Multitasking On The Roadway

Chair & Speaker: **David Strayer**, University of Utah, USA
Paul Atchley, University of Kansas, USA
Jason McCarley, Flinders University, Australia

Overview

Driver distraction caused by multitasking is a significant source of injuries and fatalities on the roadway. This panel will discuss what basic cognitive and neuroscience research in the laboratory, driving simulator, and instrumented vehicle can tell us about the mechanisms underlying multitasking behavior. Our approach will sample from a wide variety of methods and techniques including sophisticated behavioral analysis using driving simulation and instrumented vehicles, measures of eye movement behavior, spectral EEG and ERP measures, as well as fMRI, and DTI from individuals with extraordinary multitasking ability. We will examine the factors that lead a person to multitask in the first place (and why they keep doing it) despite that fact that they readily acknowledge that it is dangerous (at least for others). We will also examine how multitasking impairs the sampling of information from the driving environment, suppressing visual scanning, impairing awareness of safety-critical objects in the drivers field of view, degrading the anticipation of potential hazards, and worsening situation awareness of the driving environment. We consider driving to be a complex skill that is supported by a hierarchical network of control that is differentially affected by different multitasking activities. Finally, we show individual differences in the efficiency of a frontal-mediated attentional network that supports multitasking in this real-world context.

D01 001

David Strayer, University of Utah, USA

Biography

Dr Strayer is a professor in the Department of Psychology at the University of Utah. He received his Ph.D. from the University of Illinois @ Urbana-Champaign in 1989. Dr. Strayer's research examines attention and multitasking using a variety of cognitive and neuroscience methods to examine this real-world behavior.

D01 002

Paul Atchley, University of Kansas, USA

Biography

Dr Atchley is a professor in the Department of Psychology at the University of Kansas. He received his Ph.D. from the UC-Riverside in 1996 and is an expert on driver distraction and factors that govern how and why drivers choose to multitask in the automobile.

D01 003

Jason McCarley, Flinders University, Australia

Biography

Dr McCarley is an associate professor in the Department of Psychology at Flinders University. He received his Ph.D. from the University of Louisville in 1997 and has used a variety of methods to study applied and basic aspects of perception, attention, and cognition.

ORAL PRESENTATION
ABSTRACTS

OP1: Methods Development

Carlo Miniussi, IRCCS Centro San Giovanni di Dio Fatebenefratelli, Italy
Peter Bell, Brain and Mind Research Institute, Australia
Chun-Yu Tse, The Chinese University of Hong Kong, Hong Kong
Michael Wagner, Compumedics, Germany

OP1 001: The Contribution of TMS-EEG Coregistration in the Exploration of the Human Connectome

Carlo Miniussi, IRCCS Centro San Giovanni di Dio Fatebenefratelli, Italy

Recent developments in neuroscience have emphasised the importance of integrated distributed networks of brain areas for successful cognitive functioning. Neuroimaging studies adopting analyses from the graph field of mathematics have shown that the brain architecture has a modular organisation in which segregated networks supporting specialised processing are linked through a few long-range connections, ensuring processing integration. Although such architecture is structurally stable, it appears to be flexible in its functioning, enabling long-range connections to regulate the information flow and facilitate communication among the relevant modules, depending on the contingent cognitive demands. Importantly, much of the current understanding of the brain architecture relays on measures of structural connectivity, reflecting anatomical connections, and of functional connectivity, reflecting the temporal correlations between cortical activity (Friston et al., 1993). These measures cannot fully explain the causal dynamics of connectivity and their relationship with cognition. Here we aim to highlight an emerging distinctive approach based on the direct activation of an area by transcranial magnetic stimulation (TMS) and the simultaneous evaluation of the distribution of this activity in cortical networks by electrophysiological recordings (EEG). By presenting TMS-EEG studies on network dynamics at rest and during cognition, and comparing them with fMRI-based functional connectomics, we will show how TMS-EEG data support the general principles of brain architecture inferred from graph theory and provide further insights into the properties of the functional connectome. Moreover, we will highlight the types of data that can be obtained through TMS-EEG, such as the timing of signal propagation, the excitatory/inhibitory nature of connections and, most importantly, causality of cortical interactions.

OP1 002: Exploring The Topology Of Network Convergence: Integration And Segregation In The Human Connectome

Peter Bell, Brain and Mind Research Institute, Australia

Introduction The human brain is organized into a scale-free neuronal architecture, consisting of specialized networks that dynamically communicate to create the vast array of human behavior. Although communication between large-scale neuronal networks is a fundamental organizational property of the brain, exactly how information is integrated across these networks has proven difficult to define. Here, we provide a novel, data-driven method for systematically exploring the topology of network integration within the human connectome.

Methods 3T resting state BOLD data was collected from 42 healthy adults. ICA was used to extract 9 networks that represented those most commonly assessed in the literature. To assess the topology of network convergence, we summed together binarized masks of each of the nine network components to create a map in which the intensity at each voxel reflects the extent to which the voxel is 'shared' across multiple network components. Further, we explored the extent of network cross-talk between each network component, providing novel graphical and statistical measures that represent estimates of the relative degree of segregation and integration within each individual neuronal network. Results Our data provide new insights into the functional organization of the human brain. We show that individual large-scale neuronal networks are markedly heterogeneous in their propensity to integrate information, shedding new light into the functions of human brain networks. Moreover, we demonstrate the existence of a central 'integrative core', that is well-positioned to support the convergence and integration of distributed global neural signals. Conclusions Our results provide new insights into how information is processed, transferred and distributed throughout the large-scale networks of the brain, helping to define the pathways of information flow within the human brain.

ORAL PRESENTATION
ABSTRACTS

OP1: Methods Development cont'd

OP1 003: Tracking Brain Plasticity in Cochlear Implant Patients Using the Event-Related Optical Signal (EROS)

Chun-Yu Tse, The Chinese University of Hong Kong, Hong Kong

Cochlear implants assist people with profound hearing loss to interact with the environment and to reestablish verbal communication, by replacing the function of damaged cochlear hair cells with direct stimulation of the auditory nerve. This process provides a unique opportunity for studying plasticity in the adult human brain. Changes in the fronto-temporal network involved in auditory sensory discrimination were tracked from before to after implantation (i.e., before the implant, at 2-weeks post-implant, and at 6-months post-implant) in six cochlear implant patients using the Event-Related Optical Signal (EROS). EROS measures changes in the way brain tissue scatters near-infrared light that are associated with neuronal activity. EROS has high resolution in both the temporal and spatial dimensions, as it can measure the time course of neuronal activity in localized brain regions. All participants suffered from post-lingual hearing loss in the high frequency range, but had some residual hearing in the low frequency range. Each imaging session included three types of stimulus blocks: high and low frequency auditory discrimination, and visual discrimination (control) blocks. Auditory blocks consisted of 100-ms (80%) and 50-ms (20%) tones while visual blocks consisted of vertical (80%) or horizontal (20%) black-and-white bars. Participants had to classify the stimuli according to the length of the tones or the orientation of the bars by button press. After implantation, larger improvements in accuracy were observed for the high-frequency than for the low-frequency blocks. This corresponded to an increase in activity in the high-frequency blocks at a latency of 100-200 ms after tone presentation, which was observed in temporal cortex in most participants and in frontal cortex in some participants. This is the first study demonstrating the feasibility of using EROS for monitoring brain reorganization associated with recovery of hearing ability after cochlear implant.

OP1 004: Analysis Of EEG/MEG Map Topographies And Source Distributions On The Epoch Level Using Non-Parametric Randomization Tests

Michael Wagner, Compumedics, Germany

In Event-Related Potential (ERP) and Event-Related Field (ERF) experiments, stimuli are presented repeatedly, and the subject's brain response is recorded using EEG or MEG, respectively. After artifact removal, epoching, and averaging, though, it is no longer possible to establish whether and for which latencies the averaged waveforms are significantly different between stimulus types, nor whether the epochs per stimulus type are consistent enough to warrant averaging them in the first place. A statistical analysis across epochs can provide exactly this information. Traditional statistical measures in channel space such as the t-test make disputable assumptions regarding repeatability and independence. Therefore, non-parametric methods have recently attracted attention for the analysis of ERPs and ERFs. In this contribution, a framework is proposed that allows the application of non-parametric methods such as Topographic Analysis of Variance (TANOVA) and Statistical non-Parametric Mapping of Current Density Reconstructions (CDR SnPM) not only to individual averages in the context of a group study but to the individual epochs themselves, even for single-subject data. Unlike described in previous publications, the statistical analysis is conducted sample-by-sample as opposed to using a maximum statistic over all samples. The then necessary multiple comparison correction is based on the spectral properties of the data. For CDR SnPM, in addition to a test for significant differences between conditions, a within-condition consistency test is used to justify testing for differences on a sample-by-sample basis. A visual Continuous Performance Task (CPT) EEG experiment eliciting Mismatch Negativity (MMN) is used to demonstrate the methods. Latencies and brain locations where the brain response differs significantly between stimulus types are consistent with what is known about the MMN.

POSTER SESSION 1

TOPICS IN THIS POSTER SESSION ARE:

TOPIC	CODE
Attention	MAT
Cognition and Executive Processes	MCE
Language	MLA
Memory and Learning	MML
Motor Behaviour	MMO
Sensation & Perception	MPE

Attention

MAT001: Electrophysiological Assessment of Attention Bias in Good vs. Poor Sleepers
Presented by: Ruth Ann Atchley, University of Kansas, USA
Authors: Ruth Ann Atchley, Natalie Stroupe

MAT002: Neural Responses To Heartbeats Dissociate The Self As The Subject And The Self As The Object During Spontaneous Thoughts
Presented by: Mariana Babo-Rebelo, Laboratoire de Neurosciences Cognitives / Ecole Normale Supérieure, France
Authors: Mariana Babo-Rebelo, Craig Richter, Catherine Tallon-Baudry

MAT003: Left-Handers Are Resistant To Drowsiness Induced Spatial Attention Bias
Presented by: Corinne Bareham, MRC Cognition and Brain Sciences Unit, UK
Authors: Corinne Bareham, Tristan Bekinschtein, Sophie Scott, Tom Manly

MAT004: Characterizing The Topology Of Attentional And Sensory Network Communication
Presented by: Peter Bell, Sydney University, Australia
Authors: Peter Bell, James Shine

MAT005: Role Of Modality-Specific Pre-Stimulus Oscillations In A Spatialized Temporal Order Judgment task. A Challenge To The "Gating-Through-Inhibition" Framework?
Presented by: Lars T Boenke, Leibniz Institute for Neurobiology, Germany
Authors: Lars T Boenke, Abdelhafid Zeghbib, David Alais, Frank Ohl

MAT006: Emotional Burden Effects on Attention and Executive Function in Family Caregivers of Alzheimer Patients
Presented by: Elke Bromberg, Pontifical Catholic University of Rio Grande do Sul, Brazil
Authors: Elke Bromberg, Mácio Corrêa, Kelem Vedovelli, Bruno Giacobbo, Carlos Souza, Daiane Lima, Leticia Beras, Irani Argimon

MAT007: Adult Developmental Trajectories Of Pseudoneglect In The Tactile, Visual And Auditory Modalities
Presented by: Joanna Brooks, Australian National University, Australia
Authors: Joanna Brooks, Stephen Darling, Catia Malvaso, Sergio Della Sala

MAT008: Object Exposure Is Not Critical For Object-Based Attention
Presented by: Cameron T Ellis, University of Auckland, New Zealand
Authors: Cameron T Ellis, Paul M Corballis, Anthony J Lambert

MAT009: Face-Sex Categorisation is Better Above-Fixation Than Below: Evidence From The Reach-to-Touch Paradigm
Presented by: Matthew Finkbeiner, Macquarie University, Australia
Authors: Matthew Finkbeiner, Genevieve Quek

MAT010: Neural Correlates Of Endogenous And Exogenous Attention In Touch: Evidence For Independent And Interdependent Mechanisms
Presented by: Bettina Forster, City University London, UK
Authors: Bettina Forster, Alexander Jones

MAT011: Exploring The Mechanisms That Support Attentional Bias Modification
Presented by: Gina Grimshaw, Victoria University of Wellington, New Zealand
Authors: Gina Grimshaw, Lisa Hunkin

MAT012: Electrophysiological Indices of Competition for Neural Resources in a Dual Working-Memory and Selective-Attention Task
Presented by: Dion Henare, University of Auckland, New Zealand
Authors: Dion Henare, Paul Corballis

MAT014: Effects Of Emotional States On Eye Movements During Visual Search
Presented by: Zhenlan Jin, University of Electronic Science and Technology of China, China
Authors: Zhenlan Jin, Ling Li

MAT015: Transcranial Direct Current Stimulation of the Right Inferior Parietal Cortex Modulates the Frequency of Task-Unrelated Thoughts
Presented by: Shogo Kajimura, Kyoto University, Japan
Authors: Shogo Kajimura, Yoshihiro Kadono, Michio Nomura

MAT016: Spatial Attention Influences Plasticity Induction in the Motor Cortex
Presented by: Marc Kamke, Queensland Brain Institute, The University of Queensland, Australia
Authors: Marc Kamke, Alexander Ryan, Martin Sale, Megan Campbell, Stephan Riek, Timothy Carroll, Jason Mattingley

POSTER SESSION 1

Attention cont'd

MAT017: The Neural Mechanisms For Working Memory Based Biased Attention To Food

Presented by: Sanjay Kumar, Oxford Brookes University, UK

Authors: Sanjay Kumar, Suzanne Higgs, Femke Rutters, Glyn Humphreys

MAT018: Efficacy of Attentional Modulation of Visual Activity in Visual Short-Term Memory

Presented by: Bo-Cheng Kuo, National Taiwan University, Taiwan

Author: Bo-Cheng Kuo

MAT019: Role of the Dorsal Visual Stream in Shifting Attention in Response to Peripheral Visual Information.

Presented by: Tony Lambert, University of Auckland, New Zealand

Authors: Tony Lambert, Adrienne Wootton, Nathan Ryckman, Jaimie Wilkie

MAT020: Mapping Development Of The MMN and P3a Potentials During Adolescence: A Longitudinal Investigation Of Healthy Individuals And Individuals At-Risk For Psychosis

Presented by: Kristin Laurens, University of New South Wales, Australia

Authors: Kristin Laurens, Jennifer Murphy, Hannah Dickson, Ruth Roberts

MAT021: Children's Performance on the Sustained Attention to Response Task: A Cross-Sectional Analysis of Age-Related Changes.

Presented by: Frances Lewis, University of Melbourne, Australia

Authors: Frances Lewis, Robert Reeve, Katherine A Johnson

MAT022: The Effect of Unconscious Emotional Faces on Spatial Attention: an ERP Study

Presented by: Ling Li, School of Life Science and Technology, University of Electronic Science and Technology of China, China

Authors: Ling Li, Xianxian Kong, Zhenlan Jin

MAT023: Speed-Accuracy Trade-Off Influences The Effect Of Attentional EEG Alpha Modulation

Presented by: Katharina Limbach, University of Auckland, New Zealand

Authors: Katharina Limbach, Paul M Corballis

MAT024: Listening Costs Associated With Shifts In Auditory Spatial Attention

Presented by: Gaven Lin, The University of Sydney, Australia

Authors: Gaven Lin, Simon Carlile

MAT025: Visuo-Spatial Attention Influences The Rate Of Evidence Accumulation During Perceptual Decision making

Presented by: Gerard Loughnane, Neural Engineering Trinity College Dublin, Ireland

Authors: Gerard Loughnane, Daniel Newman, Mark Bellgrove, Edmund Lalor, Simon Kelly, Redmond O'Connell

MAT026: Reduced Age-related Gray Matter Atrophy in Long-term Meditators within the Medial Occipital Lobe

Presented by: Eileen Luders, UCLA, USA

Authors: Eileen Luders, Florian Kurth

Cognition and Executive Processes

MCE001: Stroke patients with aphasia show impeded motor recovery: A story of mirror neurons in BA44.

Presented by: Deanna Anderlini, The University of Queensland, Australia

Authors: Deanna Anderlini, Guy Wallis, Timothy Carroll

MCE002: Metabolic Aberrations In Fronto-Parietal Brain Regions In Recently Detoxified Alcohol Dependent Individuals: Contribution To Impaired Abstract Reasoning Abilities

Presented by: Deepika Bagga, INMAS, India

Authors: Deepika Bagga, Namita Singh, Subash Khushu, Prabhjot Kaur, Mohan Garg, Debajyoti Bhattacharya

MCE003: Game-Based Training of Mental Flexibility: ERPs Suggest a Forward Shift of Control During Task Switching

Presented by: Guido Band, Leiden Institute for Brain and Cognition, Netherlands

Authors: Guido Band, Kerwin Olfers

MCE004: White Matter Matters For Grey(Ing) Areas: A Functional And Structural View Of Task Switching Dynamics In Middle-To-Old Age

Presented by: Pauline Baniqued, University of Illinois at Urbana-Champaign, USA

Authors: Pauline Baniqued, Kathy Low, Mark Fletcher, Nils Schneider-Garces, Chin Hong Tan, Benjamin Zimmerman, Gabriele Gratton, Monica Fabiani

MCE005: Who Jumps To Conclusions? A Comprehensive Assessment Of Probabilistic Reasoning In Psychosis Following Traumatic Brain Injury (PFTBI).

Presented by: Rachel Batty, Swinburne University of Technology, Australia

Authors: Rachel Batty, Andrew Francis, Neil Thomas, Malcolm Hopwood, Jennie Ponsford, Susan Rossell

MCE006: Executive Dysfunction In Psychosis Following Traumatic Brain Injury (PFTBI)

Presented by: Rachel Batty, Swinburne University of Technology, Australia

Authors: Rachel Batty, Andrew Francis, Neil Thomas, Malcolm Hopwood, Jennie Ponsford, Susan Rossell

MCE007: The Link Between Numerical Exposure at Home and Children's Exact Numerical Skills

Presented by: Carlo Semenza, University of Padova, Italy

Authors: Silvia Benavides-Varela, Brian Butterworth, Francesca Burgio, Giorgio Arcara, Daniela Lucangeli, Carlo Semenza

MCE008: Belief Updating Is Indexed By Single-Trial P3 Amplitude: A Neurocognitive Modelling Approach To EEG

Presented by: Daniel Bennett, University of Melbourne, Australia

Authors: Daniel Bennett, Stefan Bode, Carsten Murawski

MCE009: Induced Gamma-Band Activity Signals Awareness Of Change In A Bistable Percept During Wakefulness But Changes Dynamics With Sleep Onset

Presented by: Andrés Canales-Johnson, University of Cambridge, UK

Authors: Andrés Canales-Johnson, Daniela Cabezas, Carolina Silva, Francisco Olivares, Roberto García, Álvaro Rivera-Rei, Valdas Noreika, David Huepe, Robert Carlyon, Tristan Bekinschtein

MCE010: State-Dependent High Frequency Power Changes In Human Neonatal EEG

Presented by: Maya Cano, University of California, USA

Authors: Maya Cano, Rachel Kuperman, Kristopher Anderson, Robert Knight

MCE011: Fast Dynamics Of Domain-General Vs. Specific Neural Mechanisms Of Task Switching: Interactions Between The Frontoparietal And Spatial Orienting Networks

Presented by: Marcelina Chamielec, University of Balearic Islands, Spain

Authors: Marcelina Chamielec, Álvaro Darriba, Javier Villacampa, Rosa Martorell, Alejandro Gálvez, Francisco Barceló

POSTER SESSION 1

MCE012: Inhibitory Control Over Rewarding Stimuli In Opiate Dependent Participants
Presented by: Kathleen Charles-Walsh, University of Melbourne, Australia
Authors: Kathleen Charles-Walsh, Daniel J. Upton, Robert Hester

MCE013: Integrity Of The Grey/White Matter Border Is Associated With Cognitive Performance In Ageing: The PATH Through Life Project.
Presented by: Nicolas Cherbuin, Australian National University, Australia
Authors: Nicolas Cherbuin, Marnie Shaw, David H. Salat, Perminder S. Sachdev, Kaarin J. Anstey

MCE014: The Significance of Different Non-symbolic and Symbolic Magnitude Comparison Judgment Profiles in Children
Presented by: Cindy Chew, University of Melbourne, Australia
Authors: Cindy Chew, Robert Reeve

MCE016: Dissociable Visual Perception And Executive Functioning Processes In Typically Developing Adults With Varying Degrees Of Autistic-Like Characteristics.
Presented by: Philippe Chouinard, La Trobe University, Australia
Authors: Philippe Chouinard, Karisa Parkington, Becky Clements, Oriane Landry

MCE017: Hemispheric Specialization for Processing Arithmetic in Adults
Presented by: Veronica Connaughton, The University of Western Australia, Australia
Authors: Veronica Connaughton, Vicole Bothma, Azhani Amiruddin, Karen Cluniess-Ross, Noel French, Allison Fox

MCE018: Dissociable Frontoparietal Oscillatory Networks For Proactive and Reactive Control Characterised Using Complex Network Analyses
Presented by: Patrick Cooper, University of Newcastle, Australia
Authors: Patrick Cooper, Aaron Wong, Renate Thienel, Patricia Michie, Frini Karayanidis

MCE019: Myelin Paucity Of The Superior Cerebellar Peduncle In Individuals With Friedreich Ataxia: An MRI Magnetization Transfer Imaging study
Presented by: Louise Corben, Murdoch Childrens Research Institute, Australia
Authors: Louise Corben, Saman Kashuk, Hamed Akhlaghi, Sharna Jamadar, Martin Delatycki, Joanne Fielding, Beth Johnson, Nellie Georgiou-Karistianis, Gary Egan

MCE020: Cognition Early After Stroke Correlates Better With Regional Brain Volume Than White Matter Hyperintensity Volume
Presented by: Toby Cumming, Florey Institute of Neuroscience and Mental Health, Australia
Authors: Toby Cumming, Qi Li, Emilio Werden, Audrey Raffelt, Renee Lichter, Heath Pardoe, Amy Brodtmann

MCE021: Do Nicotine Dependent Subjects Show Differences In Response To Risk?
Presented by: Louise Curley, The University of Auckland, New Zealand
Authors: Louise Curley, Rob R Kydd, Ian J Kirk, Bruce R Russell, Robert Hester

MCE022: Fast Neural Dynamics Of A "Multiple Demand" Frontoparietal Network For Cognitive Control
Presented by: Francisco Barceló, University of the Balearic Islands, Spain
Authors: Francisco Barceló, Javier Villacampa, Rosa Martorell, Marcelina Chamielec, Alejandro Gálvez, Álvaro Darriba

MCE023: Brain Correlates of Creative Musical Activity
Presented by: Liudmila Dikaya, Southern Federal University, Russia
Authors: Liudmila Dikaya, Pavel Ermakov, Igor Dikiy

MCE024: Brain Cortical Patterns of Lying Responses Realization
Presented by: Igor Dikiy, Southern Federal University, Russia
Authors: Igor Dikiy, Pavel Ermakov, Liudmila Dikaya

MCE025: Brain Mechanisms Associated With Single And Dual-Tasks During Locomotion
Presented by: Shelley Duncan, Victoria University, Australia
Authors: Shelley Duncan, Derek Panchuk, Remco Polman

MCE027: Endogenous vs. Exogenous Action Inhibition: A TMS-EEG Study
Presented by: Stefania Ficarella, University of Trento, Italy
Authors: Stefania Ficarella, Lorella Battelli

MCE028: Effects of Pharmacological Blockade and Genotype of Serotonin Transporters on Response Inhibition and Post Error Slowing
Presented by: Adrian Fischer, Otto von Guericke University Magdeburg, Germany
Authors: Adrian Fischer, Christian Kubisch, Martin Reuter, Markus Ullsperger

MCE029: Neural Responses to Musical Consonance and Dissonance in the Human Superior Temporal Gyrus
Presented by: Francine Foo, University of California, Berkeley, USA
Authors: Francine Foo, David King-Stephens, Peter Weber, Kenneth Laxer, Josef Parvizi, Robert Knight

MCE030: Patterns Of Response Times For Enumeration, Number Comparison, Addition And Subtraction Are Different For Symbolic And Non-Symbolic Stimuli
Presented by: Jason Forte, University of Melbourne, Australia
Authors: Jason Forte, Robert Reeve

MCE031: Common And Distinct Electromagnetic Correlates Of Mental Travel In Time And Space
Presented by: Baptiste Gauthier, CEA/ Neurospin Center, France
Authors: Baptiste Gauthier, Karin Pestke, Virginie van Wassenhove

MCE032: Sleepy? Doing It Worst Without Noticing: Decrease In Performance But Not Confidence In Decision-Making While Falling Asleep
Presented by: Stanimira Georgieva, MRC Cognition and Brain Sciences Unit, UK
Authors: Stanimira Georgieva, Tristan Bekinschtein

MCE033: Working Memory Deficits In Individuals With Friedreich Ataxia: The IMAGE-FRDA Study
Presented by: Nellie Georgiou-Karistianis, Monash University, Australia
Authors: Nellie Georgiou-Karistianis, Monique Stagnitti, Gary Egan, Elsdon Storey, Martin Delatycki, Louise Corben

MCE034: An Aware Error Is A Salient Event: The Anterior Insula Assigns Salience To Aware Errors Through Interoceptive Mechanisms
Presented by: Elke Godefroid, Ghent University, Belgium
Authors: Elke Godefroid, Gilles Pourtois, Jan Wiersema

MCE036: Functional Brain Correlates Of Psychiatric Function In Huntington's Disease: The Image-HD Study
Presented by: Shannon Driscoll, Monash University, Australia
Authors: Shannon Driscoll, Govinda Poudel, Julie Stout, Juan Dominguez, Andrew Churchyard, Phyllis Chua, Gary Egan

POSTER SESSION 1

Language

MLA001: Tracking The Emergence Of Meaning In The Brain During Natural Story Comprehension
Presented by: Phillip M. Alday, University of Marburg, Germany
Authors: Phillip M. Alday, Jona Sassenhagen, Ina Bornkessel-Schlesewsky

MLA002: An Event-Related Potential Study Of Sentence Processing In Parkinson's Disease
Presented by: Anthony Angwin, The University of Queensland, Australia
Authors: Anthony Angwin, Nadeeka Dissanayaka, Katie McMahon, Peter Silburn, David Copland,

MLA003: Lexical Representation For Oral Reading And Writing/Spelling: Evidence From Aphasia
Presented by: Venugopal Balasubram, Seton Hall University, USA
Authors: Venugopal Balasubram, Maha Aldera, Maureen Costello

MLA004: The neurobiology of language: in defense of a nonhuman primate model
Presented by: Ina Bornkessel-Schlesewsky, University of South Australia, Australia
Authors: Ina Bornkessel-Schlesewsky, Matthias Schlesewsky, Steven Small, Josef Rauschecker

MLA005: An MEG Study Of Semantic Competition In Picture Naming
Presented by: Jon Brock, Macquarie University, Australia
Authors: Jon Brock, Erin Martin, Paul Sowman

MLA006: Practice Makes Perfect: Training The Interpretation Of Emotional Ambiguity
Presented by: Jessica Clifton, Victoria University of Wellington, New Zealand
Authors: Jessica Clifton, Gina M. Grimshaw

MLA007: The Impact of Phonological Similarity between First and Second Language on Lexical Access during Overt Speech Production: An ERP Study
Presented by: Manfred F. Gugler, Max Planck Institute for Human Cognitive and Brain Sciences, Germany
Authors: Manfred F. Gugler, Jana Aurig, Hellmuth Obrig, Sonja Rossi

MLA008: Evidence for Predictive Coding in Human Auditory Cortex
Presented by: Christopher Holdgraf, Uuniversity of California, Berkeley, USA
Authors: Christopher Holdgraf, Wendy de Heer, Jochem Rieger, Brian Pasley, Robert Knight, Frederic Theunissen

MLA009: Perinatal Testosterone Exposure and Cerebral Lateralisation in Adult Males: Evidence for the Callosal Hypothesis
Presented by: Lauren Hollier, The University of Western Australia, Australia
Authors: Lauren Hollier, Murray Maybery, Jeffrey Keelan, Martha Hickey, Andrew Whitehouse

MLA010: fMRI Reveals Atypical Processing Of Letters And Speech Sounds In Beginning Readers At Family Risk For Dyslexia
Presented by: Katarzyna Jednoróg, Nencki Institute of Experimental Biology, Poland
Authors: Katarzyna Jednoróg, Anna Banaszkiewicz, Katarzyna Chyl, Agnieszka Dębska, Magdalena Łuniewska, Agata Żelechowska, Marek Wypych, Artur Marchewka

MLA011: Measurement Of Auditory Brain Function In Cochlear Implant Recipients Using MEG
Presented by: Blake Johnson, Macquarie University, Australia
Authors: Blake Johnson, David Meng, Stephen Crain

MLA012: Structural Connectivity Of Left Cortical Speech Regions Defined By Direct Cortical Stimulation During Awake Language Mapping
Presented by: Christian Kell, Goethe University, Germany
Authors: Christian Kell, Pavel Hok, Silke Fuhrmann, Ines Kropff, Marie-Therese Forster, Christian Senft, Volker Seifert

MLA013: Language Lateralisation And Cognitive Performance During Infancy
Presented by: Mark Kohler, University of South Australia, Australia
Authors: Mark Kohler, Jessica Hofmann, Atlanta Flitton, Rachael Spooner, Nicholas Badcock, Owen Churches, Hannah Keage

MLA014: A MEG Study of Auditory Verbal Hallucinations And Inhibition In Patients With Schizophrenia.
Presented by: Sarah Lancaster, Swinburne University of Technology, Australia
Authors: Sarah Lancaster, Susan Rossell, Matthew Hughes, William Woods

MLA015: Intonation Processing Deficits Among Mandarin Chinese Speakers With Congenital Amusia: An ERP Study
Presented by: Xuejing Lu, Macquarie University, Australia
Authors: Xuejing Lu, Daxing Wu, Fang Liu, William Forde Thompson

MLA016: R34D1NG W0RD5 W1TH NUMB3R5: Electrophysiological Evidence for Semantic Activation
Presented by: Nicole Martin, Oregon State University, USA
Authors: Nicole Martin, Mei-Ching Lien, Philip Allen

MLA017: Transcranial Direct Current Stimulation in Mild Cognitive Impairment: Behavioral Effects and Neural Mechanisms
Presented by: Marcus Meinzer, The University of Queensland, Australia
Authors: Marcus Meinzer, Robert Lindenberg, Mai Thy Phan, Lena Ulm, Carina Volk, Agnes Flöel

MLA018: Subcortical Links In Bilingual Language Representation
Presented by: Amanda Miller Amberber, University of New South Wales, Australia
Authors: Amanda Miller Amberber, Lyndsey Nickels, Max Coltheart, Stephen Crain

Memory & Learning

MML002: Neurophysiological Markers Of Perceptual Learning In Awake And Sleeping Humans
Presented by: Thomas Andrillon, Ecole Normale Superieure, France
Authors: Thomas Andrillon, Daniel Pressnitzer, Trevor Agus, Damien Léger, Sid Kouider

MML003: The Neuroanatomical Layout Of V1 And Its Links To Individual Visual Imagery Strength And Precision
Presented by: Johanna Bergmann, University of New South Wales, Australia
Authors: Johanna Bergmann, Erhan Genç, Axel Kohler, Wolf Singer, Joel Pearson

MML004: Aging and Episodic Memory: The Role Of Attention In Hemispheric Asymmetry Reduction
Presented by: Badiâa Bouazzaoui, Francois Rabelais University, France
Authors: Badiâa Bouazzaoui, Gaën Plancher, Michel Isingrini, Lucie Angel, Laurence Taconnat, Sandrine Vanneste, Séverine Fay

POSTER SESSION 1

MML007: L-Dopa Improves Learning And Maintenance Of New Nouns In Healthy Adults

Presented by: David Copland, The University of Queensland, Australia

Authors: David Copland, Alana Campbell, Alicia Rawlings, Katie McMahon, Peter Silburn, Pradeep Nathan

MML008: The Role Of Stimulus Train Length In Mismatch Negativity (MMN) Abnormalities In Schizophrenia: A Comparison of the 'Roving' and 'Oddball' MMN Paradigms

Presented by: Rodney Croft, University of Wollongong, Australia

Authors: Sumie Leung, Lisa-marie Greenwood, Patricia Michie, Rodney Croft

MML009: Sleep Restores The Potential To Undergo Learning Induced Increases Of Corticomotor Excitability: New Evidence In Line With The Synaptic Downscaling Hypothesis

Presented by: Toon de Beukelaar, Catholic University of Leuven, Belgium

Authors: Toon de Beukelaar, Jago Van Soom, Nicole Wenderoth

MML010: ERP Evidence For Lifespan Differences In Feedback-Induced Learning: How The Processing Of Positive And Negative Feedback Changes From Childhood To Old Age

Presented by: Nicola Ferdinand, Saarland University, Germany

Authors: Nicola Ferdinand, Jutta Kray

MML012: Event-Related-Potentials Reveal An Age-Related Decline In Inhibition During A Working Memory Task

Presented by: Helen Gaeta, AUT University, New Zealand

Authors: Helen Gaeta, David Friedman

MML013: Acute Glycine Administration Increases Mismatch Negativity In Chronic Schizophrenia

Presented by: Lisa-marie Greenwood, University of Wollongong, Australia

Authors: Lisa-marie Greenwood, Sumie Leung, Patricia Michie, Amity Green, Pradeep Nathan, Paul Fitzgerald, Patrick Johnston, Nadia Solowij, Jayashri Kulkarni, Rodney Croft

MML015: Eye Fixation Patterns Support Improved Guidance As The Source Of Reduced Search Times In Contextual Cueing

Presented by: Anthony Harris, Queensland Brain Institute, The University of Queensland, Australia

Authors: Anthony Harris, Roger Remington

MML016: The Impact Of Sleep On Three-Ball Cascade Juggling

Presented by: Kerstin Hoedlmoser, University of Salzburg, Austria

Authors: Kerstin Hoedlmoser, Kathrin Bothe, Sabrina Tibi, Manuel Schabus

MML017: Multimodal Brain Imaging of Motor Sequence Learning

Presented by: YunYing Huang, The University of Oxford, UK

Authors: YunYing Huang, Chun-Yu Tse, Trevor Penney

MML022: Evidence For A Working Memory Construct Evolution Rather Than a "paradigm shift": A New Meta-Analysis Of Normative Functional Neuroimaging Studies of n-back Tasks

Presented by: Peter Goodin, Swinburne University of Technology, Australia

Authors: Gemma Lamp, Peter Goodin, Robin Laycock, Sheila Crewther

MML023: Inhibition Of Semantic Association: Evidence From Item Method Directed Forgetting

Presented by: Huang-Mou Lee, Chang Jung Christian University, Taiwan

Author: Huang-Mou Lee

MML025: What Makes A Picture Memorable For A Long Time – An fMRI Study Using Nencki Affective Picture System

Presented by: Artur Marchewka, Nencki Institute of Experimental Biology, Poland

Authors: Artur Marchewka, Marek Wypych, Abnoos Moslehi, Marcin Sińczuk, Katarzyna Jednoróg

MML026: Investigating the Electrophysiological Correlates of Rewards and Contingency in a Two-Alternative-Choice Procedure

Presented by: Stuart McGill, University of Auckland, New Zealand

Authors: Stuart McGill, Douglas Elliffe, Paul Corballis

MML027: Effects of Exercise Program Requiring Attention, Memory and Imitation on Cognitive Function in Elderly Persons

Presented by: Ryosuke Shigematsu, Mie University, Japan

Authors: Ryosuke Shigematsu, Tomohiro Okura, Masaki Nakagaichi, Yoshio Nakata

Motor Behaviour

MMO001: A TMS Investigation Of Dorsal And Ventral Premotor Regions In Arbitrary And Direct Motor Preparation

Presented by: Joshua Balsters, ETH Zurich, Switzerland

Authors: Joshua Balsters, Kathy Ruddy, Richard Carson, Nicole Wenderoth

MMO002: Decoding Attentional Shifts From Motor Preparatory Brain Activity

Presented by: Jeffery Bednark, The University of Queensland, Australia

Authors: Jeffery Bednark, Michelle Steffens, Ross Cunnington

MMO003: Does The Nervous System Search For A Less Painful Movement Strategy During Acute Elbow Pain?

Presented by: Michael Bergin, The University of Queensland, Australia

Authors: Michael Bergin, Kylie Tucker, Bill Vicenzino, Paul Hodges

MMO004: The Role Of Music Training In The Development Of Emergent And Event Timing Mechanisms

Presented by: Thenille Braun Janzen, Macquarie University, Australia

Authors: Thenille Braun Janzen, William Thompson, Ronald Ranvaud

MMO005: Inter-Limb Generalization Of Visuomotor Adaptation Is More Automatic When The Perturbation Is Aligned In Extrinsic And Joint-Based Coordinates

Presented by: Timothy Carroll, The University of Queensland, Australia

Authors: Timothy Carroll, Eugene Poh, Tania Duarte Ferreira, Aymar de Rugy

MMO006: Cellular Neuropathology Associated With Cognitive And Behavioural Dysfunction In A Mouse Model of Williams-Beuren Syndrome

Presented by: Cecilia Chin Roei Chang, University of New South Wales, Australia

Authors: Cecilia Chin Roei Chang, Cesar Canales, John Power, Anthony Hannan, Edna Hardeman, Stephen Palmer

MMO007: Movement-Related Neuromagnetic Fields In Preschool Age Children

Presented by: Douglas Cheyne, Hospital for Sick Children, Canada

Authors: Douglas Cheyne, Cecilia Jobst, Graciela Tesan, Stephen Crain, Blake Johnson

POSTER SESSION 1

Motor Behaviour cont'd

MMO008: The Direction Of Force Twitches Evoked By TMS In A Passive Limb Shift According To The Direction Of Impending Contralateral Muscle Activation

Presented by: Lilian Chye, The University of Queensland, Australia

Authors: Lilian Chye, Stephan Riek, Aymar de Rugy, Tim Carroll

MMO009: Do Action Goals Change Distractor Interference? Evidence For Top-Down Modulation Of Visual Attention In Action Space During Action Execution

Presented by: Hayley Colman, The University of Queensland, Australia

Authors: Hayley Colman, Roger Remington, Ada Kritikos

MMO010: Effect of Anodal tDCS on Cortical Activation During Response Preparation And Activation

Presented by: Alexander Conley, University of Newcastle, Australia

Authors: Alexander Conley, Jodie Marquez, Aaron Wong, Patrick Cooper, Mark Parsons, Frini Karayanidis

MMO012: Similarity of Finger And Hand Intermittent Corrective Movements

Presented by: Jason Friedman, Tel Aviv University, Israel

Authors: Jason Friedman, Lior Noy

MMO013: Using a Virtual Reality Paradigm to Explore known Triggers of Freezing of Gait in Parkinson's Disease.

Presented by: Moran Gilat, Brain and Mind Research Institute, University of Sydney, Australia

Authors: Moran Gilat, Mac Shine, Courtney Walton, Julie Hall, Sharon Naismith, Simon Lewis

MMO014: Interaction of Concurrent Motor Plans And Perceived Actions On Neural Oscillations

Presented by: Veronika Halász, Queensland Brain Institute, The University of Queensland, Australia

Authors: Veronika Halász, William Woods, Ross Cunnington

MMO015: Does Dancing Improve Fall Risk Due To Its Demands On Cognitive Effort?

Presented by: Dennis Hamacher, Otto von Guericke University Magdeburg, Germany

Authors: Dennis Hamacher, Daniel Hamacher, Kathrin Rehfeld, Anita Hökelmann, Lutz Schega

MMO016: Novel Adaptations In Motor Cortical Maps In Persistent Elbow Pain

Presented by: Paul Hodges, The University of Queensland, Australia

Authors: Paul Hodges, Siobhan Schabrun, Lucy Chipchase, Bill Vicenzino, Emma Jones

MMO017: Transcranial Direct Current Stimulation with an M1 / Orbitofrontal Montage shows No Effect on Simple Visual Motor Reaction Time

Presented by: Jared Horvath, University of Melbourne, Australia

Authors: Jared Horvath, Olivia Carter, Jason Forte

Sensation & Perception

MPE001: Effects Of Categorical Speech Perception During Active Discrimination Of Stop-Consonants And Vowels Within The Left Superior Temporal Cortex

Presented by: Christian Altmann, Kyoto University, Japan

Authors: Christian Altmann, Maiko Uesaki, Kentaro Ono, Masao Matsuhashi, Tatsuya Mima, Hidenao Fukuyama

MPE002: Tolerance For Local And Global Differences In The Integration Of Shape Information

Presented by: David Badcock, The University of Western Australia, Australia

Authors: David Badcock, James Dickinson, Jason Bell, Serena Cribb

MPE003: The Impact of Prior Expectations on Subliminal Priming

Presented by: Leonardo Barbosa, ENS LSCP, France

Authors: Leonardo Barbosa, Sid Kouider

MPE004: Imaginary Companions In Childhood: A Marker For Adulthood Schizotypal Traits?

Presented by: Emma Barkus, University of Wollongong, Australia

Author: Emma Barkus

MPE005: Functional Imaging of Cognitive Processes Underlying the Perception of Contemporary Visual Art

Presented by: Marion Behrens, Frankfurt University Hospital, Germany

Authors: Marion Behrens, Pascal Nicklas, Christian Kell

MPE006: Autistic Children Show More Efficient Parvocellular Visual Processing

Presented by: Alyse Brown, Latrobe University, Australia

Authors: Alyse Brown, David Crewther

MPE008: Effects of Motion Imagery and Motion Perception on Subsequent Conscious Perception

Presented by: Shuai Chang, University of New South Wales, Australia

Authors: Shuai Chang, Joel Pearson

MPE009: Subjective Stimulus Duration Depends on Visual Field Location

Presented by: Xiaoqin Cheng, National University of Singapore, SIngapore

Authors: Xiaoqin Cheng, Katrin Kliegl, Anke Huckauf, Trevor Penney

MPE010: A Study On Visual And Semantic fMRI-Adaptation Using A Normal Range Analogue Of Autism

Presented by: Philippe Chouinard, La Trobe University, Australia

Authors: Philippe Chouinard, Oriane Landry, Melvyn Goodale

MPE011: Hemispheric Differences In Auditory Temporal Integration As Indexed By The T-Complex Of The Auditory Event-Related Potential

Presented by: Karen Clunies-Ross, The University of Western Australia, Australia

Authors: Karen Clunies-Ross, Allison Fox, An Nguyen, Christopher Brydges, Veronica Connaughton

MPE012: To Mu is to Move, to Tau is to Understand: a Possible Functional Role for Lower Alpha Oscillations in Human Speech Perception.

Presented by: Bernadine Cocks, University of South Australia, Australia

Authors: Bernadine Cocks, Graham Jamieson, Ian Evans

MPE013: Dynamic Systems In Human Face Recognition: A Novel Face Processing Model

Presented by: William Comfort, Federal University of ABC, Brazil

Authors: William Comfort, Yossi Zana

POSTER SESSION 1

MPE014: Atypical Brainstem Responses To Repeated Amplitude?Modulated Sounds In Children Diagnosed With Autism Spectrum Disorders

Presented by: Miriam Cornella, University of Barcelona, Spain

Authors: Miriam Cornella, Sumie Leung, Amaia Hervàs, Jordi Costa-Faidella, Isabel Rueda, Sabine Grimm, Carles Escera

MPE016: Attention to Global and Local Features of Letter Stimuli Modulates Early Visual Processing

Presented by: Scott Coussens, University of South Australia, Australia

Authors: Scott Coussens, Owen Churches, Mark Kohler, Hannah Keage

MPE017: Relative Timing Of Initial Striate And Extrastriate Visual Cortical Activations Using Human Magnetic Evoked Fields

Presented by: David Crewther, Swinburne University of Technology, Australia

Authors: David Crewther, Alyse Brown, Laila Hugrass

MPE018: Persistent Order-Driven Biases In Auditory Relevance-Filtering Processes – A Mismatch Negativity (MMN) study

Presented by: Karlye Damaso, University of Newcastle, Australia

Authors: Karlye Damaso, Daniel Mullens, Lisa Whitson, Alexander Provost, Andrew Heathcote, Istvan Winkler, Juanita Todd

MPE019: Are Multisensory Inputs Integrated Automatically In BodyRrepresentation?: The Effect of Perceptual Lad on Visuo-Proprioceptive Itegration

Presented by: Harriet Dempsey-Jones, The University of Queensland, Australia

Authors: Harriet Dempsey-Jones, Ada Kritikos

MPE020: The Influence of Pre-Specified Targets on Categorisation Tasks

Presented by: Natalie Doring, Southern Cross University, Australia

Authors: Natalie Doring, Anna Brooks, Rick Van Der Zwan

MPE021: Goal-Directed Pointing Enhances Target Identification In Object Substitution Masking

Presented by: Eve Dupierrix, Queensland Brain Institute, The University of Queensland, Australia

Authors: Eve Dupierrix, Jason. B Mattingley

MPE022: How a Model of Object Recognition Learns to Become a Model of Face Recognition

Presented by: Guy Wallis, The University of Queensland, Australia

Author: Guy Wallis

KEYNOTE ABSTRACTS

KEY004: Hubs In Brain Structure And Function

Keynote Speaker: Professor Olaf Sporns, Indiana University, USA

Overview

Recent years have seen significant advances in mapping structural and functional brain connectivity across several species, including humans. One persistent finding has been the presence of highly connected and/or highly central brain regions, so-called network hubs. This talk will focus on the structural and functional roles of network hubs in the human brain. I will discuss how hubs are defined and detected in structural and functional network data, and what predictions network models make about their contribution to signaling and communication processes. I will end by reviewing recent work on how brain hubs are linked into "cores" or "rich clubs" and what this type of network architecture can tell us about integrative brain function.

KEY005: Imaging And Stimulating Adaptive Brain Plasticity

Keynote Speaker: Professor Heidi Johansen-Berg, University of Oxford, UK

Overview

Animal studies show that the adult brain shows remarkable plasticity in response to learning or recovery from injury. Non-invasive brain imaging techniques can be used to detect systems-level structural and functional plasticity in the human brain. This talk will focus on how brain imaging has allowed us to monitor healthy brains learning new motor skills, to assess how brains recover after damage, such as stroke, and how they adapt to change, such as limb amputation.

Although imaging is useful to detect such adaptations, many brain imaging measures are non-specific and do not allow us to pinpoint the underlying cellular changes that are driving observed effects. The talk will also discuss studies in animal models in which both imaging and histological approaches can be used to shed light on the underlying biological drivers for structural plasticity detected using MRI.

Finally, the talk will discuss how brain stimulation can be used to manipulate brain remodelling. For example, using transcranial direct current stimulation (tDCS) to the motor cortex we can speed people's learning of a new task, alter their brain chemistry, or improve function in stroke patients. FMRI identifies changes in cortical activity that may mediate these functional benefits. In future, imaging could be used to guide individually targeted brain stimulation to enhance adaptive brain plasticity.

S07: Understanding High-Level Vision, Attention And Decision Making By Means Of Frequency-Tagging EEG

Chair & Speaker: Bruno Rossion, University of Louvain, Belgium
Professor Jason Mattingley, The University of Queensland, Australia
Bruno van Swinderen, Queensland Brain Institute, Australia
Redmond O'Connell, Trinity College Dublin, Ireland

Overview

Periodic visual stimulation leads to periodic brain responses measured by the electroencephalogram (EEG), the so-called "steady-state visual evoked potentials" (SSVEPs, Regan, 1966). This approach has many advantages over other cognitive neuroscience methods, in particular its objectivity (i.e., the signal is measured at a frequency known by the experimenter), its high signal-to-noise ratio, and the possibility to record from different visual stimuli presented concurrently ("frequency-tagging"). Yet, this approach remains underestimated in cognitive neuroscience, having been so far essentially confined to the study of low-level visual stimuli. The four speakers of this symposium (Mattingley, Rossion, van Swinderen, and O'Connell) have all performed a series of independent studies using the frequency-tagging EEG technique over recent years. Their presentations will illustrate how this approach can capture various key aspects of visual perception (including perceptual integration), selective attention and perceptual decision making, both in healthy humans and clinical populations as well in the simplest animal brains such as bees and flies.

S07 001: Objective Evidence For Perceptual Integration By Means Of Frequency-Tagging EEG

Bruno Rossion, University of Louvain, Belgium

The human face is often considered as the quintessential whole, or Gestalt. However, objective evidence that the whole of a face is more than the sum of its parts is still lacking. In a series of studies, we have used a paradigm based on periodic visual stimulation of whole faces (Rossion & Boremanse, 2011) and frequency-tagging (Regan & Heron, 1969) to investigate the mechanisms of perceptual integration in the human brain. During EEG recording, the left and right halves of a face, or its top and bottom halves, were contrast-modulated with different frequencies (f1: 5.87 Hz; f2: 7.14 Hz) so that the responses to each of the two halves presented simultaneously could be distinguished objectively. In general, these part-based responses were located over low-level visual areas and remained unchanged following spatial misalignment or separation of the face parts, or inversion of the whole face. Most importantly, there were intermodulation components (IMs: f1-f2: 1.26 Hz; f1+f2= 13.01 Hz) over the right occipito-temporal hemisphere, reflecting the nonlinear interaction of the two input frequencies. The magnitude of the IM components decreased substantially and specifically with spatial misalignment/separation of the face parts, or with face inversion. These IMs constitute an objective trace of a unified face representation in the human brain, demonstrating that the whole of a face is more than the sum of its parts and opening an avenue for the study of perceptual integration in the human brain.

Biography

Bruno Rossion is director of research at the National Research Fund in Belgium, University of Louvain. He has authored over 100 scientific publications in international peer-reviewed journals on the topic of face perception, using a diversity of approaches: behavioral measures (psychophysics), human electrophysiology (ERPs, EEG), neuroimaging (PET, fMRI), eye movements, single-case studies of brain-damage patients (prosopagnosia), behavioral and EEG studies of infants and children, and human intracerebral recordings and electrical stimulations (http://face-categorization-lab.webnode.com//). Over the past few years, he has developed an approach based on periodic visual stimulation to understand individual face discrimination and perceptual integration.

SO7 002: Using Frequency Tagging To Measure Visual Perception And Selective Attention In Health And Disease

Jason Mattingley, University of Queensland, Australia

Electroencephalography (EEG) studies employing event-related potentials (ERPs) have been particularly successful at characterising instantaneous changes in the amplitude and timing neural signals associated with perceptual and cognitive events. In many situations, however, the neural events of interest unfold over prolonged timescales that can last for several seconds or even minutes. In these circumstances, a more fruitful approach is to employ steady-state evoked potentials (SSEPs), in which several competing stimuli are flickered continuously, and their unique neural signatures recovered from the EEG trace using frequency-based analyses. We have used such "frequency tagging" methods, combined with EEG, to measure various aspects of visual perception and selective attention, in health and disease. Here I provide an overview of these investigations. At the level of early visual perception, we have used frequency tagging to reveal the neural correlates of amodal completion of visual surfaces hidden behind occluding objects. We have used analogous approaches to show that feature-based attention spreads to ignored locations during conjunction search, but not during unique feature search, and that this spread of attention reflects active enhancement of target-coloured items at irrelevant locations. In more recent work we have employed frequency tagging to compare the influence of spatial attention on neural responses to visible and invisible phase-scrambled targets embedded in dynamic noise. Finally, we have adapted several of these paradigms to investigate anomalous visual processing in parietal-lesioned patients with unilateral spatial neglect, and in macular degeneration patients suffering from visual hallucinations.

Biography

Professor Jason Mattingley is Foundation Chair in Cognitive Neuroscience at the Queensland Brain Institute and School of Psychology, University of Queensland. He is an Australian Research Council Laureate Fellow, has been awarded the Australian Psychological Society's Distinguished Contribution to Psychological Science Award, and is an elected Fellow of the Academy of Social Sciences in Australia. Professor Mattingley's research is directed at understanding the neural and cognitive mechanisms that underlie selective attention in health and disease, with a particular focus on how attentional processes influence multisensory integration, motor planning, neural plasticity and consciousness. He has published extensively in high impact journals including Science, Nature, Neuron, Current Biology and Nature Neuroscience.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S07: Understanding High-Level Vision, Attention And Decision Making By Means Of Frequency-Tagging EEG cont'd

SO7 003: Behavioural, Electrophysiological, And Genetic Approaches To Studying Top-Down Visual Attention In Insects

Bruno van Swinderen, Queensland Brain Institute, Australia

Attention allows animals to respond selectively to competing stimuli. In humans and other primates, stimulus-selective responses can occur in the brain before behavioural actions, and this motivational form of attention has been referred to as a "top-down" process, to distinguish it from salience-driven or "bottom-up" attention. Whereas it is now established that even insects display bottom-up attention, at the level of both behavior and brain activity, it is unknown whether attention-like selection in the insect brain might also precede and predict behavioral choices. The case for top-down attention is especially compelling for honeybees, which have demonstrated cognitive capabilities such as the capacity to learn abstract concepts. To effectively relate predictive attention processes to behaviour, however, requires recording brain activity from behaving animals faced with competing choices. I will discuss a novel closed-loop visual attention paradigm for bees and flies that allows these questions to be effectively addressed. In honeybees, stimulus selectivity in the optic lobes was found to precede behavioural choices made by the animal. Replay of the same visual sequences, but without active control by the bee, widened the receptive field of frequency-tagged objects. The same experimental approaches were adapted to the fruit fly Drosophila melanogaster, a much smaller insect with a wide repertoire of genetic tools. These tools, such as the ability to transiently activate key neurotransmitter systems or brain structures, will allow for a better understanding of how bottom-up and top-down attention processes may be coordinated in the simplest animal brains.

Biography

Bruno van Swinderen is Associate Professor and ARC Future Fellow at the Queensland Brain Institute, where he heads a laboratory in cognitive and behavioural neuroscience. His laboratory uses insect model systems, such as flies and bees, to study complex phenomena such as visual selective attention, sleep, and general anaesthesia – with the overall goal to understand stimulus suppression mechanisms in the brain. To achieve this goal, a variety of techniques are used, including behavioural analysis, electrophysiology, and molecular genetic techniques.

SO7 004: A Window Onto The Basic Elements Of Perceptual Decision Making In The Human Brain

Redmond O'Connell, Trinity College Dublin, Ireland

A significant challenge associated with non-invasive recording techniques such as electroencephalography (EEG) is to isolate brain signals that can be directly linked to well-defined neural mechanisms. Here, I will present a series of novel human electrophysiological paradigms that make it possible to simultaneously monitor the key information processing stages intervening between sensation and action during simple perceptual decisions in discrete neural signals. Each of these paradigms involves monitoring continuously presented stimuli for gradual changes in a single sensory feature where the absence of discrete stimulus onsets provides a clear view of the neural computations underpinning decision formation in the trial-averaged EEG. Steady-state stimulation is utilized to generate a precise read-out of early sensory encoding and alpha- and beta-band activity provide independent spectral indices of attentional engagement and motor preparation respectively. This approach has yielded new insights into the neural implementation of perceptual decision making, the speed-accuracy tradeoff and visuo-spatial attention. I will also highlight the potential of this work to improve our understanding of cognitive deficits associated with age-related cognitive decline and attention-deficit/hyperactivity disorder.

Biography

Redmond O'Connell is Assistant Professor at the Trinity College Institute of Neuroscience and School of Psychology, Trinity College Dublin and is an Adjunct Senior Research Fellow at Monash University. Research in the O'Connell laboratory is seeking to understand the neural mechanisms underpinning high-level cognitive functions including decision making, performance monitoring and attention. This work comprises both basic and translational research and employs a range of psychophysiological techniques including EEG, fMRI, autonomic system measurement and transcranial stimulation.

LUNCH OPTIONS

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- Located in the Grey Street Ground Floor Foyer offering take-away coffee and snacks, daily specials, Mediterranean style tapas menu and bar (Open Monday - Wednesday 7am-3pm and Thursday - Saturday 7am-7.30pm)

Merivales Cafe Bar & Restaurant

- Located in the Merivale Street Main Foyer, offers gourmet sandwiches, cakes, pastries and coffee (Open from Monday – Friday from 8.00am - 3.00pm).

SO8: The Dynamic Brain

Claudio R. Mirasso, Institute for Cross-Disciplinary Physics and Complex Systems, Spain
Luis M. Martinez, Institute of Neuroscience, Alicante, Spain
Chair & Speaker: **Leonardo L. Gollo**, Queensland Institute for Medical Research, Australia
Michael Breakspear, Queensland Institute for Medical Research, Australia

Overview

Studying the dynamics of brain activity is fundamental to a deeper understanding of its core computational mechanisms. Modelling and simulating the dynamics of large-scale brain activity is a rapidly emerging neuroscience field that promises a more principled way of interpreting brain imaging data and inferring the relationship between cognition and brain function. More, such "in silico" experiments allow systematic exploration of physiological parameters in a manner that is not otherwise possible: This approach lies at the heart of the enormous European-based Brain project. Our symposium will present four contributions that cover the range of brain network dynamics by emerging and leading international researchers. In particular, we will present cutting edge work that the role of brain network structure plays in shaping cortical dynamics during perceptual and cognitive activities. Together, these talks will cover synchronization in microcircuits, thalamocortical processes that underlie the processing of visual stimuli, stochastic dynamics during decision making, and the origin of slow fluctuations related to mood and affect in deep midline cortical regions. These talks will be of interest to computational neuroscientists, neuroimaging researchers as well as cognitive neuroscientists interested in the modelling activities that are in the process of transforming the field.

SO8 001: Anticipated Synchronization In Neuronal Populations: Reconciling Information Directionality With Negative Time Lag

Claudio R. Mirasso, Institute for Cross-Disciplinary Physics and Complex Systems, Spain

Synchronization has been extensively studied in the brain, where it has been hypothesised to be relevant to issues such as the binding problem, temporal coding, deployment of spatial attention, higher cognitive functions, and many others. Among the tools available to assess the coordinated activity of two or more areas, correlation functions are probably the most widely employed. However, correlations do not detect the directionality of the connection. Granger causality (GC) has shed light on the directional influences and the time arrow of the information flow. A positive GC from an area A to an area B would indicate that the activity of area A causes the activity of area B. Intuitively, one tends to assume that a positive GC is accompanied by a positive time delay (relative phase) between the activities of areas A and B, signaling that activity in A precedes that of B. But would it be possible to compute a positive GC and a negative time delay? This is precisely the scenario we study in this work, motivated by experiments reported in monkeys while performing a visual task.

Biography

Claudio R. Mirasso received the Ph.D. in physics from the Universidad Nacional de La Plata, Argentina, in 1989. He has held post-doctoral positions in Spain and the Netherlands. He is Full Professor at the Physics Department, Universitat de les Illes Balears, Spain and researcher of the Institute for Cross-Disciplinary Physics and Complex Systems (IFSIC, UIB-CSIC).

He has authored or co-authored over 140 journal papers. He was coordinator of the European Projects OCCULT and PHOCUS. His current research interests include modelling and simulation of neuronal dynamics, dynamics and applications of delayed coupled systems, information processing and applications of nonlinear dynamics.

SO8 002: (How The Thalamus Changes) What The Cat's Eye Tells The Cat's Brain

Luis M. Martinez, Institute of Neuroscience, Alicante, Spain

Visual information reaches the brain through the activity of thousands of neurons distributed in non-random arrays across the innermost layer of the retina. Anatomical and physiological studies have shown that both the dendritic arbors and the receptive fields of retinal ganglion cells (RGCs) form mosaics that are coordinated to approach the theoretical resolution limit of a hexagonal lattice. The stereotyped, optimized and hardwired nature of the retinal arrays has led to two main predictions. First, that due to an extensive pooling from neighboring photoreceptors, visual acuity should match the Nyquist limit of the RGCs population. And second, that the spatial arrangement of the mosaics should set a strong constrain on the emergence of different receptive field structures, local circuits and functional properties in downstream visual areas of the brain. In this lecture I will discuss recent results showing how the thalamic array, dynamically transforms the retinal message on its way to the primary visual cortex contributing to high resolution visual processing, the emergence of cortical receptive fields and maps.

Biography

Luis M. Martinez is a Staff Scientist with the Spanish National Research Council at the Institute of Neuroscience in Alicante, where he directs the Laboratory of Visual Neuroscience. PhD in Neurobiology from the University of Santiago de Compostela, Spain, he did his postdoctoral training at The Rockefeller University in New York, under the direction of Torsten N. Wiesel, Nobel prize in 1981, in collaboration with Judith Hirsch, and Jose-Manuel Alonso. Dr. Martinez's long-term scientific goals are to understand how the visual circuits of the brain generate the perception of the world and why different brains do it so differently.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S08: The Dynamic Brain cont'd

SO8 003: Computational Models Of Perceptual Uncertainty And Decision Making

Leonardo L. Gollo, Queensland Institute for Medical Research, Australia

Computing and representing the precision of our beliefs is a key cognitive process which underlies perceptual inference and decision making, particularly in the presence of ambiguous or noisy sensory information. In a recent functional neuroimaging experiment, we showed that detecting change amongst noisy perceptual stimuli engages a constellation of cortical regions in left prefrontal cortex [1]. It is natural to ask how these regions coordinate their activity during the perceptual decision making process during this task. Here we use a Bayesian-based model inversion [2] to disambiguate three candidate classes of network models – parallel, serial and hierarchical. We find strongest evidence for a nonlinear, hierarchical arrangement of causal interactions, in which rostral prefrontal cortex provides context dependent gating of information flowing between different regions of dorsolateral prefrontal cortex.

We provide a computational interpretation of these findings by examining phase and amplitude fluctuation in small network motifs of coupled neural mass oscillators. 1. Karim, M., Harris, J. A., Morley, J. W., Breakspear, M. (2013). The role of prefrontal cortex in representing the precision of our beliefs. Submitted. 2. Friston, K. J., Harrison, L., & Penny, W. (2003). Dynamic causal modelling. Neuroimage, 19(4), 1273-1302.

Biography

Dr Gollo was awarded a PhD in physics at the Universitat de les Illes Balears in 2012 and is currently a postdoctoral fellow of the Systems Neuroscience Group at the Queensland Institute of Medical Research. Dr Gollo's current studies use computational tools and theoretical insights from physics of complex systems and nonlinear dynamics to understand problems of systems neuroscience.

SO8 004: Dwelling Quietly in the Rich Club: Brain Network Determinants of Slow Cortical Fluctuations

Michael Breakspear, Queensland Institute for Medical Research, Australia

The relationship between the fast time scales of neuronal dynamics and the slow fluctuations of mood and affect have not yet found full theoretical explanation. Recent analyses of brain network topology has shown that the regions involved in the regulation of mood and introspection belong to a topological core of the brain known as the rich club – a constellation of densely interconnected regions that form the structural backbone of the brain. Computational models predict that the local network topology of this constellation of brain regions – which include the anterior insula, thalamus, amygdala and precuneus – support slowly fluctuating patterns of sychronization. In contrast, the local network topology of the surrounding "feeder" cortical regions are predicted to show rapidly fluctuating and unstable dynamics. I will hence propose that these network properties of central cortical regions are the structural determinants of the slowly fluctuating changes in neuronal dynamics in these brain regions. These time scales are ideally suited to the regulation of internal visceral states, corresponding to the somatic correlates of mood and anxiety. I will end by reviewing recent analyses of resting state fMRI data from subjects with melancholia that support this proposal.

Biography

Professor Michael Breakspear is the Coordinator of the Mental Health and Complex Disorders Program at the Queensland Institute of Medical Research (QIMR) and a consultant psychiatrist at the Royal Brisbane and Women's Hospital. He trained in medicine and physics at the University of Sydney before completing his specialist training in psychiatry at St Vincent's Hospital. He moved to QIMR in 2009 to become the inaugural program coordinator of mental health and complex disorders. He leads a multidisciplinary research team whom undertake psychiatric and imaging research aimed at improving diagnosis and treatment in clinical psychiatry.

S09: New Approaches To The Neural Basis Of Mathematical Cognition

Chris Clark, University College London, UK
Carlo Semenza, University of Padova, Italy
Teresa Iuculano, Stanford University, USA
Chair & Speaker: Brian Butterworth, University College London, UK

Overview

Numeracy attainment has a substantial economic, cultural, social and personal impact. Educational efforts to address this problem have met with limited success, in part because the core neuro-biology of numeracy remains only partly characterized, mainly on grey matter regions activated in very simple number tasks using PET and fMRI. Here we present methodologies for examining the core neuro-biology that haven't previously been deployed. They reveal new aspects of the functional and anatomical organization of mathematical cognition and their genetic basis.

SO9 001: Microstructural Measures Of The Developing Brain And Its Response To Learning: Evidence From Neuroimaging

Chris Clark, University College London, UK

Diffusion tensor imaging has provided unique information about brain microstructure. The trajectories of these brain microstructural changes have been mapped from birth to adulthood. In particular sexual dimorphisms have been demonstrated which appear to be related to the differential onset of puberty in men and women. In addition to this several studies have used diffusion tensor imaging to detect changes in the structure of the brain following various learning tasks. This raises the question as to whether these types of experiment can be used to measure brain structural changes as a result of the acquisition of mathematical skills.

Biography

Chris Clark is a Reader in Imaging and Biophysics and specialises in diffusion MRI and tractography in studies of the paediatric brain in health and disease. His recent publications include: Gibbard, C.R., et al (in press 2013). White matter microstructure correlates with autism trait severity in a combined clinical-control sample of high-functioning adults. Neuroimage: Clinical Kawadler, J.M., et al (2013, in press). Subcortical and cerebellar volumetric deficits in paediatric sickle cell anaemia. British Journal of Haematology. Assaf, Y., et al and the CONNECT Consortium. (2013, in press). The CONNECT project: Combining Macro- and Micro-structure. Neuroimage

SO9 002: Simple Calculation In The Brain: Evidence From Direct Cortical Electro-Stimulation

Carlo Semenza, University of Padova, Italy

Single digit multiplication and addition were mapped during awake surgery using electro-stimulation in right-handed patients affected by high-grade gliomas located in the left or in the right parietal lobe (3 for each site; more patients will be studied by the time of the conference). In all patients, different sites of the parietal cortex, mainly in the inferior lobule, were detected as being specifically related to calculation (multiplication or addition). These findings add to previous knowledge about the anatomical-functional organization for multiplication and addition within parietal areas, in particular in the right hemisphere.

Biography

Carlo Semenza is professor of Neuropsychology in the Department of Neuroscience at the University of Padova. He works on the neural aspects of the mental lexicon and of mathematical abilities.

Recent publications include: Della Puppa, A et al (2013) Right parietal cortex and calculation processing. Intra-operative functional mapping of multiplication and addition. Journal of Neurosurgery. Semenza, C., et al (2012) Genetics and mathematics: FMR1 premutation female carriers. Neuropsychologia, 50(14):3757-63 Salillas, E. et al (2012) Single pulse TMS induced disruption to right and left parietal cortex on addition and multiplication. NeuroImage, 59 (2012) 3159–3165.

SO9 003: Training The "Mathematical Brain": Evidence From Functional Brain Imaging And Neuro-Modulation Techniques

Teresa Iuculano, Stanford University, USA

Here we adopt a multi-componential approach to skill acquisition in typical and atypical learners, particularly those with developmental dyscalculia (DD). It combines training models with functional brain imaging (fMRI) in Study 1 neuro-modulation techniques (Transcranial Electrical stimulation) in Study 2. In Study 1 we show that 2 months of math training in 7-9 year old children with DD significantly improved their performance to the level and normalized brain activity-levels in multiple brain systems known to be important for arithmetic, numerical representation, attention and working memory. Moreover, performance improvement was significantly predicted by functional normalization of these brain regions. In Study 2, we show that the application of a small constant current to the left posterior parietal cortex, a key region for numerical representation, during numerical learning, could normalize behavioral performance in an adult case of severe and persisting DD.

Biography

Teresa Iuculano is a post-doctoral fellow at the Stanford Cognitive and Systems Neuroscience Laboratory, Stanford University School of Medicine, and Honorary fellow at the Institute of Cognitive Neuroscience, University College London. Her research focuses on the behavioural and brain correlates related to the acquisition of mathematical abilities in the typical and atypical brain. Her recent publications include: Iuculano, T, et al. (2013). Brain Organization Underlying Superior Mathematical Abilities in Children with Autism. Biol. Psychiatry, doi: 10.1016/j.biopsych.2013.06.018 Iuculano, T, Cohen-Kadosh, R (2013). The Mental Cost of Cognitive Enhancement. J Neurosci, 33(10), 4482-4486

SO9 004: The Genetics Of The Neural Bases Of Low Numeracy

Brian Butterworth, University College London, UK

The present study of 160 8 to 14 year twins revealed evidence for a core number factor within a wide and varied battery of cognitive tests. There was a significant genetic relationship between numerical attainment and the structure of brain regions known to support the core capacity to represent numerosities. Moreover, the developmental trajectory of grey matter density in the critical brain region differs between high and low attainers.

Biography

Brian Butterworth is Emeritus Professor of Cognitive Neuropsychology at University College and Fellow of the British Academy. He is currently working with colleagues in several countries on the neuropsychology and the genetics of typical and atypical mathematical development. His recent publications include: Butterworth, B., & Kovas, Y. (2013). Understanding Neurocognitive Developmental Disorders Can Improve Education for All. Science, 340(6130), 300-305. Butterworth, B., & Walsh, V. (2011). Neural basis of mathematical cognition. . Current Biology, 21(16), R618-R621 Butterworth, B., Varma, S., & Laurillard, D. (2011). Dyscalculia: From brain to education. Science, 332, 1049-1053.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S10: TMS And TDCS As A Tool In Cognitive Neuroscience: How Does Transcranial Stimulation Influence Behavior?

Michael A. Nitsche, University Medical Center Goettingen, Germany
Carlo Miniussi, University of Brescia & IRCCS Centro San Giovanni di Dio Fatebenefratelli, Italy
Chair & Speaker: Hartwig R. Siebner, Copenhagen University Hospital Hvidovre, Denmark

Overview

Non-invasive brain stimulation (NIBS) has become a popular method for inducing reversible brain lesions in normal subjects. If such a "virtual lesion" impairs task performance, it is concluded that the "lesioned" region makes a critical contribution to the cognitive processes that are probed by the task. There is a mismatch between the widespread use of NIBS in cognitive neuroscience and the rudimentary knowledge regarding the mechanisms by which NIBS disrupts brain function. The objective of this symposium is to focus on the neural processes underlying a NIBS-induced "virtual lesion". Vincent Walsh will set the frame by highlighting methodological and theoretical limitations of the virtual lesion approach. Michael Nitsche will discuss the use of low-intensity transcranial electrical stimulation as a tool to manipulate neural excitability and intrinsic neural oscillations and how this relates to stimulation-induced changes in behavior. Carlo Miniussi will provide a "noisy account" on the virtual lesion approach and discuss how NIBS influences brain functions by altering regional noise levels. Hartwig Siebner will adopt a connectionists view on the virtual lesion approach and show that changes in effective connectivity in specific pathways of the stimulated network may account for the absence or presence of NIBS-induced "virtual lesion effects.

S10 001: Transcranial Electrical Stimualtion (Tdcs, Tacs, And Trns) As Tools To Interfere With Cognitive Functions: Shifting Excitability And Shaping Oscillations.

Michael A. Nitsche, University Medical Center Goettingen, Germany

Alterations of cortical excitability, oscillatory as well as non-oscillatory brain activity are physiological derivates of cognitive processes, such as perception, working memory, learning, and long-term memory formation. Since non-invasive brain stimulation is capable to induce respective alterations in the human brain, these stimulation approaches might be attractive tools to modulate cognition. Transcranial direct current stimulation (tDCS) alters spontaneous cortical activity via its impact on cortical excitability, while transcranial alternating current stimulation (tACS), and transcranial random noise stimulation (tRNS) are presumed to induce or interfere with oscillations of cortical networks. Via these mechanisms, the respective stimulation techniques have indeed been shown to modulate cognitive processes in a multitude of studies conducted during the last years. I will summarize the knowledge obtained about the potential of tDCS, tACS, and tRNS to study and modify cognitive processes in healthy humans, and discuss options for directions of future research.

Biography

Michael A. Nitsche is board-certified neurologist, psychologist and associate professor at the Department for Clinical Neurophysiology of the University Medical Center, Goettingen, Germany, where he runs the laboratory for Systemic Neurosciences. His main research interest is plasticity research in humans, including non-invasive brain stimulation, neuropsychopharmacology and its impact on cognition.

S10 002: Non-Invasive Brain Stimulation In Cognitive Neuroscience: A "Noisy" Explanation

Carlo Miniussi, University of Brescia & IRCCS Centro San Giovanni di Dio Fatebenefratelli, Italy

Non-invasive brain stimulation (NIBS) is a unique method to study cognitive functions. NIBS offers the opportunity to study brain mechanisms beyond process localisation, providing information about when activity in a given brain region is involved in a cognitive process, and even how it is involved. We know that NIBS techniques have the potential to transiently influence behaviour by altering neuronal activity, which may have facilitatory or inhibitory behavioural effects, and these alterations can be used to understand how the brain works. NIBS techniques include transcranial magnetic and electric stimulation (TMS and TES). The mechanisms underlying TMS and TES seem to be different, nevertheless, the final behavioural effects induced by TMS and TES are often very similar. In this presentation, I will describe the mutual interactions between NIBS and brain activity and provide an updated perspective on the theoretical frameworks of NIBS and their impact on cognitive neuroscience. Given that NIBS necessarily involves the relatively indiscriminate activation of large numbers of neurons, its impact on a neural system can be easily understood as modulation of neural activity that changes the relation between noise and signal. The framework that I wish to proposed here offers the opportunity to understand how NIBS, by altering levels of noise, could usually impair, but sometimes improve performance on a task. Depending on the amount of noise introduced by NIBS, the existing level of noise in the system or in the task due to the state of the subject, it is possible to evaluate the final result.

Biography

Carlo Miniussi received his M.Sc in Experimental Psychology from Padova University (1994), Ph.D. in Neuroscience from Verona University (1999). He has been a postdoctoral fellow at the Experimental Psychology Dept Oxford University for two years. In 2000 he became chief of the Neurophysiology Laboratory IRCCS Fatebenefratelli Brescia, Italy. In 2005 he was appointed Associate Professor of Human Physiology School of Medicine, University of Brescia. In 2010, he was qualified as full Professor of Human Physiology. In the 2013 he has been elected President elect of Italian Society of Psychophysiology.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S10 003: Non-Invasive Brain Stimulation In Cognitive Neuroscience: A "Connectivity" Account

Hartwig R. Siebner, Copenhagen University Hospital Hvidovre, Denmark

NIBS given before or during an experimental task can produce a change in task performance which is often attributed to a selective disruption of neural processing in the cortical area that has been targeted with NIBS. In the first part of the presentation, I will summarize recent work that modeled the distribution of NIBS-induced electrical currents in the brain and discuss the implication of this work for the virtual lesion approach in cognitive neuroscience. In the second part of the presentation, I will present a set of fMRI studies which assessed the effects of NIBS on functional brain connectivity. These studies provided converging evidence that NIBS dynamically tunes the effective connectivity strength of cortico-cortical and cortico-subcortical connections in functional brain networks and hereby, shapes neural processing well beyond the stimulated region. Based on these results, I will argue that dynamic network models that consider NIBS effects on large-scale effective connectivity may be more appropriate than a local virtual lesion model to account for the behavioral impact of NIBS, including state- and task-specific effects of NIBS on a given brain function.

Biography

Hartwig R. Siebner is board-certified neurologist and professor for functional neuroimaging at the University of Copenhagen. He is heading the Danish Research Centre for Magnetic Resonance (DRCMR) at Copenhagen University Hospital Hvidovre and is Principal Investigator of the "Control of Action" (ContAct) reseach group at DRCMR. His research focuses on the question how the human brain generates and optimizes actions. To this end, he combines advanced magnetic resonance imaging (MRI) of the brain with transcranial stimulation techniques to study causal interactions within motor brain systems and to trace sensorimotor plasticity.

S11: The Menzies Foundation Symposium: A Window Into Normal Cognition: Insights From Synaesthesia

David Brang, University of Chicago, USA
Katie Bankieris, University of Rochester, USA
Derek Arnold, University of Queensland, Australia
Chair & Speaker: Anina N. Rich, Macquarie University, Australia

Overview

The phenomenon of synaesthesia, in which a stimulus elicits an unusual additional experience (e.g., a sound elicits a colour), has generated enormous interest over the past decade. Contemporary cognitive neuroscience methods and novel manipulations of classic measures of behaviour have given insights into the mechanisms that underpin this fascinating phenomenon. In this symposium, the speakers will present recent research on the integration of information across the senses in both synaesthetes and non-synaesthetes, with a focus on the role of higher-level information and the insights we can gain from synaesthesia for understanding cognition more generally. Overall, the goal of the symposium is to promote active debate into the role conceptual information plays in synaesthesia and the inferences we can draw from synaesthetic research to fundamental mechanisms and concepts that underpin the human cognitive system.

S11 001: Implicit Shape-Color Associations In Synesthesia

David Brang, Northwestern University, USA

Grapheme-color synesthesia is a neurological phenomenon in which letters and numbers (graphemes) consistently evoke particular colors (e.g., A may be experienced as red). These sensations are thought to arise through the cross-activation of grapheme processing regions in the fusiform gyrus and color area V4, supported by anatomical and functional imaging. However, the developmental acquisition of grapheme-color associations remains elusive. One account suggests that synesthesia is present at or near birth and initially binds basic shapes and forms to colors, which are later refined to grapheme-color associations through experience. Consistent with this view, we and others have shown that similarly shaped letters and numbers tend to elicit similar colors in synesthesia and that some synesthetes consciously associate basic shapes with colors. This model further predicts that the initial shape-color correspondences in synesthesia may persist as implicit associations, driving the assignment of colors for novel characters. Examining the presence of latent color associations for novel characters, we trained synesthetes and controls on pre-defined associations between colors and complex shapes, on the assumption that the prescribed shape-color correspondences would on average differ from implicit synesthetic associations. Consistent with our suggestion that implicit form-color associations conflict with these learned pairings, synesthetes were significantly less accurate than controls to learn novel shape-color associations. In sum, this series of results suggests that grapheme-color associations may originate as shape-color associations early in development, before synesthetes acquire the necessary experience with numbers and letters to associate them with colors.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S11: The Menzies Foundation Symposium: A Window Into Normal Cognition: Insights From Synaesthesia cont'd

Biography

Dr David Brang is a cognitive neuroscientist at Northwestern University and the University of Chicago, where he studies the anatomical and functional networks underlying multisensory processes present in both the general population and in special populations including synesthetes. He is one of the most prolific synesthesia researchers in the United States, publishing 16 articles on the topic since 2008. His research highlights both conceptual and perceptual components to synesthesia and emphasizes the numerous cognitive benefits bestowed upon synesthetes. This research has been highlighted in media outlets worldwide, including CNN, MSNBC, Scientific American, and National Geographic.

S11 002: What Can Synaesthesia Teach Us About Sound Symbolism

Katie Bankieris, University of Rocherster, USA

Sound symbolism is a linguistic device that directly links phonological form to semantic meaning. Sound symbolism can allow speakers to understand the meanings of etymologically unfamiliar foreign words, although the mechanisms are not well understood. We examined whether sound symbolism is mediated by the same types of cross-modal processes that typify synaesthetic experiences. Synaesthesia is an inherited condition in which stimuli (e.g., words) cause additional, unusual cross-modal percepts (e.g., colours). Synaesthesia may be an exaggerated form of normal cross-sensory processing; if so, we may find synaesthesia-like correlates in normal cross-modal processing, such as in sound symbolism. To test this we predicted that synaesthetes may have superior sound symbolic understanding. In our study, 19 grapheme-colour synaesthetes (who experience colours from letters/digits) and 57 non-synaesthete controls were presented with adjectives from 10 unfamiliar languages (e.g., 'avraam' [Tamil]) and were asked to guess each meaning from two choices (loud or quiet?). Both groups showed superior understanding compared to chance in some semantic domains, and synaesthetes significantly outperformed controls in these semantic domains. This heightened ability suggests that sound symbolism may rely on the type of cross-sensory integration that drives synaesthetes' unusual experiences. It also suggests synaesthesia co-occurs with heightened multisensory skills in domains unrelated to the specific form of synaesthesia.

Biography

Katie Bankieris is a graduate student advised by Richard Aslin in the University of Rochester's Brain and Cognitive Sciences. She is broadly interested in cue integration within and across sensory modalities. Her work as a US-UK Fulbright Scholar focused on the relationship between synesthesia and crossmodal correspondences in the general population. Her doctoral work addresses synesthesia as a phenomenon leading to widespread cognitive changes as well as the development of cue integration.

S11 003: Grapheme-Colour Synaesthesia: More Than A Vivid Memory?

Derek Arnold, The niversity of Queensland, Australia

Grapheme-colour synaesthetes have sensations of colour when reading printed achromatic graphemes, such as black letters and digits. For some grapheme-colour synaesthetes seeing a printed grapheme automatically triggers a sensation of colour, whereas hearing the name of a grapheme does not. This dissociation allowed us to compare the precision with which synaesthetes are able to match their colour experiences automatically triggered by visible graphemes, with the precision of their matches for recalled colours based on the same graphemes spoken aloud. In six syntesthetes colour matching for printed graphemes was equally variable relative to recalled experiences. In a control experiment synaesthetes and age-matched controls either matched the colour of a circular patch while it was visible on a screen, or they judged its colour from memory after it had disappeared. Both synaesthetes and controls were more variable when matching from memory, and the variance of synaesthetes' recalled colour judgements matched that associated with their synaesthetic judgements for visible graphemes in the first experiment. Results suggest that synaesthetic experiences of colour triggered by achromatic graphemes are analogous to recollections of colour.

Biography

A/Prof Derek Arnold publishes widely on topics in perception, elucidating computations underlying conscious sensory experience. His work has featured in many of the world's leading outlets for neuroscience research, including "Nature, Current Biology, Journal of Neuroscience and Proceedings of the Royal Society B". He received the 2008 Early Career Research award from the Australian Psychological Society, and has won a string of prestigious research fellowships, most recently a Future Fellowship from the Australian Research Council. His work on synaesthesia has focussed on identifying the stage of colour analysis at which synaesthetic experiences are generated.

S11 004: A Conceptual Mediation Hypothesis Of Synaesthesia: What Can Yellow Tuesdays Tell Us About How We Represent Objects?

Anina N. Rich, Macquarie University, Australia

Synaesthesia is a phenomenon in which stimulation in one sensory modality triggers involuntary experiences typically not associated with that stimulation. A synaesthete may experience colours when seeing words, letters, and digits, or while listening to music or smelling an odour. There has been considerable progress over the last decade in understanding the cognitive and neural mechanisms of synaesthesia. Current neurocognitive models of synaesthesia construe it as a perceptual phenomenon and hence focus primarily on the modality-specific brain regions for perception. Many behavioural studies, however, suggest an important role for conceptual level information in synaesthesia. We will give an overview of this evidence, and results of neural stimulation studies, as the basis for proposing that synaesthesia resembles more general conceptual knowledge for object attributes, at both psychophysical and neural level.

Biography

A/Prof Anina Rich is co-director of the Macquarie University Perception in Action Research Centre and heads up the "Synaesthesia@ Macquarie" research group. She is Australia's leading expert on synaesthesia, with publications on the topic in high profile journals including "Nature" and "Nature Reviews Neuroscience". Her work has made a clear argument for selective attention playing a critical role in synaesthetic binding, analogous to normal binding of object features for conscious perception. Her work has received considerable media attention, and she has won a number of awards, including most recently, the Academy for the Social Sciences in Australia 2013 Paul Bourke Award.

S12: Working Memory 2014: 40 Years On Since Baddeley & Hitch

Nahid Zokaei, University of Oxford, UK
Chair & Speaker: Eva Feredoes, University of Reading, UK
Mathilde Bonnefond, Radboud University, Netherlands
Yoni Pertzov, Hebrew University, Jerusalem

Overview

Since its theoretical formalisation in 1974, working memory (WM) has been a consistently intensive area of research, generating much debate at psychological and neuroscientific levels. Recently this has centred on the precise placement of WM in relation to other cognitive constructs; it appears to share many operations with attention and long-term memory and is not necessarily an independent short-term retention system. Here we outline the new wave of WM research focussed on understanding the 'place' of WM. Using a variety of research techniques including patient lesion studies, fMRI, TMS (including concurrent TMS-fMRI) and MEG, we have evidence towards an updated theoretical and neural conceptualisation of WM. First, we describe the attention-dependent dynamic nature of information retention in sensory cortex (Zokaei). Next, the necessity of hippocampus for binding WM items will be shown (Pertzov). A mechanistic model of alpha-gamma oscillations for controlling information flow in WM, and accompanying empirical evidence, will then be provided (Bonnefond). Finally, these findings will be brought together in an up-to-date account of WM with focus on effective combinations of cutting-edge neuroscience techniques, and theoretical and computational models, that can make valuable contributions for the formulation of sophisticated accounts of how the brain solves WM (Feredoes).

S12 001: The Role Of Attention In Working Memory Maintenance

Nahid Zokaei, University of Oxford, UK

What do attention and working memory (WM) systems share? While many have pointed out the intimate connection between the two processes, the exact role of attention in WM maintenance remains unclear. We investigated the relationship between these two processes using a more sensitive, recently developed measure of WM precision that relies on participants to reproduce the exact qualities of a feature in memory. Behaviourally, I will first show the important role of attention in maintenance of bound representations. When asked to do an attentionally demanding task during WM maintenance, participants more frequently reported non-probed features with no change in memory precision for the features themselves. Secondly, I will show changes in the representational state of items in WM maintenance through both top-down and bottom-up influences of attention. By having attention focused on retained items, some were represented in a more prioritises state, with their recall later improved over non-privileged items. Privileged state was achieved through incidental cueing in WM maintenance (a task regarding an irrelevant feature of items in WM) or automatically, by virtue of recency. We also investigated causal evidence for different representational state in WM maintenance in early visual cortex using the causal approach of transcranial magnetic stimulation (TMS). Strikingly, TMS to MT+ during memory retention of motion directions disrupted only the memory of items prioritised within WM. Hence the maintenance of items in the privileged state appears to rely on sensory cortex.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S12: Working Memory 2014: 40 Years On Since Baddeley & Hitch cont'd

Biography

I started my academic education in the department of Psychology in University College London (UCL).

Throughout my undergraduate studies, I worked part-time as a research assistant in the Department of Psychology and became interested in visual attention and working memory. I pursued this interest through a Ph.D., funded by the Brain Research Trust and supervised by Profs. Masud Husain and Geraint Rees, both leaders in the field. I am currently a post-doctoral researcher in the Cognitive Neurology group at Oxford University, where I investigate the cognitive neuroscience of WM using diverse approaches including special patient groups, TMS and MEG.

S12 002: The Neural Mechanisms Of Top-Down Control During Visual Working Memory

Eva Feredoes, University of Reading, UK

Top-down control is an important aspect of WM, determining, for example what information will be retained across the short term and how it will be protected from intervening interference. But the precise conditions under which top-down control occurs during WM, the brain regions involved and the nature of their signals remains to be described more completely. One important brain region for exerting top-down control is lateral prefrontal cortex (LPFC). I will present evidence on how LPFC communicates with category-specific areas retaining WM information. Using the causal connectivity approach of concurrent TMS-fMRI, I will show how LPFC-based top-down control occurs in the presence of external distractors, protecting the contents of WM by enhancing the representations of memorised information. This fits with previous findings in which LPFC is concerned with task-relevant over irrelevant information, by neurally biasing the former over the latter. I will then conclude by bringing together the diverse findings presented in the symposium, demonstrating their contribution to a view of WM that more seamlessly incorporates attention and long-term memory, and which adopts more general neural mechanisms in an emergent manner. I will also highlight how the cutting-edge experimental methodologies described in the talks are able to propel theoretical, neuroscientific and computational accounts of WM.

Biography

I became a cognitive neuroscientist after some charismatic undergraduate lectures given by Emeritus UQ Prof. Jack Pettigrew. (His exam question, asking for our own 'interhemispheric switch rates' by measuring our breathing through each nostril was a particular highlight!) Since my PhD (UNSW), I have developed a research programme investigating the neural underpinnings of working memory using causal approaches such as concurrent TMS-fMRI. I am currently establishing my own research group as a University of Reading lecturer and will continue to pursue my goal of understanding how the brain 'solves' the simple problem of remembering across the short term…stay tuned!

S12 003: Alpha Activity As A Mechanism To Preserve Working Memory Integrity

Mathilde Bonnefond, Radboud University, Netherlands

The ability to suppress the processing of interfering stimuli is a core process of working memory. This ability is correlated with working memory capacity and its change with age has been shown to be associated with the decline of working memory. Alpha oscillatory activity (8-13 Hz) is thought to underlie this process through pulses of inhibition silencing a network node every ~100 ms. I will present evidence showing that, on a Sternberg-like working memory task, both visual alpha power and phase are top-down adjusted so that the processing of a predictable distractor is optimally suppressed. Moreover, I will show that alpha activity is coupled with low gamma (~40Hz) and high gamma (> 60Hz) power and that the stronger the alpha power, the weaker the high gamma power specifically at the alpha trough.

This confirms that stronger alpha power is associated with stronger pulses of inhibition and that the adjustment of both the power and the phase of alpha activity allow the inhibition level to be maximal at the onset of the distractor. I will introduce a general theory about how alpha activity might act as a mechanism for limiting and prioritising the input flow in order to prevent information overload.

Biography

During my Ph.D. at the University of Lyon I used M/EEG to test different theories of reasoning. My skills in electrophysiology to investigate cognition led me to a post-doctoral fellowship at the prestigious Donders Institute for Brain, Cognition and Behaviour, mentored by Prof. Ole Jensen. I investigated the nonlinear dynamical properties of brain alpha oscillations in attentional and working memory tasks, using MEG and fMRI. I am now a senior researcher at the Donders Institute, working on brain network plasticity, and also continue to investigate the complex electrophysiological mechanisms that underlie attention and working memory.

PANEL DISCUSSION OVERVIEW
AND SPEAKER BIOGRAPHIES

S12 004: The Hippocampus Is Necessary For Binding Object Identity To Location In Visual Working Memory

Yoni Pertzov, Hebrew University, Jerusalem

It has been suggested that objects are maintained as integrated units in working memory and when forgotten they are lost as a whole, without leaving behind any trace. To study the relevance of this claim to real-life situations, we investigated how object-location information is remembered â€“ and forgotten. We used a localization task with a continuous, analogue scale of reporting rather than binary (correct/incorrect) responses, with difficult-to-verbalize stimuli and variable delays. Analysis of the distribution of localization errors for healthy participants showed that items were sometimes mislocalized near the original position of other items in memory (â€˜swap errorsâ€™). Moreover, when objects were forgotten they did not disappear completely from memory, but rather the links that bound identity and location became vulnerable over time, so swap errors increased with longer retention intervals. Maintaining object-location links was found to be especially fragile in patients with bilateral damage of the medial temporal lobes (MTL), specifically hippocampus. Increased binding errors also occurred in pre-symptomatic carriers of an autosomal dominant gene (PSEN1 or APP) which gives 100% risk of developing Alzheimerâ€™s disease. Hippocampal volume in these individuals, who scored within normal range in standard neuropsychological tests, correlated inversely with the number of binding errors. These findings provide insight into the early cognitive deficits associated with Alzheimerâ€™s disease and strengthen claims that hippocampus is necessary for maintaining associative information across short retention intervals, challenging traditional accounts of MTL function as exclusively for long term memory.

Biography

My academic education started in Communication System Engineering. However, my fascination with Neuroscience led me to the graduate program of the Interdisciplinary Center for Neural Computation at the Hebrew University, Jerusalem where I obtained my PhD. I then moved to London where I was a post-doc at the UCL Institute of Cognitive Neuroscience. Currently I am a Senior Lecturer in the Psychology Department at the Hebrew University. The questions that motivate my research all revolve around visual working memory. I am using various research methods including neuroimaging in healthy individuals and patients with neurological disorders.

D02: How Do We Improve Medical Translation? Developing Translational Approaches Towards Exploring Cognitive And Behavioural Endophenotypes In Animal Models Of Disease

Chair & Speaker: Jess Nithianantharajah, University of Edinburgh, UK
Anthony J Hannan, Florey Institute of Neuroscience and Mental Health, Australia
Caitlin E McOmish, Columbia University Medical Center, USA

Overview

Impairments in cognition are common to many brain diseases and represent a major unmet medical need. As a result of human genetic studies there is an increasing recognition that many human disorders of cognition are caused by underlying mutations. The identification of these mutations and the availability of animal models carrying mutations in orthologous genes place mutant mice at the forefront of translational approaches. For over 20 years mice carrying gene mutations have been studied in learning paradigms such as the water maze and fear conditioning and these rodent behaviours said to be similar to human behaviour and mutant mice showing phenotypes in these behaviours have been promoted as models of human disease. Moreover, drugs have been tested on mutant mice in rodent behavioural tests and led to human clinical trials. While this approach may seem logical, if the behaviours measured in mice are not homologous to those in humans, then drug trials may potentially be misleading. A way forward is to critically assess the behaviours measured in rodents that model those symptoms observed in patients. Recent advancements in technologies such as touchscreen cognitive tests that measure similar components of cognition in mice and humans can be combined with genetics and provide a powerful tool for translation, identification of new targets for drug development and improve drug trial design (Nithianantharajah et al., 2013: Nithianantharajah & Grant, 2013).

In a complementary way, this panel discussion will bring together research experts (Dr Jess Nithianantharajah, A/Prof. Anthony Hannan & Dr Caitlin McOmish) in cognitive and behavioural analysis of animal models of cognitive diseases to discuss the current stance, future directions for effective translation from animal models of disease to the clinic and the potential pitfalls and solutions in existing translational approaches that rely on rodent behavioural testing. It will also discuss genetic, environmental and pharmacological factors in disease modelling and how technologies including the touchscreen cognitive testing can pave for future medical translation. Elucidating common disease symptoms/mechanisms that underlie cognitive disorders and developing methods to improve how these can be modelled in animals will be essential for increasing our understanding of cognitive dysfunction in brain disorders and future development of novel therapeutic approaches.

PANEL DISCUSSION OVERVIEW
AND SPEAKER BIOGRAPHIES

D02: How Do We Improve Medical Translation? Developing Translational Approaches Towards Exploring Cognitive And Behavioural Endophenotypes In Animal Models Of Disease cont'd

D02 001

Jess Nithianantharajah, University of Edinburgh, UK

Biography

Jess Nithianantharajah did her doctoral thesis in behavioural neuroscience at the University of Melbourne. She commenced her postdoctoral training at the Howard Florey Institute before undertaking training with Prof. Seth Grant in the Genes to Cognition team at the Wellcome Trust Sanger Institute, Cambridge, UK where she collaborated with Drs. Tim Bussey and Lisa Saksida at the University of Cambridge where the rodent touchscreen technology was developed. She is currently based at the University of Edinburgh and her recent research employing the touchscreens has been the first demonstration of assessing cognitive components in humans and mice carrying the same mutation. These data also show that it is possible to genetically dissect different behaviours and identify their underlying molecular mechanisms using these methods as standardized approaches, with the prospect of understanding the genetic architecture of the cognitive repertoire towards the identification of new drug targets.

D02 002

Anthony J Hannan, Florey Institute of Neuroscience and Mental Health, Australia

Biography

Anthony Hannan received his undergraduate training and PhD from the University of Sydney. He was then awarded a Nuffield Medical Fellowship at the University of Oxford, where he subsequently held other research positions before returning to Australia on to establish a laboratory at the Florey Institute. He is currently a Professorial Fellow and head of the Neural Plasticity Laboratory, Florey Institute of Neuroscience and Mental Health. He also holds an ARC Future Fellowship (FT3), Honorary NHMRC Senior Research Fellowship, and is a Principal Fellow at the University of Melbourne. He has published over 100 peer-reviewed papers, in leading journals such as Nature, Nature Neurosci., Mol. Psychiatry, J. Neurosci., Brain, Annals Neurol., Cerebral Cortex, Nature Rev. Neurosci., and Trends Neurosci. His laboratory investigates gene-environment interactions and experience-dependent plasticity in the healthy and diseased brain, focusing on cognitive disorders. This includes research on models of Huntington's disease, where he and his colleagues first discovered the beneficial effects of environmental enrichment and exercise, as well as depression-like and dementia-like symptoms and associated abnormalities of neural plasticity. This research team at the Florey is also investigating how genetic and environmental factors combine to cause specific disorders of cognition, including schizophrenia and autism spectrum disorders.

D02 003

Caitlin E McOmish, Columbia University Medical Center, USA

Biography

Caitlin McOmish received her PhD from the University of Melbourne. She was then awarded an NH&MRC overseas biomedical fellowship (previous CJ Martin fellowship) to undergo postdoctoral training at Columbia University Medical Center, NY, USA. She has received several awards and honours including awards from the American College of Neuropsychopharmacology, the Society for Neuroscience, and the Australasian Neuroscience Society, as well as holding a current NARSAD Young Investigator award. Dr. McOmish's research aims to identify the mechanisms that underlie precise symptom clusters in psychiatric disease, most notably schizophrenia. Schizophrenia symptoms are classified as positive, negative or cognitive. These classes of symptoms appear to derive from distinct neuropathology, and cognitive symptoms in particular, have been demonstrated to significantly impact the outcome of the patients. Despite this, the overwhelming focus of both animal models, and clinical trials remains the positive symptoms. Identifying effective intervention strategies to treat all subsets of the disease is thus an important avenue forward. Her research to date has been published in several international journals including the top ranked journal in psychiatry – Molecular Psychiatry – as well as Biological Psychiatry, and Neuropsychopharmacology.

ORAL PRESENTATION
ABSTRACTS

OP2: Cognition, Memory & Learning

Matar Haller, University of California, Berkeley, USA
Britta Worringer, RWTH Aachen University, Germany
Corinna Haenschel, City University London, UK
Catherine Wacongne, INSERM, France

OP2 001: Temporally Sustained Activity in Lateral Prefrontal Cortex Supports Decision Making

Matar Haller, University of California, Berkeley, USA

Decision-making relies on temporally coordinated activity across a network of cortical and subcortical brain regions, reflecting stimulus perception and evaluation as well as response selection, preparation and execution. The lateral PFC is a crucial node in decision-making networks, yet the temporal dynamics and spatial distribution of activation within lateral PFC is not defined in humans. Capitalizing on the superb temporal and spatial resolution of direct cortical recordings from subdural electrodes (electrocorticography;; ECoG), we identified specific temporal patterns of cortical activation and examined their spatial distribution. Subjects (n=18) performed a number of tasks graded in difficulty (7 total). Local field potential power in the broadband high gamma range (HG;; 70-150Hz) indexed local cortical activity. Electrodes with significant HG increases over baseline (FDR adjusted $p<0.05$) were classified as task-active. Principal component analysis (PCA) with hierarchical clustering was used to identify consistent temporal patterns of HG activation. These patterns included transient stimulus- or response- locked activity as well as sustained activation from stimulus presentation through response execution. All cortical areas featured multiple patterns of HG activity, suggesting that temporally and spatially distributed network activity is required for successful goal-directed behavior. The majority of electrodes with sustained HG activity were in lateral PFC (72%), reflecting the central role of this region in information integration. Within lateral PFC, the majority of active sites (60%) exhibited sustained activity. The proportion of lateral PFC sites with sustained activity significantly increased with task difficulty ($p<0.01$), and the peak of HG activation at these sites predicted reaction times. We propose that temporally sustained activity in the lateral PFC reflects the critical role of this region in decision-making networks.

OP2 002: Investigating Neural Correlates of Dual-Tasking and Task-Switching: A Meta-Analytic Approach

Britta Worringer, RWTH Aachen University, Germany

Many dual-tasking and task-switching studies have demonstrated limitations of the human cognitive system in performing several tasks at once. A number of functional magnetic resonance imaging experiments revealed a fronto-parietal network associated with performance decrements in both experimental settings. However, despite numerous commonalities across dual-tasking and task-switching, both paradigms have been investigated largely independently from each other. The current study provides new insights into the neural commonalities and differences of dual-tasking and task-switching by performing an Activation Likelihood Estimation meta-analysis of 17 dual-tasking and 22 task-switching neuroimaging experiments. Moreover, by contrasting 8 crossmodal and 9 unimodal dual-tasking experiments we investigated modality-specific effects. The results indicated activity associated with both paradigms in the left parietal lobule. Contrasted to dual-tasking, which yielded more consistent activation in left middle and superior frontal areas, task-switching evoked more consistent activation in the supplementary motor area (SMA). In contrast to unimodal dual-tasking, which did not evoke more consistent activation in any brain area, crossmodal dual-tasking yielded more consistent activation in a widespread bilateral frontal network. Results indicate a common neural base of limited information processing in task-switching and dual-tasking associated with increased activation in left parietal lobule. More consistent activation in SMA during task-switching suggests a more demanding process of task-set updating, while stronger activation during dual-tasking in left middle and superior frontal areas points to more demands on action planning, organization and regulation. Furthermore, we hypothesise that increased activation in frontal areas during crossmodal dual-tasking reflects a modality translation process due to modality-incompatibility of stimulus-response mappings.

ORAL PRESENTATION
ABSTRACTS

OP2 003: Effects Of Acute Ketamine Infusion On Visual Working Memory Encoding: A Study Using ERPs

Corinna Haenschel, City University London, UK

The impairment of working memory (WM) is regarded as a central deficit in schizophrenia spectrum disorders. We have previously demonstrated a relationship between EEG measures of visual stimulus encoding and WM performance in schizophrenia. Specifically, we examined the early visual P1 and the later occurring P3 ERP component. Both ERPs were attenuated in participants with schizophrenia. However, the P1 was predictive of WM performance in healthy controls. The findings emphasise the importance of visual encoding anomalies in explaining WM deficits in schizophrenia. These information processing abnormalities have been suggested to be the result of a NMDA glutamate receptor abnormality. Ketamine, a non-competitive NMDA antagonist, can be used to explore the neurophysiological characteristics of acutely induced glutamate receptor dysfunction in healthy volunteers. In this study, we aimed to test whether the administration of IV ketamine can replicate the cognitive and electrophysiological patterns that our group previously observed in schizophrenia patients and schizotypal individuals. 44 healthy volunteers were randomised to receive IV infusion of ketamine or placebo. A 64 channel EEG was used to obtain event-related potentials in response to a delayed discrimination working memory (WM) task. The two groups were compared in respect to their performance task as well as the amplitude of the P1 and P300 ERPs. The psychiatric scales scores (BPRS, CADSS) were significantly increased in the ketamine group when compared to saline. While there was no difference in terms of reaction times to the task, accuracy in the ketamine group worsened significantly with increase in working memory load than in controls. Ketamine significantly increased the P1 but lead to a decrease in P300. In this study acute NMDA antagonism induced a WM deficit that was associated with visual processing and memory abnormalities. Specifically, ketamine increased the amplitude of the P1 potential and reduced the P300 amplitude. In addition P1 but not P300 predicted performance on the WM task. These effects could be mediated ketamine-induced acute glutamate release in the visual cortex, enhancing neuronal responses to visual stimuli and increasing the signal-to-noise ratio which in turn disrupted higher order cognitive function.

OP2 004: Modeling Managment Of Access To Working Memory As A Self-Evalution Process For Intrinsically Motiveted Prediction

Catherine Wacongne , INSERM, France

Working memory offers the unique possibility to maintain information during an arbitrary long time. However, this possibility comes with the constraint that the number of items that can be maintained this way is very limited. This situation creates a computational problem of optimizing working memory content by choosing appropriately which items should be maintained and which items should be discarded. Previous work by O'Reilly (O'Reilly & Frank, 2006) showed that a reinforcement learning scheme could allow training of a basal ganglia dependent gating mechanism to successfully manage working memory content in order to complete diverse tasks. The predictive coding framework, proposes that one of the intrinsic purpose of the brain is the prediction of future events. Data (Bekinschtein et al., 2009) suggests that the involvment of working memory can be crucial, even in the absence of an explicit task to discover long distance temporal dependencies. We studied a simplified version of the working memory management problem by reducing working memory capacity to one slot. We show that using a value system that is sensitive to prediction accuracy, and a reinforcement learning algorithm, the brain can use self-evaluation to learn a successful gating policy to control the access to its working memory slot and optimize predictions. Specifically, we studied the performance of this value based working memory access (vbWMA) model on simple sequences of stimuli whose probability of occurrence was chosen independently of the past, except for one long distance predictive relation. The vbWMA model was able to learn to store the predictive stimulus for the appropriate duration. The dynamics of policy discovery was non-linear. Comparison with other models shows that this strategy offers an excellent trade-off between final performance and learning time. We also show that the vbWMA develops appropriate strategies in more complex situations with multiple long distance dépendencies.

POSTER SESSION 2

TOPICS IN THIS POSTER SESSION ARE:

TOPIC	CODE
Attention	TAT
Cognition and Executive Processes	TCE
Emotion and Social Processes	TES
Language	TLA
Methods Development	TME
Sensation & Perception	TPE

Attention

TAT001: Prediction and Attention: an ERP Study on the Effects of Stimulus Probability and Task Relevance

Presented by: Anna Marzecová, University of Leipzig, Germany

Authors: Anna Marzecová, Iria SanMiguel, Andreas Widmann, Sonja A. Kotz, Erich Schröger

TAT002: fMRI Reveals Abnormal Attentional Networks in People with Migraine Headache in Between Headache Attacks

Presented by: Marla Mickleborough, University of Saskatchewan, Canada

Authors: Marla Mickleborough, Layla Gould, Chelsea Ekstrand, Eric Lorentz, Paul Babyn, Ron Borowsky

TAT003: A Systematic Review Of Comorbidity In PTSD Using Eye Tracking And MEG

Presented by: Selma Music, Swinburne University of Technology, Australia

Authors: Selma Music, Susan Rossell, Joseph Ciorciari

TAT004: Genetically Mediated Resistance To Distraction: Influence Of Dopamine Transporter Genotype On Attentional Selection

Presented by: Mark Bellgrove, Monash University, Australia

Authors: Mark Bellgrove, Daniel Newman, Tarrant Cummins, Janette Tong, Beth Johnson, Joseph Wagner, Jack Goodrich, Ziarih Hawi, Chris Chambers

TAT005: Inter-Hemispheric Activation Asymmetry And Trial-To-Trial Fluctuations In Alertness: An Electrophysiological And Pupillometric Investigation

Presented by: Daniel Newman, Monash University, Australia

Authors: Daniel Newman, Gerard Loughnane, Rafael Abe, Marco Zoratti, Simon Kelly, Redmond O'Connell, Mark Bellgrove

TAT006: The Suppression of N1 To Predicted Sounds Depends On Attention

Presented by: Tim Paris, University of Western Sydney, Australia

Authors: Tim Paris, Jeesun Kim, Chris Davis

TAT007: The Upper Visual Field Advantage For Face-Processing: A Product Of Endogenous Attentional Bias?

Presented by: Genevieve Quek, Macquarie University, Australia

Authors: Genevieve Quek, Matthew Finkbeiner

TAT008: Efficiency Of Attentional Selection Is Continuous Rather Than Categorical

Presented by: Dragan Rangelov, Ludwig-Maximilians University, Germany

Authors: Dragan Rangelov, Hermann Müller, Thomas Töllner

TAT010: Emotion And Attention Interactively Regulate The Flow Of Information In V1 As Early As 75 ms After Stimulus Onset

Presented by: Valentina Rossi, Ghent University, Belgium

Authors: Valentina Rossi, Gilles Pourtois

TAT011: Dissociating The Neural Mechanisms Underlying Spatiotopic And Retinotopic Inhibition Of Return: An Investigation Using Eye Tracking And Electroencephalography

Presented by: Jason Satel, University of Nottingham, Malaysia

Authors: Jason Satel, Matthew D. Hilchey, Zhiguo Wang, Raymond M. Klein

TAT012: Allocation of Attention During Tasks Involving Discriminations of Rotated Stimuli

Presented by: Jordan Searle, University of Auckland, New Zealand

Authors: Jordan Searle, Jeff Hamm

TAT013: Temporal Orienting Of Attention And Predictive Timing In Anticipatory Auditory Processing

Presented by: Chase S. Sherwell, Queensland Brain Institute, The University of Queensland, Australia

Authors: Chase S. Sherwell, Marta I. Garrido, Ross Cunnington

TAT014: Attending to the Unseen: The Effects of Spatial Attention on Neural Responses to Visible and Invisible Stimuli

Presented by: Cooper Smout, Queensland Brain Institute, The University of Queensland, Australia

Authors: Cooper Smout, Jason Mattingley

TAT015: Visuospatial Attention Bias is Related to ADHD Symptomology: A Behavioural and Electrophysiological Analysis

Presented by: Joseph Wagner, The University of Queensland, Australia

Authors: Joseph Wagner, Daniel Newman, Gerard Loughnane, Simon Kelly, Redmond O'Connell, Mark Bellgrove

POSTER SESSION 2

Attention cont'd

TAT017: Distinct Neuronal Effects Of Perspective And Hand Grip On Paired-Object Affordance: An fMRI Study

Presented by: Melanie Wulff, University of Birmingham, UK

Authors: Melanie Wulff, Glyn W Humphreys, Pia Rotshtein

TAT018: Early Intraparietal Involvement In Motion-Driven Attention Identified With fMRI-Neuronavigated TMS

Presented by: Bonnie Alexander, La Trobe University, Australia

Authors: Bonnie Alexander, Robin Laycock, Sheila Crewther, David Crewther

TAT019: Differences in Attentional Biases to Food Cues between Obese and Healthy Weight Individuals as Measured by a Stroop Task and Electroencephalographic Indices

Presented by: Joshua Hendrikse, Deakin University, Australia

Authors: Joshua Hendrikse, Melissa Hayden, Emily Kothe

TAT020: The Neural Correlates Evidence For The Time Course Of Distractor Dilution Under Attentional Load

Presented by: Tzu-Yu Hsu, National Taiwan University, Taiwan

Authors: Tzu-Yu Hsu, Shao-Ming Lee, Yei-Yu Yeh

TAT023: Measuring Attention In Rodents: Comparison Of The 5-choice Serial Reaction Time Task (5C-SRT) and Continuous Detection Task (CDT)

Presented by: Karly Turner, Queensland Brain Institute, The University of Queensland, Australia

Authors: Karly Turner, James Peak, Thomas Burne

TAT024: Coding Dichotomy In Lateral Intraparietal Cortex (LIP) Of The Macaque Monkey And Its Role In Spatial Attention

Presented by: Trichur Vidyasagar, University of Melbourne, Australia

Authors: Trichur Vidyasagar, Ekaterina Levichkina, Yuri Saalmann

Cognition & Executive Processes

TCE002: Diagnostic Markers Of Young Children's Numerical Cognition: The Significance Of Precise Small Number, Approximate Number, Executive Function And Vocabulary Abilities

Presented by: Sarah Gray, University of Melbourne, Australia

Authors: Sarah Gray, Robert Reeve

TCE003: Cortico-Striatal-Pallidal-Thalamic Circuitry Changes Associated With Reduced Causal Awareness In Early Onset Depression

Presented by: Kristi Griffiths, Brain and Mind Research Institute, University of Sydney, Australia

Authors: Kristi Griffiths, Jim Lagopoulos, Daniel Hermens, Ian Hickie, Bernard Balleine

TCE005: Cortical Representations of Cognitive Control and Working Memory are Dependent Yet Non-Interacting

Presented by: Ian Harding, University of Melbourne, Australia

Authors: Ian Harding, Ben Harrison, Michael Breakspear, Christos Pantelis, Murat Yucel

TCE006: Cognitive Development And Volumes Of The Corpus Callosum And Lateral Ventricles In Normal And Premature infants

Presented by: Thalia Harmony, National Autonomous University of Mexico, Mexico

Authors: Thalia Harmony, Yuria Cruz, Jorge Bosch-Bayard, Erika Cruz, Manuel Hinojosa, Thalia Fernandez, Josefina Ricardo-Garcell, Berta González-Frankenberger, Antonio Fernández-Bouzas

TCE007: Deep Brain Stimulation of Anterior Thalamic Nuclei Modulates Emotion - Executive Function Interaction in Humans

Presented by: Kaisa Hartikainen, Tampere University Hospital, Finland

Authors: Kaisa Hartikainen, Lihua Sun, Markus Polvivaara, Maarja Brause, Juha Öhman, Jukka Peltola, Kai Lehtimäki

TCE008: Impulsivity in Obesity: An Event-Related Potential Investigation

Presented by: Melissa Hayden, Deakin University. Australia

Authors: Melissa Hayden, Emelia Olsson, Emily Kothe

TCE009: Beyond P300: An Auditory ERP Paradigm With Sequential Stimulation

Presented by: Johannes Hoehne, Technical University of Berlin, Germany

Authors: Johannes Hoehne, Michael Tangermann

TCE010: MEG Responses Over Right Inferior Frontal Gyrus During Stop-Signal Task Performance

Presented by: Matthew Hughes, Swinburne University of Technology, Australia

Authors: Matthew Hughes, William Woods, Neil Thomas, Patricia Michie, Susan Rossell

TCE011: Age Differences In The Reliance On Executive Resources During Updating Working Memory Depend On Memory Load

Presented by: Michel Isingrini, University of Tours, France

Authors: Michel Isingrini, Lucie Angel, Severine Fay, Laurence Taconnat, Patrick Lemaire, Badiaa Bouazzaoui

TCE012: Multivoxel Coding of Visual Stimuli is Flexible: Frontoparietal and Visual Cortices Adapt to Code the Currently Relevant Distinction

Presented by: Jade Jackson, Macquarie University, Australia

Authors: Jade Jackson, Anina N. Rich, Mark A. Williams, Alexandra Woolgar

TCE013: A P300 Brain-Computer Interface for Controlling a Robot by Issuing a Color Flashes Located in His "Eyes" as Target and Non-target Stimuli

Presented by: Alexander Kaplan, Moscow State University, Russia

Authors: Alexander Kaplan, Arina Kochetova

TCE014: Cerebral Language Lateralisation Attenuates In Old Age: Evidence From Functional Transcranial Doppler Methods

Presented by: Hannah Keage, University of South Australia, Australia

Authors: Hannah Keage, Owen Churches, Lisa Kurylowicz, Atlanta Flitton, Louise Lavrencic Lavrencic, Jessica Hofmann, Mark Kohler, Nicholas Badcock

TCE015: Cortical Excitability Modulates The Sensory Strength Of Visual Mental Imagery

Presented by: Rebecca Keogh, University of New South Wales, Australia

Authors: Rebecca Keogh, Joel Pearson

POSTER SESSION 2

TCE016: Functional Neuroimaging Of Prefrontal Cortex In Parkinson's Disease Using Near Infra-Red Spectroscopy: Effects Of Cognitive Task During Seated And Standing Postures

Presented by: Graham Kerr, Queensland University of Technology, Australia

Authors: Graham Kerr, Mark Muthalib, Roger Pegoraro, Luisa Roeder, Tim Piatkowsk, Ian Stewart, Simon Smith

TCE018: Transcranial Direct Current Stimulation Of Prefrontal Cortex: An Event-Related Potential And Proton Magnetic Resonance Spectroscopy Study

Presented by: Lilly Knechtel, University of Newcastle, Australia

Authors: Lilly Knechtel, Ulrich Schall, Gavin Cooper, Todd Jolly, Peter Stanwell, Saalladah Ramadan, Renate Thienel

TCE019: Inter-Individual Differences In Intrinsic Connectivity Of The Ocular Motor Network Predict Anti-Saccade Spatial Accuracy

Presented by: Scott Kolbe, University of Melbourne, Australia

Authors: Scott Kolbe, Sanuji Gajamange, Sharna Jamadar, Beth Johnson, Gary Egan, Joanne Fielding

TCE020: Anterior Cingulate Cortex Activity During a Counting Stroop Task Predicts Successful Smoking Cessation

Presented by: Klaus-Martin Krönke, Technical University of Dresden, Germany

Authors: Klaus-Martin Krönke, Max Wolff, Annika Benz, Thomas Goschke

TCE023: Sleep Deprivation And Inference Under Uncertainty

Presented by: Irma Triasih Kurniawan, Duke-NUS Graduate Medical School, Singapore

Authors: Irma Triasih Kurniawan, Konstantinos Tsetsos, Michael W.L. Chee

TCE024: The Care And Testing Of Video-Game Players: Using Patterns Of Performance To Provide Insight Into The Effects Of Video-Game Experience And Expertise

Presented by: Andrew James Latham, The University of Sydney, Australia

Authors: Andrew James Latham, Christine Westermann, Lucy L. M. Patston, Lynette J. Tippett

TCE025: Using Multiscale Entropy to Quantify the Complexity of Neural Systems during the Process of Cognitive Control

Presented by: Wei-Kuang Liang, National Central University, Taiwan

Authors: Wei-Kuang Liang, Chi-Hung Juan

TCE027: Impaired Cognitive Functioning In Cervical Dystonia

Presented by: Tobias Loetscher, Flinders University, Australia

Authors: Tobias Loetscher, Michelle McDonnell, Lynley Bradnam

TCE028: Inter-Individual Variability In MRI-Related Anxiety Predicts Task Based Brain Activity

Presented by: Valentina Lorenzetti, Monash Clinical and Imaging Neuroscience, Australia

Authors: Valentina Lorenzetti, Rebecca Kerestes, Ian Harding, George Youssef, Christopher Davey, Murat Yucel, Ben Harrison

TCE030: Characterizing Rare Copy Number Variants In Schizophrenia: A Clinical, Cognitive, And Neuroimaging Study.

Presented by: Andrew Martin, Queensland Brain Institute, The University of Queensland, Australia

Authors: Andrew Martin, Gail Robinson, David Reutens, Bryan Mowry

TCE031: Optimal Group Decision: A Matter of Confidence Calibration

Presented by: Sebastien Massoni, Queensland University of Technology, Australia

Authors: Sebastien Massoni, Nicolas Roux

TCE032: Structural And Functional Correlates Of Cognitive Ability Differ Across The Adult Lifespan

Presented by: Ian McDonough, University of Texas at Dallas, USA

Authors: Ian McDonough, Jenny Rieck, Gérard Bischof, Patricia Reuter-Lorenz, Denise Park

TCE033: Hippocampal Asymmetry Is Associated With Cognitive Decline In Type 2 Diabetes

Presented by: Nicole Milne, The University of Western Australia, Australia

Authors: Nicole Milne, David Bruce, Sergio Starkstein, Melinda Nelson, Wendy Davis, Ronald Pierson, Romola Bucks

TCE035: Contingency Degradation In Humans: The Effect Of Outcome Identity

Presented by: Richard Morris, Sydney University, Australia

Authors: Richard Morris, Amir Dezfouli, Kristi Griffiths, Bernard Balleine

TCE037: Distributed And Overlapping Neural Bases For Object Individuation And Identification

Presented by: Claire Naughtin, The University of Queensland, Australia

Authors: Claire Naughtin, Paul Dux, Jason Mattingley

TCE038: Small Numerosities Are Associated With The Left, Large Numerosities Are Associated With The right: Evidence From A SNARC Task

Presented by: Fiona Nemeh, University of Melbourne, Australia

Authors: Fiona Nemeh, Mark Yates, Tobias Loetscher, Anna Ma-Wyatt, Michael E. R. Nicholls

TCE039: How Task-Set-Size Influences Cognitive Control: Alpha Power And Medial-Frontal Negativities Reflect Cognitive effort

Presented by: Roland Nigbur, Otto von Guericke University Magdeburg, Germany

Authors: Roland Nigbur, Markus Ullsperger

TCE040: Dissociating The Component Processes Of Impulsivity In Parkinson's Disease

Presented by: Claire O'Callaghan, Neuroscience Research Australia, Australia

Authors: Claire O'Callaghan, James Shine, Alana Muller, Courtney Walton, Simon Lewis, Michael Hornberger

TCE043: Eye Movements In Enumerating Visual Dot Arrays: The Significance For Math Cognition

Presented by: Jacob Paul, University of Melbourne, Australia

Authors: Jacob Paul, Jason Forte, Robert Reeve

TCE044: What's In A Punchline? Using jokes & fMRI To Determine The Processes Underlying Humour Expectation And Appreciation

Presented by: Moos Peeters, University of Cambridge, UK

Authors: Moos Peeters, Tristan Bekinschtein, Deab Mobbs

POSTER SESSION 2

Cognition & Executive cont'd

TCE045: Centromedian Nuclei of Thalamus Contributes To Working Memory Performance: Evidence From Electric Stimulation of CMN In A Human Subject Treated With DBS For Refractory Epilepsy

Presented by: Jari Peräkylä, Tampere University Hospital, Finland

Authors: Jari Peräkylä, Lihua Sun, Markus Polvivaara, Juha Öhman, Jukka Peltola, Kai Lehtimäki, Kaisa Hartikainen

TCE046: Intracultural Effects On Adult Theory-Of-Mind Reasoning

Presented by: Daniel Perez-Zapata, The University of Queensland, Australia

Authors: Daniel Perez-Zapata, Virginia Slaughter, Julie Henry

TCE047: Impact Of Genome-Wide Discovered Psychosis-Risk Gene ZNF804A On White Matter Integrity In Health And Psychosis

Presented by: Diana Prata, Kings College London, London, UK

Authors: E-J Mallas, C Chaddock, J Sato, S Shergill, J Woolley, MM Picchioni, E Kravariti, M Walshe, M Allin, T Toulopoulou, E Bramon, C McDonald, GJ Barker, DP Prata

Emotional & Social Processes

TES001: The Error-Related Negativity (ERN) as a Marker of Individual Differences in Cognitive Empathy

Presented by: Azhani Amiruddin, The University of Western Australia, Australia

Authors: Azhani Amiruddin, Allison Fox, Karen L. Clunies-Ross, Veronica Connaughton, Vicole Bothma

TES002: Negative Biases And The Slow Negative Wave In Parkinson's Disease

Presented by: Tiffany Au, The University of Queensland, Australia

Authors: Tiffany Au, Anthony Angwin, David Copland, John O'Sullivan, Gerard Byrne, Peter Silburn, Rodney Marsh, George Mellick, Nadeeka Dissanayaka

TES003: Empathy Correlates With Insula And Cingulate Cortex Activity During Encoding But Not Enactment Of Manual Imitation

Presented by: Lieke Braadbaart, University of Aberdeen, UK

Authors: Lieke Braadbaart, Justin Williams, Gordon Waiter

TES004: Isoluminant Figure-Ground Emotional Stimuli Reveal The Crucial Role Of The Magnocellular Visual System In Exogenous (Automatic) Attention

Presented by: Luis Carretié, Autonomous University of Madrid, Spain

Authors: Luis Carretié, Sandra Hoyos, María J. García-Rubio, Dominique Kessel, Manuel Tapia, Almudena Capilla, Jacobo Albert, Sara López-Martín

TES005: A MEG Investigation into Rapid Amygdala Responses

Presented by: Sean Carruthers, Swinburne University of Technology, Australia

Author: Sean Carruthers

TES006: Simulating Cooperative Interactions to Investigate the Neural Correlates of Joint Attention

Presented by: Nathan Caruana, Macquarie University, Australia

Authors: Nathan Caruana, Alexandra Woolgar, Jon Brock

TES007: GABAergic Control Of Anxiety-Potentiated Responding To Stimulus Deviance

Presented by: Brian Cornwell, Swinburne University of Technology, Australia

Authors: Brian Cornwell, Christian Grillon

TES009: Emotional And Cognitive Processing In Parkinson's Disease

Presented by: Nadeeka Dissanayaka, The University of Queensland. Australia

Authors: Nadeeka Dissanayaka, Tiffany Au, Anthony Angwin, John O'Sullivan, Gerard Byrne, Peter Silburn, Rodney Marsh, George Mellick, David Copland

TES010: Are Gaze Patterns And Autism-Relevant Traits Related To Inferred Mirror Neuron Activity?

Presented by: Peter Donaldson, Deakin University, Australia

Authors: Peter Donaldson, Caroline Gurvich, Joanne Fielding, Peter Enticott

TES012: Deep Repetitive Transcranial Magnetic Stimulation (rTMS) Of Dorsomedial Prefrontal Cortex Improves Social Relating In Autism Spectrum Disorder

Presented by: Peter Enticott, Deakin University, Australia

Authors: Peter Enticott, Bernadette Fitzgibbon, Hayley Kennedy, Sara Arnold, David Elliot, Amy Peachey, Abraham Zangen, Paul Fitzgerald

TES013: Anatomical Differences In Empathy Related Brain Areas: A Voxel-Based Morphometry Study

Presented by: Robert Eres, The University of Queensland, Australia

Authors: Robert Eres, Jean Decety, Winnifred Louis, Pascal Molenberghs

TES014: Mismatch Field Provides a Biological Link Between High Autistic and Schizotypal Tendencies.

Presented by: Talitha Ford, Swinburne University of Technology, Australia

Authors: Talitha Ford, David Crewther

TES015: An fMRI Investigation into Facial Affect Perception in Body Dysmorphic Disorder

Presented by: Sally Grace, Swinburne University of Technology, Australia

Authors: Sally Grace, Ben Buchanan, Matthew Hughes, Jerome Maller, Richard Nibbs, David Castle, Susan Rossell

TES016: Altered Neural Synchronisation In Major Depressive Disorders During Emotional Video Viewing

Presented by: Christine Guo, QIMR Berghofer, Australia

Authors: Christine Guo, Vinh Nguyen, Matthew Hyett, Gordon Parker, Michael Breakspear

TES017: Adult Attachment Style: Biases in Threat-Related and Social Information Processing

Presented by: Graham Jamieson, University of New England, Australia

Authors: Raewyn Stinson, Ian Evans, Graham Jamieson

TES019: Social Cognition Is Not Associated With Cognitive Reserve In Older Adults

Presented by: Louise Lavrencic, University of South Australia, Australia

Authors: Louise Lavrencic, Lisa Kurylowicz, Mark Kohler, Owen Churches, Hannah Keage

TES020: Response Inhibition During Emotional Contexts In Children With ADHD: Neural And Behavioral Data

Presented by: Sara López-Martín, Autonomous University of Madrid, Spain

Authors: Sara López-Martín, Jacobo Albert, Alberto Fernández-Jaén, Luis Carretié

POSTER SESSION 2

Language

TLA002: The Use Of High-Density Electrophysiology In The Early Detection Of Cognitive And Language Impairments In Preterm Infants.

Presented by: Natacha Paquette, University of Montreal, Canada

Authors: Natacha Paquette, Phetsamone Vannasing, Michelle McKerral, Franco Lepore, Maryse Lassonde, Anne Gallagher

TLA003: Behavioural And fMRI Evidence Of Semantic Categorisation Deficits In Schizophrenia

Presented by: Susan Rossell, Swinburne University of Technology, Australia

Authors: Susan Rossell, Matthew Hughes

TLA004: Different Language Trainings Modulate Word Learning in Young Infants: a Combined EEG and fNIRS Study

Presented by: Sonja Rossi, Medical University Innsbruck, Austria

Authors: Sonja Rossi, Maria Richter, Micol Vignotto, Julia Mock, Franziska Stephan, Hellmuth Obrig

TLA005: Two Sides Of The Predictive Coin: Age-Related P300 vs. N400 Dissociations In Language Processing Differentiate Prediction Fulfilment From Internal Model Updating

Presented by: Matthias Schlesewsky, Johannes Gutenberg-University, Germany

Authors: Matthias Schlesewsky, Markus Philipp, Franziska Kretzschmar, Tanja Grewe, Petra Schumacher, Maike Gumpert, Ina Bornkessel-Schlesewsky

TLA006: Genome-Wide Supported Dyslexia Risk Variant rs11100040 Alters Neural Connectivity Profiles Affecting Phonological Awareness In Children

Presented by: Michael Skeide, Max Planck Institute for Human Cognitive and Brain Sciences, Germany

Authors: Michael Skeide, Holger Kirsten, Indra Kraft, Gesa Schaadt, Bent Müller, Arndt Wilcke, Jens Brauer, Johannes Boltze, Angela Friederici

TLA007: L2 minus L1 Difference In N400 Amplitude Reveals The L2 Vocabulary Size

Presented by: Jakub Szewczyk, Jagiellonian University, Poland

Authors: Jakub Szewczyk, Zofia Wodniecka

TLA008: A Study Of The Relationship Between Receptive And Expressive Language Processing In Schizophrenia

Presented by: Eric Tan, Monash University, Australia

Authors: Eric Tan, Gregory Yelland, Susan Rossell

TLA009: Auditory Envelope Following Responses In The Mature And Developing Human Brain

Presented by: Huizhen Tang, CCD, Macquarie University, Australia

Authors: Huizhen Tang, Jon Brock, Stephen Crain, Blake Johnson

TLA010: Are Babies Born With Left-Hemisphere Language Dominance? An fNIRS Study

Presented by: Phetsamone Vannasing, Sainte-Justine Hospital, Canada

Authors: Phetsamone Vannasing, Anne Gallagher, Natacha Paquette, Julie Tremblay, Olivia Florea, Dima Safi, Renée Béland, Franco Lepore, Maryse Lassonde

TLA011: Motor Speech Deficits In Behavioural Variant Frontotemporal Dementia

Presented by: Matthew Poole, University of Melbourne, Australia

Authors: Matthew Poole, Amy Brodtmann, Hugh Pemberton, Essie Low, David Darby, Adam Vogel

TLA014: Understanding of Interface or Neurotransmitter between Cerebral Lobes and Parts of Speech in Inter-language Interpreting answers Super-language Interpreting Theory and Psychotherapy

Presented by: Yoshinori Inoue, The Federation of Academic Interpreters / Translators, Japan

Author: Yoshinori Inoue

TLA016: Neural Mechanisms Of Verb Processing: An ERP study With Locative Alternations

Presented by: Abhilasha Srivastava, Centre of Behavioural and Cognitive Sciences, University of Allahabad, India

Authors: Abhilasha Srivastava, Narayanan Srinivasan

Methods Development

TME003: A Test Of Conventions: An Empirical Study To Determine Whether ERP Researchers Should Start Plotting All Waveforms With Negative Downward

Presented by: Owen Churches, Flinders University, Australia

Authors: Owen Churches, Mike Nichols, Daniel Feuerriegel, Mark Kohler, Hannah Keage

TME004: Introducing SPoC: A Multivariate Analysis Framework For The Analysis Of Cross-Frequency Power Coupling As Well As For Multimodal Integration Of EEG/MEG Power With Hemodynamics

Presented by: Sven Dähne, Berlin Institute of Technology, Germany

Authors: Sven Dähne, Stefan Haufe, Vadim Nikulin, Klaus-Robert Müller

TME005: Distance Concentration in High-Dimensional fMRI Datasets: Possible Analysis Implications

Presented by: Jo Etzel, Washington University, USA

Authors: Jo Etzel, Todd Braver

TME006: Optimization of the Neurofeedback protocol in children with Learning Disabilities and a lag in their EEG maturation

Presented by: Thalia Fernandez, National Autonomous University of Mexico, Mexico

Authors: Thalia Fernandez, Thalia Harmony, Jorge Bosch-Bayard, Roberto A. Prado-Alcala, Gloria A. Otero-Ojeda, Fabiola Garcia, Maria del Carmen Rodriguez, Maria Isabel Caballero, Judith Becerra

TME007: Sensorimotor Plasticity In Pain: Effects, Mechanisms And Consequences

Presented by: Paul Hodges, The University of Queensland, Australia

Author: Paul Hodges

POSTER SESSION 2

Methods Development cont'd

TME009: Visualization and Quantification of Differences in Interaction Strength of Sensory and Motor Networks in the Human Brain using Differential Correlation Analysis and Graph Theory

Presented by: Christof Karmonik, Houston Methodist Research Institute, USA

Authors: Christof Karmonik, Jeff Anderson, Steve Fung, Amit Verma, Robert Grossman

TME011: Measuring Neurovascular Coupling by Combining Electroencephalogram and Functional Transcranial Doppler: A Detailed Method

Presented by: Lisa Kurylowicz, University of South Australia, Australia

Authors: Lisa Kurylowicz, Nicholas Badcock, Mark Kohler, Owen Churches, Hannah Keage

TME012: Dual Logic and Dual Neural Basis for Reciprocal Social Interaction

Presented by: Ray Lee, Princeton University, USA

Author: Ray Lee

TME013: The Rich Club Of The Brain In Bipolar Disorder

Presented by: Anton Lord, The University of Queensland, Australia

Authors: Anton Lord, Gloria Roberts, Michael Breakspear, Phillip Mitchell

Sensation & Perception

TPE001: Neural Adaptation Of Visual ERP Components: Effects Of Adaptor Stimulus Duration And Interstimulus Interval

Presented by: Daniel Feuerriegel, University of South Australia, Australia

Authors: Daniel Feuerriegel, Owen Churches, Mark Kohler, Hannah Keage

TPE002: Disentangling the Study of Person Cue Processing from Face and Body Processing

Presented by: Justin Gaetano, Southern Cross University, Australia

Authors: Justin Gaetano, Anna Brooks, Rick Zwan

TPE003: Vestibular-Auditory Interactions: Assessing the Influence of Passive Self-Motion on Auditory Localisation

Presented by: Luzia Grabherr, University of South Australia, Australia

Authors: Luzia Grabherr, Vanda Lory, Fred Mast

TPE005: Impaired Generation Of High-Frequency Oscillations In A Rat Model Of Schizophrenia

Presented by: Lauren Harms, University of Newcastle, Australia

Authors: Lauren Harms, Deborah Hodgson, William Fulham, Markku Penttonen, Ulrich Schall, Juanita Todd, Patricia Michie

TPE006: Pleasant to Touch: How Touch Avoidance Influences Pleasant Perceptions of CT-targeted Touch

Presented by: Emily Hielscher, Queensland Centre for Mental Health Research (QCMHR), Australia

Authors: Emily Hielscher, Doug Mahar

TPE007: Neural Correlates of Motion Velocity in Human Auditory Cortex

Presented by: I-Hui Hsieh, National Central University, Taiwan

Authors: I-Hui Hsieh, Chao-An Meng, Kourosh Saberi

TPE008: Optokinetic Nystagmus Confirms Multistable Rivalry Between Four Discrete Overlapping Motion stimuli

Presented by: Laila Hugrass, Swinburne University of Technology, Australia

Authors: Laila Hugrass, David Crewther, Imogen Bell, Linden Parkes, Philip Sumner, Alistair Walsh, Michael Reynolds

TPE009: The Brain Establishes, Tests, And Updates Predictive Models For Visual Inputs That Are Never Perceived

Presented by: Bradley N Jack, Southern Cross University, Australia

Authors: Bradley N Jack, Urte Roeber, Robert P. O'Shea

TPE010: Developmental Dyscalculia Like Symptoms Induced Psychophysically Via High Contrast Surround Masking In Neurotypical Observers

Presented by: Nicola Jastrzebski, Swinburne University of Technology, Australia

Authors: Nicola Jastrzebski, Laila Hugrass, David Crewther

TPE011: Magnetoencephalographic (MEG) Response Properties Associated With Capacity-Limited Sensory Gating Resources During More/Less Estimation Judgements: Case Of The Disappearing Magnetic Dipole In Right Posterior Parietal Cortex (rPPC) Under The Cloak Of Surro

Presented by: Nicola Jastrzebski, Swinburne University of Technology, Australia

Authors: Nicola Jastrzebski, David Crewther, William Woods

TPE012: Can SSRIs Enhance Human Visual Cortex Plasticity?

Presented by: Alice K. Lagas, University of Auckland, New Zealand

Authors: Alice K. Lagas, Joanna Black, Cathy M. Stinear, Winston D. Byblow, Geraint Phillips, Bruce R. Russel, Robert R. Kydd, Benjamin Thompson

TPE013: Decoding of Single Auditory Features Investigated by Mismatch Negativity

Presented by: Melissa Larsen, Danish Research Center for Magnetic Resonance, Denmark

Authors: Melissa Larsen, Morten Mørup, Michelle Rosgaard Birknow, Elvira Fischer, William Baaré, Thomas Werge, Hartwig Siebner

TPE014: Investigating The Effect Of Stimulus Variables And Eye Movement Profiles On Binocular Rivalry Rate: Implications For Large-Scale Endophenotype Studies

Presented by: Phillip Cheuk Fung Law, Monash University, Australia

Authors: Phillip Cheuk Fung Law, Jacqueline Riddiford, Caroline Gurvich, Trung Ngo, Steven Miller

TPE015: To Hear Or Not To Hear: Stimulus-Specific Adaptation In The Auditory System

Presented by: Manuel Malmierca, University of Salamanca, Spain

Authors: Manuel Malmierca, Yaneri A. Ayala, Flora M. Antunes, Daniel Duque, Javier Nieto, Blanca N. Aguillon, David Pérez-González, Xin Wang,

TPE016: Motion Discrimination is Impaired in Cannabis Users

Presented by: Elena Mikulskaya, University of Newcastle, Australia

Authors: Elena Mikulskaya, Frances Martin

POSTER SESSION 2

TPE017: Individual Differences In Visuotactile Processing Predict Susceptibility To The Rubber Hand Illusion

Presented by: Hannah Morgan, Macquarie University, Australia

Authors: Hannah Morgan, Regine Zopf

TPE018: Ketamine As A Model For Schizophrenia Deficits

Presented by: Susan Rossell, Swinburne University of Technology, Australia

Authors: Susan Rossell, Celia Morgan, Nicole Joshua, Olivia Carter, Erica Neill

TPE019: Neural Entrainment To Musical Rhythms In Human Auditory Cortex, As Revealed By Intracerebral recordings

Presented by: Sylvie Nozaradan, Catholic University of Louvain, Belguim

Authors: Sylvie Nozaradan, Jacques Jonas, Jean-Pierre Vignal, Louis Maillard, Andre Mouraux

TPE020: Large Auditory Evoked Potentials To Rare Emotional Stimuli In Preterm Infants At Term Age

Presented by: Satu Pakarinen, Cognitive Brain Research Unit, University of Helsinki, Finland

Authors: Satu Pakarinen, Anna Grekula, Iina Ala-Kurikka, Kaija Mikkola, Vineta Fellman, Minna Huotilainen

TPE022: Investigating the Ecological Validity of Predictive Auditory Processing

Presented by: Martin Reiche, Carl von Ossietzky University of Oldenburg, Germany

Authors: Martin Reiche, Andreas Widmann, Alexandra Bendixen

TPE023: Odours Influence Distributed Patterns Of Brain Activity For Matching Visual Objects

Presented by: Amanda Robinson, The University of Queensland,Australia, Australia

Authors: Amanda Robinson, Zhengyi YANG, Jeiran Choupan, Judith Reinhard, Jason Mattingley

KEYNOTE ABSTRACTS

KEY006: Temporal Decoding Of Brain Signals: A Window Into Conscious And Non-Conscious Operations

Keynote Speaker: **Professor Stanislas Dehaene**, Collège de France, Paris, France

Overview

Parsing a cognitive task into a sequence of operations is a central problem in cognitive neuroscience. A major advance is now possible thanks to the application of pattern classifiers to time-resolved recordings of brain activity (electro-encephalography [EEG], magneto-encephalography [MEG], or intracranial recordings). By probing when a specific mental content becomes decodable in brain activity, we can characterize the time course of cognitive codes. Most importantly, how the trained classifiers generalize across time, and from one experimental condition to another, sheds light on the temporal organization of information-processing stages.

I will illustrate these ideas using several MEG+EEG experiments in which temporal decoding is used to track the fate of conscious and unconscious stimuli in the brain. With Moti Salti, using masking, we present a brief pulse of sensory evidence about a bar presented at a peripheral spatial location. Blindsight is extensive, as subjects behave way above chance in localizing the unseen target. The representation of the invisible percept can be tracked through a series of stages, but the same percept, when visible, leads to an additional series of activations which involve amplified activity in parietal and prefrontal cortices. In a second experiment, Lucie Charles and I investigate, more specifically, how self-monitoring processes of error detection are modulated by perceptual awareness of a masked target digit. Although subjects perform above chance in both number comparison and metacognitive confidence judgments, the error-related negativity (ERN) is present only on conscious trials, and multivariate decoding reveals the presence of intention and error codes unique to conscious trials. On this basis, we propose the existence of two distinct brain mechanisms for metacognitive judgments: a conscious all-or-none process of single-trial evaluation, indexed by the ERN, and a non-conscious statistical assessment of confidence.

KEY007: Schizophrenia As A Cognitive Disorder: Insights From Cognitive Neuroscience

Keynote Speaker: **Emeritus Professor Pat Michie**, University of Newcastle, Australia

Overview

Despite diagnostic emphasis on positive and negative symptoms, cognitive deficits and decline in functioning are core to schizophrenia. I will focus on an ERP measure of deviance detection in audition, mismatch negativity (MMN), in combination with other neuroimaging methodologies, pharmacological studies and animal models, to demonstrate what insights have been revealed about schizophrenia. Following our initial reports that MMN amplitude to simple duration deviants is reduced in schizophrenia, many research groups subsequently documented that reduced MMN is substantial in schizophrenia, and arguably one of the most robust neurobiological findings in the literature. In addition, while data on the relationship of MMN to cognitive deficits is still scant, there is strong evidence that MMN is related to general, social and occupational functioning, a relationship that our research suggests is mediated by grey matter loss in anterior regions. One reason why MMN has attracted so much attention is evidence of its dependence on the glutamate NMDAR system, providing a link to PCP-models of schizophrenia: NMDAR antagonists such as PCP not only induce psychotic and cognitive changes in healthy people that parallel schizophrenia symptoms, they also reduce MMN in humans and animals. Other evidence from our group (not universally replicated) that reduced MMN precedes the onset of the illness, is present in those identified as at risk of developing psychosis and in first degree relatives of patients, indicate that MMN meets criteria for an endophenotype for schizophrenia and is therefore a good candidate marker in animal models of the disorder. Our most recent research utilising two animal models, maternal immune activation, a risk factor for schizophrenia, and NMDAR antagonist challenge, demonstrates that MMN is affected in both models, although not quite in the manner expected. The MMN story has therefore recently become somewhat more complicated - but nonetheless informative.

S13: Segregation And Integration Of Cortical Laminar Information Streams And Their Role In Attention

Markus Barth, The University of Queensland, Australia
Saskia Haegens, Columbia University, USA
Co-Chair & Speaker: **René Scheeringa**, Donders Institute for Brain, Cognition and Behaviour, Netherlands
Co-Chair & Speaker: **Andre M. Bastos**, Ernst Strüngmann Institute (ESI) for Neuroscience, Germany

Overview

One of the most fascinating anatomical properties of the cortex, established since the time of Ramon y Cajal, is its laminar structure. This prominent anatomical feature suggests distinct functional roles for the different laminae in cognitive processes such as attention. The precise computational function of these cortical layers, however, is a largely open question. Recent theories of cortical function, such as predictive coding, posit that there is a functional segregation of dynamics and computations which occur in the superficial and deep cortical layers. These models predict a strong functional segregation in the connectivity, dynamics, and physiological properties of cells situated in distinct cortical laminae. In this symposium we will present the latest developments on laminar resolution fMRI in humans (Markus Barth) and recent work on animal (Saskia Haegens) and human physiology (René Scheeringa). This work supports the notion of functional segregation between superficial and deep layers. These results constrain and inform computational models of how canonical microcircuits interact, and the characteristic frequencies which support neuronal communication (André Bastos). Together, these studies shed new light on the function of laminar cortical circuits, and how they may support complex and dynamic cognitive functions.

S13 001: The Possibility To Image Functional Changes In Cortical Laminae Using fMRI

Markus Barth, The University of Queensland, Australia

Recent developments in high field MRI and receiver coil technology have opened up the possibility of laminar fMRI in humans which holds great promise to detect activation at the level of functionally relevant cortical substructures. It could offer greater insight into human brain function by elucidating both the interaction between brain regions on the basis of laminar activation patterns associated with input and output, and in the interactions between laminae in a specific region. Experimental results and physiological models show that it is possible to investigate laminar profiles and laminar activation using a very high isotropic spatial resolution at high field strength.

Biography

As the Facility Fellow at the Centre for Advanced Imaging, the University of Queensland, Associate Professor Markus Barth leads the 7 Tesla research program. Having obtained his PhD in Technical Physics from the Technical University of Vienna, and having worked in the field of MRI at the Medical University of Vienna (Austria) and the Donders Institute for Brain Cognition and Behaviour (Radboud University, Nijmegen, The Netherlands) for the last 15 years, A/Prof. Barth has become an expert in advanced MR imaging methods. His main contributions have been made in the field of (cognitive) neuroscience and functional MRI, as well as clinical applications at high and ultra high field. Recent groundbreaking achievements include the development of accurate detection of layer specific functional activation in the human brain and ultra-fast MRI.

S13 002: Structure/Function/Model Analyses Of The Neocortical Laminar Activity Profile In Awake-Behaving Primates

Saskia Haegens, Columbia University, USA

We study laminar profiles of physiological activity in the neocortex of awake primates using linear array multielectrodes that sample the cortical laminar expanse at 100-200 micron spatial intervals. This method allows simultaneous recordings of field potentials (FPs) along with concomitant neuronal spiking activity across cortical layers. FPs arise from the first-order synaptic response, transmembrane current flow, which occurs whether or not there is sufficient spatiotemporal summation to cause neurons to fire. Indexing this subthreshold activity is essential to the understanding of ensemble excitability fluctuations and related cortical oscillatory dynamics. To precisely localize and currents related to the excitatory and inhibitory processes generating FPs, one-dimensional current source density (CSD) analysis is applied to the FP profile. Assisted by modeling/computational analyses, and anatomical reconstruction of input/output circuitry, this delineates the timing and laminar sequence of feedforward (bottom-up) and feedback (top-down) influences that impinge on the ongoing dynamic activity of local neuronal ensembles. Positioning multiple multielectrodes in interconnected structures allows examination of laminar patterns of interactions; this capacity is augmented by selective microstimulation. Microcannulae incorporated into the multielectrodes allow precise delivery of neurotransmitter agonists/antagonists and of anatomical tract tracing compounds. This talk will address: 1) the neural generators of key EEG components particularly alpha, delta and gamma, 2) the demonstrable physiological correlates of activating anatomical feedforward and feedback pathways, and 3) the underappreciated impact of non-specific, so-called matrix thalamic inputs on neuronal synchrony and on processing of driving inputs from the periphery.

Biography

Saskia Haegens did her PhD research in Ole Jensen's lab at the Donders Institute in Nijmegen, where she studied the functional role of oscillations in the somatosensory system, using both MEG and intracranial methods. Part of this research was done in collaboration with Ranulfo Romo in Mexico City. A main focus of her research is the role of the alpha rhythm in selective attention. Currently she works as a postdoctoral researcher with Charles Schroeder at Columbia University in New York, where she further explores the neurophysiological mechanisms of attention, now on the level of cortical layers using laminar recordings.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S13: Segregation And Integration Of Cortical Laminar Information Streams And Their Role In Attention cont'd

S13 003: The Relation Between Oscillatory EEG Activity And The Laminar Specific BOLD Signal

René Scheeringa, Donders Institute for Brain, Cognition and Behaviour, Netherlands

Recent developments in high-resolution fMRI have made it possible to measure BOLD signals with laminar resolution in humans. The relevance of this technique for neuroscience would be enhanced if the relationship between laminar BOLD signals and electrophysiology could be elucidated. Laminar electrophysiological recordings in animals have indicated that in the early visual cortex gamma band oscillatory activity is predominantly measured in superficial layers, while alpha and beta band activity show a strong presence in deeper layers.

In a previous experiment we demonstrated in a visual attention task that alpha/beta band power decreases and gamma band increases measured with simultaneously recorded EEG independently contribute to the BOLD response in early visual cortex. In the work we present here we show data from a very similar visual attention experiment in which we simultaneously measure EEG and laminar specific BOLD signals. We investigate whether power changes in the different EEG frequency bands show different correlation profiles over the cortical layers with the BOLD signal. In line with laminar electrophysiological recordings in animals, the results suggest the gamma band oscillations tend to show the most consistent relation with superficial layers, while for the alpha band a preference for specified layers is less apparent. With this experiment we take a first step towards establishing a neurophysiological basis for the application of laminar fMRI in human cognitive and systems neuroscience.

Biography

René Scheeringa obtained his masters' degree in experimental psychology at the University of Groningen in 2004. He obtained his PhD in 2011 from the Radboud University Nijmegen where he worked at the Donders Institute. Here he studied the relation between oscillatory EEG activity and the human BOLD signal by using simultaneously recorded EEG & fMRI. He worked as a post-doc at Neurospin, Gif-sur-Yvette, France to study how alpha-phase affects the stimulus evoked BOLD response. Currently he is back at the Donders Institute to study sensory processing using a combination of techniques, including simultaneously recorded EEG and high-resolution laminar-resolved fMRI.

S13 004: Visual Areas Exert Bottom-Up And Top-Down Influences Through Distinct Frequency Channels

Andre M. Bastos, Ernst Strüngmann Institute (ESI) for Neuroscience, Germany

Visual cortical areas are thought to form a hierarchy and to subserve cognitive functions by interacting in both bottom-up and top-down directions. However, the neurophysiological mechanisms through which top-down and bottom-up influences are exerted remain largely elusive. To address this, we recorded local field potentials from eight visual areas of two monkeys and quantified inter-areal directed influences between these areas. Using Granger causality analysis, we found that bottom-up influences are carried by theta-band (~4 Hz) and gamma-band (~60-80 Hz) synchronization and top-down influences by beta-band (~14-18 Hz) synchronization. These results motivated a dynamic causal model which was equipped with superficial and deep pyramidal cell populations – the cell populations giving rise to bottom-up and top-down connections, respectively. The model enabled us to reconstruct the transfer functions of specific subpopulations within cortical sources, and correctly discriminated top-down from bottom-up connections. Furthermore, an examination of the transfer functions associated with superficial and deep pyramidal cells confirmed that bottom-up connections employed gamma frequencies, while top-down connections were mediated by alpha/beta frequencies. This work demonstrates that in the visual cortex, functional and anatomical inter-areal asymmetries are highly correlated – this in turn made it possible to build a visual cortical hierarchy from the functional asymmetries alone. The possibility to infer hierarchical relationships through functional data alone may make it possible to derive a cortical hierarchy in the human brain. Furthermore, it will enable us to test whether concepts like hierarchy, counter-streams, and segregation of processing are general motifs that apply to all cortical systems.

Biography

Andre Moraes Bastos recently completed his PhD at the University of California, Davis. His PhD work took him on a tour of multiple scientific institutes, leading to a collaboration between himself and researchers at UC Davis, the Donders Institute for Cognitive Neuroimaging in Nijmegen, the Netherlands, the Wellcome Trust Centre for Neuroimaging in London, and the Ernst Strüngmann Institute (ESI) for Neuroscience in Cooperation with Max Planck Society in Frankfurt, Germany. His primary research interest is to understand how top-down and bottom-up counter-streams are signaled and integrated to enable dynamic cognitive behaviors.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S14: Consciousness, Integrated Information And The Free Energy Principle

Chair & Speaker: Jakob Hohwy, Monash University, Australia
Guilio Tononi, University of Wisconsin, USA
Anil Seth, University of Sussex, UK
Naotsugu Tsuchiya, Monash University, Australia

Overview

One approach to the science of consciousness is to develop a theory designed to explain core features of conscious experience, and look for neuroscientific evidence in favour of this theory. One of the most promising and prominent theories of consciousness in this vein is integrated information theory. Another approach to the science of consciousness is to take an overall theory of brain function and explore its potential to explain core features of conscious experience. One of the most promising and prominent theories of overall brain function centers on the Bayesian brain or free energy principle. This interdisciplinary symposium asks whether these two approaches can and should be combined. This question is important because a confirmatory answer would anchor information integration in overall brain function, and would throw light on the relation between free energy and the mind. The focus will be on the following questions: (1) Is it possible to interpret aspects of integrated information in terms of the free energy principle? (2) Is it possible to interpret aspects of the free energy principle as explanations of conscious experience? (3) Is there a meaningful overlap between the answers to questions (1) and (2)?

S14 001: Can The Free Energy Principle Be Used To Generate A Theory Of Consciousness

Jakob Hohwy, Monash University, Australia

This talk presents the free energy principle (FEP) and develops aspects of it that can be used to address core aspects of conscious experience. In particular, the talk focuses on how the inferential and hierarchical aspects of FEP may pertain to perceptual binding, how the agency-related notion of active inference central to FEP can explain unity of consciousness, and how the notion of precision optimization in FEP can speak to the relation between consciousness and attention. On this background, I then set out how FEP in various ways share aspects with the information integration theory but also how FEP presents a theoretical and explanatory advance over the integration information theory (IIT) of consciousness.

Biography

Jakob Hohwy is associate professor in philosophy at Monash University. He has set up the Philosophy & Cognition lab in the philosophy department at Monash and conducts interdisciplinary research in philosophy, psychology, and neuroscience. He is on a research fellowship from the Australian Research Council, focusing on contemporary theories about brain function according to which the brain fundamentally is a sophisticated hypothesis tester. His book on the topic, The Predictive Mind, is due out with Oxford University Press in November 2013.

S14 002: Integrated Information Theory and the Sources of Meaning

Guilio Tononi, University of Wisconsin, USA

Integrated information theory (IIT) is an attempt to mathematically characterize consciousness both in quantity and in quality. IIT starts from the fundamental phenomenological properties of consciousness (axioms), and asks which conditions must be satisfied by physical mechanisms, such as neurons and their connections, to account for those properties (postulates).

IIT offers a way to analyze systems of mechanisms to determine if they are properly structured to give rise to consciousness, how much of it, and of which kind. The fundamental postulates of IIT, such as integration and differentiation, can provide a parsimonious explanation for many neuroanatomical, neurophysiological, and neuropsychological findings. IIT also leads to experimental predictions, for instance that the loss and recovery of consciousness should be associated with the breakdown and recovery of information integration. Furthermore, IIT claims that meaning is synonymous with consciousness, is always internal, and only relates indirectly to the external environment. Finally, according to IIT, the relationship of inner phenomenology to the outside world is not one of processing the information contained in an input, or of optimally predicting inputs by explaining away error. Instead, it is one of "matching" internal with external relations, where external stimuli act as mere triggers that select particular internal states and the associated integrated conceptual structures that constitute experience.

Biography

Guilio Tononi is a neuroscientist and psychiatrist who holds the David P. White Chair in Sleep Medicine, as well as a Distinguished Chair in Consciousness Science, at the University of Wisconsin. Tononi is a leader in the field of consciousness studies, and has co-authored a book on the subject with Gerald Edelman. He developed the Integrated Information Theory (IIT) of consciousness. The theory is being tested with neuroimaging, TMS, and computer models.

S14 003: Integrated Information And Free Energy – Peas In A Pod?

Anil Seth, University of Sussex, UK

This talk will summarize key aspects of the free energy principle (FEP) and integrated information theory (IIT) relevant to conscious experience and its neural underpinnings. This will highlight the common theme of "reduction of uncertainty" as a potentially unifying process. New experimental results will be outlined which speak to both approaches and their integration, in which (i) expectations are manipulated to determine the extent to which predictions or prediction errors influence in access to consciousness in psychophysical paradigms and (ii) approximations to integrated information are applied to data from different conscious states.

The talk will finish with a constructive critique of both the IIT and the FEP, highlighting shortcomings as well as identifying promising pathways for their future development in cognitive neuroscience and consciousness science.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S14: Consciousness, Integrated Information And The Free Energy Principle cont'd

Biography

Anil Seth is Professor of Cognitive and Computational Neuroscience at the University of Sussex, and Founding Co-Director of the Sackler Centre for Consciousness Science. Research in his group integrates consciousness science with computational and cognitive neuroscience, with a particular emphasis on the role of predictions on perception and on empirical approaches to measuring integrated information. He is Editor-in-Chief of Frontiers in Consciousness Research and was overall conference chair for the 16th Meeting of the Association for the Scientific Study of Consciousness (Brighton, 2012).

S14 004: Integrated Information And Free Energy – Obstacles To Their Combination.

Naotsugu Tsuchiya, Monash University, Australia

I will point out several difficulties in expecting a fruitful marriage of the two prominent theories. First, while the free energy principle may be able to explain how brains work, it seems to explain equally well both conscious and non-conscious processes in the brain. The integrated information theory, on the other hand, is directly developed to address this issue. Second, while the amount of integrated information is, on average, expected to increase as organisms evolve and adapt to the environment, this tie is rather loose. In fact, recent computer simulation studies imply that evolution can result in emergence of organisms whose conscious experience would be rather limited, if any (like insects on the current earth). The adaptability to the environment as well as the course of evolution may be better explained in the free energy principle. At the end of the talk, I will consider one potential venue for a successful marriage. The free energy principle may be able to explain why and how the brain adapts to the environment and may explain the way neurons are connected in adulthood, separately for each different sensory system (e.g., vision vs. audition). Then, in the future, integrated information might possibly be able to explain why different senses are experienced in their particular ways, based on these differential connection patterns across different modalities.

Biography

Naotsugu Tsuchiya is Associate Professor in the School of Psychology and Psychiatry, Monash University. His group, housed at Monash Biomedical Imaging, focuses on questions in the science of consciousness, specifically concerning the relation between consciousness and attention, the nature of visual conscious experience, and applications of integrated information theory. He discovered the widely studied phenomenon of continuous flash suppression, and holds an ARC Future Fellowship.

S15: Task Set Representation And Updating: Aging, Training And Reward Motivation

Frini Karayanidis, University of Newcastle, Australia
Chair & Speaker: Jutta Kray, Saarland University, Germany
Hannah Schmitt, Saarland University, Germany
Jo Etzel, Washington University, USA

Overview

Cognitive decline is generally accepted as a normal part of aging. Despite extensive research, the underlying mechanisms have yet to be determined. Yet this is an essential step in designing effective intervention programs to reduce the incidence or slow the progress of age-related cognitive decline. This symposium examines key mechanisms involved in cognitive performance changes in normal aging. Axel Mecklinger shows that poor recollection is central to age-related decline in associative memory and presents ERP evidence for recruitment of compensatory perceptual processes in poor performers. Shulan Hsieh shows that the age-related decline in interference control can be mitigated by recruitment of compensatory processes under high task load. Mick Rugg presents evidence that age-related decline in episodic memory performance is predicted the efficacy with which information is initially encoded. Finally, Richard Ridderinkhof discusses recent research showing that older adults rely more heavily on S-R habit learning at the expense of flexible, goal-directed action.

S15 001: Progression Of Age-Related Decline In Task-Switching Performance And White Matter Microstructural Integrity: A Longitudinal Study

Frini Karayanidis, University of Newcastle, Australia

In cross-sectional studies, old adults show both less efficient performance on task-switching paradigms and reduced microstructural organisation of white matter pathways, as compared to younger adults. In the present study, we examine whether the rate of decline in task-switching performance over a 24-month interval is associated with rate of reduction in white matter microstructural organisation. Cognitively intact older adults (53-82 years) completed a comprehensive neuropsychological assessment, as well as a cued-trials task-switching paradigm with event-related potentials recorded to examine both preparatory (cue-target interval 1000ms) and target-driven control processes. MRI scanning included T1 structural, T2 weighted FLAIR and diffusion-weighted imaging sequences. Microstructural white matter changes were calculated using DTI analyses. Testing was repeated at 24-months with identical parameters. We show changes in both task-switching performance and measures of whole brain white matter microstructural integrity as well as grey matter volume over time. Decline in task-switching performance, especially under conditions that encourage preparation and have low interference, was associated with greater white matter microstructure decline. We examine whether the relationship between performance and white matter microstructural integrity decline is specific to frontoparietal and fronto-basal ganglia pathways associated with cognitive control.

Biography

Frini Karayanidis is an Associate Professor in Psychology at the University of Newcastle. She completed her PhD at University of New South Wales and undertook post-doctoral fellowships at Macquarie University and University of Montreal. Her research program has contributed to the establishment of electrophysiological signatures of proactive and reactive cognitive control processes in the task switching paradigm. She currently heads the Age-ility project which focuses on how variability in cognitive control contributes to the development and maintenance of adaptive behaviours throughout the lifespan.

S15 002: Is The Transfer Of Task-Switching Training In Older Adults Dependent On The Type Of Training? The Impact Of Working Memory And Inhibitions Demands

Jutta Kray, Saarland University, Germany

Recent aging studies on training in cognitive control found that older adults benefitted more from training in task switching than younger ones, that is, they showed larger transfer to untrained but similar switching tasks (Karbach & Kray, 2009). However, in this study participants practiced task switching (a) with bivalent stimuli, requiring the inhibition of irrelevant task attributes, and (b) without task cues, helping them keeping track of the task sequence. The aim of the present study is to specify the training conditions under which transfer occurs. To this end we created conditions in which working-memory and inhibition demands were reduced. Performance improvements were compared between four training groups that differed in practicing task switching with univalent or bivalent stimuli (variation of inhibition control) and with and without task cues (variation of memory demands) and an active control group (practicing single tasks) in a pretest-training-posttest design. Results indicated that all training groups showed improvements in task switching with increasing practice, independently of age and training condition. We also found larger improvements in task switching to a new untrained task in older than in younger adults. Interestingly, for younger adults improvements were independent of the training condition, while for older adults improvements were larger for conditions with bivalent stimuli, requiring inhibition of irrelevant task attributes in the context of switching. Hence, it seems that memory and switching demands alone are not critical components for the occurrence of transfer in the elderly. We will also report findings on far transfer and maintenance effects.

Biography

Jutta Kray is currently a Full Professor for Developmental Psychology at Saarland University in Saarbrücken. She received her PhD from Free University Berlin in 1998 and then worked as a Research Scientist and later as Associate Professor at the Department of Psychology at Saarland University in Saarbrücken. In 2000 she received the Margret-and-Paul Baltes Prize for outstanding dissertations in Developmental Psychology. Her research interests are the Cognitive Development Across the Lifespan, Behavioral and Neuronal Changes in Cognitive Control, and Cognitive Interventions.

S15 003: How Effective Are Monetary Incentives For Context Updating In Younger And Older Adults?

Hannah Schmitt, Saarland University, Germany

The goals of our studies were to examine age differences in separate components of context processing by means of an ERP approach and to investigate whether context processing can be promoted by motivational cues in younger and older adults. A modified AX Continuous-Performance-Task was conducted, suitable for determining neuronal correlates of context processing in Study 1, and including monetary incentive cues in Study 2. In this task, context updating on context-dependent trials was mandatory to correctly respond on a subsequent probe, while correct responses to probes on context-independent trials were independent of the context. Results of our studies indicated age differences in context updating at the behavioral level, that is, higher error rates and longer latencies on context-dependent than -independent trials in older than in younger adults. At the neuronal level, we found a larger P3b on context-dependent than –independent trials in younger adults, whereas older adults continuously updated context information, reflected in comparable P3b amplitudes on both trial types. Age-related differences in P3b amplitude and topography persisted, even if performance matched younger and older adults were compared, suggesting differences in context updating to be fundamental to cognitive aging. We also found age differences in the incentive manipulation: While younger adults showed faster responding after motivational cues, older adults showed longer latencies. Moreover, only younger adults showed a reduced P3b and a larger Contingent-Negative-Variation (CNV) after loss cues on context-dependent trials, indicating a compensational adaption of context processing during task preparation that was not applied by the elderly.

Biography

Hannah Schmitt graduated in Psychology from Saarland University in 2011. After her research stay at the University of Hull, Great Britain in 2011, she started her PhD within the “International Research Training Group” at Saarland University. Her research focus is on age-related differences in electro-physiological correlates of cognitive control and on motivational and emotional influences on cognitive control. She is also interested in cultural differences in approach and avoidance motivation.

S15 004: Reward motivation enhances coding of task-set information in frontoparietal cortex

Jo Etzel, Washington University, USA

A major function assumed to be mediated by the frontoparietal cognitive control network is the representation of task sets (or goals). The neural coding of task set information has typically been investigated by studies employing multi-tasking or task-switching paradigms. Prior studies have demonstrated that reward motivation may enhance task-switching performance, but the neural mechanisms of this effect are still unclear. Here we utilize multivariate pattern analysis (MVPA) methods in conjunction with fMRI to examine whether reward motivation modulates how task-sets are coded. Twenty participants took part in a two-session fMRI cued-task switching experiment, with the first session performed under baseline (no-reward) conditions, while in the second high-reward motivation trials (monetary bonuses for fast/accurate performance) were randomly intermixed with no-reward trials. Whole-brain searchlight analysis performed on the first session identified voxel clusters that reliably classified the to-be-performed task from cue-related activation. A cross-session validation analysis confirmed a set of regions within prefrontal and parietal components of the brain cognitive control networks that showed highly robust classification performance. A comparison of classifier performance on high-reward vs. no-reward trials revealed significantly more accurate task classification under high-reward conditions. Further, the enhanced behavioral performance under these conditions was found to be statistically mediated by the improvement in task-classification. Together, the results suggest that reward motivation might enhance task-switching performance by enabling more robust encoding and representation of task-set information within frontoparietal cortex. More broadly, they highlight the utility of reward motivation manipulations for understanding the nature of task representation in the human brain.

Biography

Jo Etzel completed a PhD in Bioinformatics and Computational Biology at Iowa State University (USA) with Julie Dickerson and Ralph Adolphs, then a postdoc under Christian Keysers at the Social Brain Lab, University Medical Center Groningen (The Netherlands). Since 2010 Jo has worked as a Research Analyst in the Psychology Department at Washington University in St. Louis (USA), primarily with the groups of Todd Braver, Jeff Zacks, and Deanna Barch. My research interests are focused on methodology, particularly multivariate analyses of fMRI data, but also nonparametric statistics and psychophysiological measures. Jo blogs about fMRI analysis at mvpa.blogspot.com.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S16: Brain Processes Associated With Cognitive Control

Diane M. Beck, University of Illinois at Urbana-Champaign, USA
Paul M. Corballis, University of Auckland, NZ
Chair & Speaker: **Gabriele Gratton**, University of Illinois at Urbana-Champaign, USA
Pauline Baniqued, University of Illinois at Urbana-Champaign, USA

Overview

This symposium will overview research on brain processes associated with cognitive control. The four talks will review different paradigms and methodologies related to cognitive control, and in particular the interactions between top-down control (supported in part by the dorsal attention network, DAN, and the cingulo-opercular network, CON) and the feed-forward analysis of incoming information. Dr. Diane Beck (University of Illinois) will consider how top-down and bottom up processes interact in forming our percepts, using fMRI, optical imaging, EEG, and trans-cranial magnetic stimulation. Dr. Paul Corballis (University of Auckland) will concentrate on on-line re-direction of attention studies using ERPs. Drs. Gabriele Gratton and Monica Fabiani (University of Illinois) will examine preparatory mechanisms controlling the input of information, making us of optical imaging and ERPS. Finally, Dr. William Gehring (University of Michigan) will discuss error processing during development of young children (relationship to executive function and motivation) and in pediatric anxiety disorders and autism, using ERPs and genetic data.

S16 001: The Role of Feedback in Visual Processing

Diane M. Beck, University of Illinois at Urbana-Champaign, USA

We use two masking paradigms that are thought to depend on feedback: metacontrast masking and object substitution masking (OSM). Both are examples of masking in which a mask reduces the visibility of an earlier target. Metacontrast masking occurs even when the target and mask are the only stimuli present, whereas OSM requires the presence of multiple potential targets. This difference suggests that the feedback mechanisms necessary to detect a target in OSM may overlap with those involved in attentional selection, whereas metacontrast masking is less dependent on attention. In line with this idea, we show that priming for a masked stimulus, which is thought to depend on attention, is obtained only during metacontrast masking and not during OSM or during metacontrast with multiple potential targets. These data support the idea that OSM interferes with attention-related feedback mechanisms, whereas metacontrast is less dependent on these particular feedback mechanisms. In a second experiment, we ask whether transcranial magnetic stimulation (TMS) can interfere with feedback and thus stimulus visibility. TMS over occipital lobe elicits phosphenes and shows a similar suppression of visibility as metacontrast masking. TMS over parietal cortex, however, shows no such reduction in visibility despite the fact that it produces similar phosphene experiences and has been shown to evoke activity in ventral visual areas. Together these data suggest that although parietal feedback and attention may impact visual awareness, they are not the only factors at play.

Biography

Diane Beck is an Associate Professor in the Department of Psychology and Neuroscience Program, and a full-time faculty member at the Beckman Institute for Advanced Science and Technology at the University of Illinois, Urbana-Champaign. Her main area of interest is visual cognition, attention and perception and she is particularly interested in the interactions between visual cortex and frontoparietal mechanisms. She and her laboratory use a variety of approaches and methods, including functional magnetic resonance imaging behavioral methods, eye-movement recordings, optical imaging and transcranial magnetic stimulation. Dr. Beck received her Ph.D. in Psychology from the University of California, Berkeley.

S16 002: Lateralisation of the Event-Related Brain Potential Reveals Neural Correlates of Attention, Distractor Suppression, and Visual Short-Term Memory

Paul M. Corballis, University of Auckland, NZ

Successful interaction with the visual environment requires the abilities to select relevant information in a rapid and flexible manner, to ignore or suppress stimuli that are irrelevant or distracting, and to retain relevant information over time in order to make appropriate responses. For the past several years my laboratory and collaborators have been investigating the mechanisms of visual information processing using a modified visual-search paradigm called "localised attentional interference" (LAI). By combining LAI and related paradigms with event-related brain potentials (ERPs) we have been able to isolate neural correlates of a variety of attentional processes, including the spatial biasing of attention, the discrimination of task-relevant targets, suppression of distractors, and the representation of visual information in short-term memory. Much of this program of research has focused on a series of lateralised ERP components – including the late directing-attention positivity (LDAP), N2pc, Ptc, contralateral delay activity (CDA) and sustained posterior contralateral negativity (SPCN) – as correlates of attentional selection, distractor suppression, and working-memory representation. Here, I will review the major findings from this research program, with particular focus on the interactions between top-down and bottom-up mechanisms in the representation and processing of visual information.

Biography

Paul Corballis is a native of Auckland, New Zealand, and attended the University of Auckland before moving to New York to undertake doctoral studies at Columbia University. He spent six years at the Center for Cognitive Neuroscience at Dartmouth College before taking a faculty position in the School of Psychology at the Georgia Institute of Technology in Atlanta. After 10 years in Georgia he returned to Auckland in 2011. He holds the rank of associate professor in the School of Psychology and is a principal investigator in the Auckland University Centre for Brain Research.

S16 003: Investigating Brain Networks In Task Preparation

Gabriele Gratton, University of Illinois at Urbana-Champaign, USA

Humans are extremely flexible in interpreting and responding to external events. This adaptation process can be investigated by using cues that inform the subject about which component of a complex upcoming stimulus they have to respond to. Electrophysiological and neuroimaging data show that this adaptive process involves activities which develop over time after the presentation of the cue. In my talk I will present data obtained with event-related brain potentials (ERPs) and the event-related optical signal (EROS) that provide a spatial-temporal description of these adaptive processes. The data come from a series of studies in which stimulus and response dimensions that have to be attended to are varied. They indicate that a particular brain network, the dorsal attention all network, DAN, is involved in all these conditions, starting at a latency of approximately 250-300 ms with activation in the left MFG, which then spread to regions around the intraparietal sulcus (IPS) at a latency of 400-500 ms. These same regions are involved in controlling posterior alpha rhythm, which is presumable involved in gating visual information input.

Task-specific areas are also activated at longer latencies. Analyses of lagged cross-correlation between areas reveal that these activations are functionally linked. The activation pattern is conserved in older adults although it is influenced by changes in structural connectivity. The EROS data provide a strong link between the neuroimaging and ERP data. The data indicate that DAN plays a central role in controlling the allocation of attention in a variety of tasks and conditions.

Biography

Gabriele Gratton, M.D. (1980,Universita' di Roma La Sapienza), Ph.D. (Psychology, 1991, University of Illinois at Urbana-Champaign). Professor of Psychology, Neuroscience, and Bioengineering, University of Illinois at Urbana-Champaign). Selected Honors and Awards: President-Elect (2008-2009); President (2009-2010) and Past-President (2010-2011) of the Society for Psychophysiological Research (SPR); Fellow of the Association for Psychological Science (APS); Foundations of Augmented Cognition Award (DARPA, 2005), Provost Outstanding Junior Faculty Research Award (University of Missouri, 2000), Distinguished Scientific Award for Early Career Contribution to Psychophysiology (SPR, 1997).

S16 004: A Functional and Structural Network View of Task-Switching Dynamics in Ageing

Pauline Baniqued, University of Illinois at Urbana-Champaign, USA

Control demanding situations such as switching between tasks or strategies rely on communication among regions of the frontoparietal network, areas which undergo significant age-related decline. We integrate data from brain anatomy, event-related potentials (ERPs), and event-related optical signals (EROS) to better characterize the preparatory dynamics of attentional control. We analyze interactions between frontoparietal control regions and task-specific regions using lagged cross-correlations that not only show synchronous activity between brain regions, but importantly, how these functional interactions evolve over time. We find that connectivity between frontal control and sensorimotor regions is critical to controlling attention; results show distinct frontal-dependent networks based on task demands, with activity in frontal cortex predicting downregulation in task-irrelevant sensorimotor areas, followed by upregulation in task-relevant regions. New findings in older adults underscore the synergistic effect of white matter structure and functional network interactions: the degree to which older participants overcame the cost of switching and activated task-relevant processes was predicted by corpus callosum volume, the main connection between the frontal cortices. Our results suggest that structural disconnection and thus weaker interactive control dynamics lead to sub-optimal preparation strategies, but also that interventions that target the health of frontoparietal regions such as the corpus callosum may attenuate age-related cognitive decline.

Biography

Pauline Baniqued received her M.A. in Psychology (Cognitive Neuroscience) from the University of Illinois at Urbana-Champaign in 2012, and her B.A. in Cognitive Science from the University of Pennsylvania in 2008. She is currently a Ph.D. candidate at the University of Illinois at Urbana-Champaign. Her research interests are in understanding the neurocognitive mechanisms of executive control, and how these control processes change with age, training and intervention. She uses converging methods of structural and functional magnetic resonance imaging (MRI), event-related brain potentials (ERPs), and optical imaging (EROS) to study the dynamics of these processes.

S17: Sensorimotor Foundations Of Understanding And Interacting With Others

Paola Sessa, University of Padova, Italy
Pascal Molenberghs, The University of Queensland, Australia
Chair & Speaker: Emily Cross, Bangor University, UK
Ross Cunnington, The University of Queensland, Australia

Overview

As humans, we have a remarkable ability to make sense of other people's behaviour by observing their actions. A rich literature within cognitive and social neurosciences provides evidence for a so-called mirror system, comprising brain regions that respond similarly when performing or observing actions. It has been argued that the mirror system critically supports our ability to interact with others in a social world. This symposium presents the state of the art of sensorimotor foundations of social perception from neuroscientific perspectives, with a focus on basic mechanisms that link action perception (Molenberghs), and how social information modulates this link (Cross, Cunnington & Sessa). Sessa presents EEG work on how empathy for pain encompasses dissociable sensorimotor/affective and mentalizing components and on how these empathic components exhibit both contextual and interindividual variance. Molenberghs discusses metaanalytical work calling into question the involvement of a putative mirror system region, BA44, in action execution and perception tasks. Cross shows how information concerning whether an observed agent is animate impacts perception and interaction with that agent, and finally Cunnington explores how an observer's race or group membership influences how they perceive another agent's pain.

S17 001: Dissociable routes to empathy for pain and variance in empathic processes

Paola Sessa, University of Padova, Italy

Empathy is a basilar form of communication between individuals, acting as a powerful social binding agent. This capacity is deep-rooted in the human brain allowing an individual to rapidly share both affective and sensorimotor facets of other people's internal states (experience sharing) and to explicitly consider/understand their states (mentalizing). Although extant evidence strongly suggests that these empathic components are anatomically dissociable, it is still unclear whether they are also functionally and temporally dissociable and selectively sensitive to certain social cues. In a set of EEG experiments we examined these issues in the context of empathy for others' pain. In the first study both sensorimotor and contextual cues of others' pain were orthogonally manipulated. Results showed that experience sharing and mentalizing are two functionally and temporally dissociable mechanisms. Building on this evidence, in separate experiments we explored how other's race and perceived trustworthiness modulate these empathic components. Results further supported a functional, neural, and temporal distinction between two sequential processing stages underlying empathy, namely, a race-biased stage of experience sharing followed by a race-unbiased stage of cognitive evaluation of pain (mentalizing); on the other hand, perceived trustworthiness shaped both empathic components, such that individuals looking trustworthy induced in the observers magnified neural empathic responses at both processing stages.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S17: Sensorimotor Foundations Of Understanding And Interacting With Others cont'd

Biography

Paola Sessa obtained her PhD in 2005 at the University of Padova and much of her initial research was on basic attentional and visual working memory processes. Since 2008, she is a lecturer at the University of Padova. She co-directs the Electroencephalography Laboratory and is a member of the Cognitive Neuroscience Center (CNC) of the same University. Her research mostly focuses on using EEG/ERP to study how social cues conveyed by human faces, such as emotional expressions, group membership and perceived trustworthiness shape both low-level processes (resolution of faces' representations in visual working memory) and empathy towards others' emotional states.

S17 002: Is The Human Mirror System Located Within Broca's Area? A Selective Meta-Analysis Of fMRI Studies Of Action Observation And Execution

Pascal Molenberghs, The University of Queensland, Australia

Mirror neurons are active when an animal executes an action or observes a similar action. Mirror neurons were first found in macaques, in area F5 and later in area PF. It is now widely believed that mirror neurons also exist within the human homologues of these areas, namely Broca's area (Brodmann areas 44 and 45) and the rostral part of the inferior parietal lobule, respectively. The suggested occurrence of mirror neurons in Broca's area is central to the hypothesis that the mirror system might have played a key role in the evolution of language in humans. Here I sought to determine, based on published fMRI studies of the human mirror system, whether Broca's area is reliably activated during action observation and execution. I employed activation likelihood estimation (ALE) on data from all published fMRI studies that included both an action observation condition and an action execution condition. Within frontal cortex, areas showing mirror-like activation were located within the ventral and dorsal premotor region rather than Broca's area. I also found that within parietal cortex, regions showing mirror activity extended beyond the rostral inferior parietal lobule into the superior parietal lobule. To the extent that existing fMRI investigations of action observation and execution reflect activity in mirror neurons, these findings call into question the notion that Broca's area is a key node within the human mirroring network. The findings also have important implications for the manner in which regions of interest are chosen in human imaging studies of mirror activity.

Biography

Pascal Molenberghs obtained his PhD in 2009 from the University of Leuven where he investigated attentional processes in healthy volunteers and stroke patients using fMRI and lesion mapping. After his PhD he moved to the University of Queensland as a Postdoctoral researcher, studying the links between action perception and execution using fMRI and meta-analyses. Since 2011, he is a Research Fellow in the School of Psychology and his research focus at the moment is on action perception, spatial neglect and social cognition. He uses fMRI, activation likelihood estimation (ALE) meta-analyses and neuropsychological testing in stroke patients to investigate these topics.

S17 003: The Impact Of Social Information On How We Perceive And Interact With Other Agents

Emily Cross, Bangor University, UK

Humans automatically imitate other people's actions during social interactions, building rapport and social closeness in the process. While the behavioural consequences and neural correlates of imitation have been studied extensively, little is known about the neural mechanisms that control imitative tendencies. For example, the degree to which an agent is perceived as human-like influences automatic imitation, but it is not known how animacy perception influences brain circuits that control imitation. In the current fMRI study, we examined how perception and belief of animacy influence the control of automatic imitation. Using an imitation-inhibition paradigm, which involves suppressing the tendency to imitate an observed action, we manipulated both bottom-up (visual input) and top-down (belief) cues to animacy. Results show divergent patterns of behavioural and neural responses. Behavioural analyses show that automatic imitation is equivalent when one or both cues to animacy are present, but reduces when both are absent. By contrast, right temporoparietal junction (rTPJ) showed sensitivity to the presence of both animacy cues. We demonstrate that rTPJ is biologically tuned to control imitative tendencies when the observed agent both looks like and is believed to be human. This suggest that rTPJ may be involved in a specialised capacity to control automatic imitation of human agents, rather than a universal process of conflict management, which would be more consistent with generalist theories of imitative control. Evidence for specialised neural circuitry that "controls" imitation offers new insight into developmental disorders that involve atypical processing of social information, such as autism spectrum disorders.

Biography

Emily Cross is a senior lecturer and co-director of the Social Brain in Action Laboratory, based jointly in Wales and the Netherlands. Since completing her PhD in 2008 at Dartmouth College, her primary research questions address how experience shapes perception and the neural foundations of action expertise. To investigate these questions, and she uses neuroimaging, neurostimulation and behavioural training approaches, often with complex action paradigms involving dance, gymnastics or contortion. Her work is currently funded by the Dutch Science Foundation, the Economic and Social Research Council, the Ministry of Defense, and the European Commission.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S17 004: Racial Bias In Neural Empathy To Observed Pain

Ross Cunnington, The University of Queensland, Australia

Brain regions representing the first-hand experience of pain also respond to seeing another person in pain. Previous studies have shown that race modulates this empathic response in the brain, such that activation is much greater when we observe pain in people of our own race than people of a different race. Across several studies, we have examined whether this racial bias in neural empathy is fixed or whether it can be changed through experience with other races or by other learnt group associations. We have used fMRI to examine neural empathic responses in Chinese students living in Australia and in Australian Caucasian students when observing painful versus non-painful touch to either Chinese or Caucasian actors. We have also used a minimal group paradigm, randomly allocating participants to one of two mixed-race teams, to examine whether meaningless group association can influence racial biases in neural empathy to pain. Overall, we consistently find activation the anterior cingulate and anterior insula cortex when observing painful versus non-painful touch that is significantly greater when observing pain in same-race than other-race actors. Crucially, however, this racial bias in neural empathy is strongly correlated with the level of daily contact participants report with the other race, with greater empathic responses in the anterior cingulate in those participants who report more daily contact with people of the other race. We therefore suggest that the racial bias in neural empathy to observed pain of others is malleable and is reduced by contact with other races.

Biography

Ross Cunnington is a Principal Research Fellow at the Queensland Brain Institute and Director of the UQ Centre for Perception and Cognitive Neuroscience, University of Queensland, Brisbane. His research focuses on understanding the neural processes crucial for planning and representing actions prior to initiation, and for perceiving and understanding the actions of others, using brain imaging methods of fMRI, EEG, and MEG. He has published over 80 journal articles and regularly presents keynote lectures and public talks on the readiness for action and free-will, the human mirror system, and empathy.

S18: Mechanisms Of Cognitive Decline In Normal Aging

Axel Mecklinger, Saarland University, Germany
Chair & Speaker: Shulan Hsieh, National Cheng Kung University, Taiwan
Michael D. Rugg, University of Texas at Dallas, USA
K. Richard Ridderinkhof, University of Amsterdam, Netherlands

Overview

Cognitive decline is generally accepted as a normal part of aging. Despite extensive research, the underlying mechanisms have yet to be determined. Yet this is an essential step in designing effective intervention programs to reduce the incidence or slow the progress of age-related cognitive decline. This symposium examines key mechanisms involved in cognitive performance changes in normal aging. Axel Mecklinger shows that poor recollection is central to age-related decline in associative memory and presents ERP evidence for recruitment of compensatory perceptual processes in poor performers. Shulan Hsieh shows that the age-related decline in interference control can be mitigated by recruitment of compensatory processes under high task load. Michael Rugg presents evidence that age-related decline in episodic memory performance is largely a consequence of the efficacy with which information is initially encoded. Finally, Richard Ridderinkhof discusses recent research showing that older adults rely more heavily on S-R habit learning at the expense of flexible, goal-directed action.

S18 001: Differential Effects Of Aging On Recollection And Familiarity: An ERP Study

Axel Mecklinger, Saarland University, Germany

It has been argued that poor recollection is a key aspect of the associative memory deficit in old adults whereas preserved familiarity can still support memory for individual items. In the present event-related potential (ERP) study, we explored the effects of aging on recollection and familiarity in a recognition memory task with speeded and non-speeded response requirements. We assumed that a speeded response condition should reduce the availability of recollection so that memory performance should be less affected by aging in this condition as compared to the non-speeded condition. Consistent with this prediction memory performance was better for young than for older adults in the non-speeded condition whereas memory in the speeded version was relatively unaffected by aging. In showing an attenuated ERP correlate of recollection in older adults in the non-speeded condition and highly similar ERP measures of familiarity across age groups and response conditions, the ERP data confirm and extend the behavioral findings. Furthermore and consistent with the view that older adults rely more on literal perceptual information when giving recognition judgments there was a sustained bilateral negativity at posterior recording sites in the older adults' ERPs in the speeded response condition. This negativity was larger for low than high performing participants in line with the possibility that it reflects processes engaged to compensate for declined memory performance in old age.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S18: Mechanisms Of Cognitive Decline In Normal Aging cont'd

Biography

Axel Mecklinger is currently a Full Professor for Neuropsychology at Saarland University in Saarbrücken and Speaker of the International Research Training Group "Adaptive minds". Prior to this he worked as a Senior Research Scientist at the Max-Planck-Institute for Human Cognitive and Brain Sciences in Leipzig. In 1999 he received the Distinguished Scientific Award for Early Career Contributions to Psychophysiology from the Society for Psychophysiological Research. His research interests are the Cognitive Neuroscience of Learning, Memory and Cognitive Control.

S18 002: The Boundary Condition For Compensatory Responses By The Elderly In A Flanker-Task Paradigm

Shulan Hsieh, National Cheng Kung University, Taiwan

The goals of this study were to determine whether there is an age-related flanker effect, whether elderly adults produce compensatory responses to overcome their deficiencies, and the extent to which any compensatory responses vary depending on the degree of task demands. To achieve these goals, we manipulated three different degrees of task demands in cognitive control in a flanker-task paradigm. Throughout the three experiments, we observed an increased flanker effect on behavioral measures exhibited by elderly adults compared with young adults, but only when task demand was low. Conversely, when task demand was increased, then there was no longer an increased flanker effect for elderly adults, but instead several compensatory responses could be evident on some event-related potential components. The current results thus suggest that elderly adults could be as capable as young adults in inhibiting flanker influence by means of compensatory responses, but when task demand was high.

Biography

Prof. Hsieh is affiliated as a distinguished professor with National Cheng Kung University in Tainan, Taiwan. Prof. Hsieh has been doing research to understand the relationship between brain and behavior, in particular about the brain substrates of the higher cognitive control functions (e.g., task switching, multi-tasking behavior, error-monitoring, and inhibition) by means of the electrophysiological approach. In more recent years, Prof. Hsieh has also devoted to researching emotion, cognitive aging, and developing some intervention programs to prevent cognitive aging.

S18 003: The Effects Of Age On Episodic Memory - What Stays Up And What Goes Down?

Michael D. Rugg, University of Texas at Dallas, USA

As a group, healthy people in their 60s and 70s are outperformed by people in their 20s on tests that depend on episodic memory. In this presentation, the results of ERP and fMRI studies, including a study employing a large sample of people in middle age, will be described. Together, the studies permit evaluation of the association between memory performance and neural correlates of episodic encoding, retrieval, and the monitoring and evaluation of retrieved information. Variance in memory performance at all ages is independently predicted by variance in the neural activity associated with each of these mnemonic operations. Age-related decline in performance is predicted mainly by differences in the efficacy with which information is initially encoded into memory.

Biography

Dr Rugg is a leading expert in cognitive neuroscience and human. His current work is aimed at understanding how age-related changes in the brain's structure and function affect cognitive abilities, both in healthy people and those with age-related diseases such as Alzheimer's. Dr. Rugg is a fellow of the American Association for the Advancement of Science and the Association for Psychological Science. He was awarded the Henri Hecaen Award for contributions to neuropsychology in 1989 and was elected a Fellow of the Royal Society of Edinburgh—one of the world's oldest scientific societies—in 1996. He is currently editor-in-chief of the international journal Neuropsychologia. He received his bachelor's and doctoral degrees in psychology from the University of Leicester in the United Kingdom and went on to professorships at the University of St. Andrews in Scotland and University College London. He joined the University of California, Irvine in 2003, where he served as the director of the Center for Neurobiology and Learning and Memory. In 2011, he joined UT Dallas as the Distinguished Chair in Behavioral and Brain Sciences and co-director of the Center for Vital Longevity.

S18 004: Effects of Age on the Balance Between Habitual and Goal-Directed Action

K. Richard Ridderinkhof, University of Amsterdam, Netherlands

Instrumental learning is supported by dissociable goal-directed and habitual systems. Although the balance between these systems has not been investigated in healthy aging, previous research suggests that aging affects controlled, effortful, conscious processing, while there is less evidence for impaired skill learning based on stimulus-response (S-R) mappings. In order to investigate directly the effect of healthy aging on the dual-system balance, we compared performance of young and older adults on an instrumental learning task in which devaluation of action outcomes affects goal-directed but not habitual action. Older adults display over-reliance on S-R habit learning at the expense of flexible, goal-directed action. These findings are novel but consistent with previous research and will be discussed in relation to changes in frontostriatal circuitry, and in relation to other recent findings from our lab on aging and association learning.

Biography

Richard Ridderinkhof is a Full Professor in Neurocognitive Development and Aging at this University of Amsterdam. He heads Amsterdam Center for the study of Adaptive Control in brain and behavior (Acacia), which focuses on the development of adaptive control processes. He has published over 150 papers in high impact peer-reviewed journals, with his 2004 Science publication receiving over 1300 citations.

ORAL PRESENTATION
ABSTRACTS

OP3: Language

Daniela Sammler, Max Planck Institute for Human Cognitive and Brain Sciences, Germany
Fahimeh Darki, Karolinska Institute, Sweden
Ghislaine Dehaene-Lambertz, INSERM U992, France
Julie Tremblay, Ste-Justine Hospital Research Center, Canada

OP3 001: Ventral and Dorsal Pathways for Prosodic Intentions

Daniela Sammler, Max Planck Institute for Human Cognitive and Brain Sciences, Germany

Prosody – on top of its linguistic and emotional roles – serves an interpersonal function in speech: to convey the speaker's communicative intentions. Research on the neural bases of prosodic intentions requires a fusion of the fields of neurolinguistics and social neurosciences. The present data outline (i) a right-hemispheric dual-stream account of prosodic comprehension, in analogy to prevailing dual-stream models of language comprehension in the left hemisphere;; and (ii) motor simulation in the dorsal stream as a conceptual interface between prosodic comprehension and the decoding of the speaker's stimulus-linked intentions. In two separate functional/diffusion magnetic resonance imaging (MRI) and transcranial magnetic stimulation (TMS) experiments, participants categorized the prosodic intention ("naming" vs "asking";; experimental task) or the word-initial consonant (/bear/ or /pear/;; control task) of single word utterances that varied along a pitch contour (falling to rising) or phoneme continuum (/b/ to /p/). The prosody task (vs control) activated (i) right posterior and anterior superior temporal sulcus (p/aSTS) connected via the middle longitudinal fasciculus (ventral pathway), and (ii) right pSTS and laryngeal premotor cortex (PMC) connected via the arcuate fasciculus (dorsal pathway). (iii) Functional relevance of the dorsal pathway was demonstrated by reduced performance in the prosody (but not control) task after TMS-induced inhibition of right PMC. These data draw a dual-stream picture of prosodic comprehension built on complementary mechanisms: A ventral WHAT pathway to map vocal pitch patterns to meaning by evaluating auditory features, and a dorsal HOW pathway to recognize a speaker's vocal action by covertly mapping the perceived pitch contour to laryngeal gestures. Following motor simulation accounts of social cognition, this latter mechanism may ground the understanding of the speaker's (low-level) intention conveyed by speech prosody.

OP3 002: DCDC2 Polymorphism Is Associated With Cortical Thickness In Left Supramarginal And Angular Gyri

Fahimeh Darki, Karolinska Institute, Sweden

Background Three genes, DYX1C1, DCDC2 and KIAA0319 have been repeatedly associated with dyslexia, neuronal migration and cilia function. Three polymorphisms within these genes, rs3743204 (DYX1C1), rs793842 (DCDC2) and rs6935076 (KIAA0319) have also been linked to normal variability of left temporo-parietal white matter volume connecting the middle temporal cortex to the angular and supramarginal gyri. Here, we assessed whether these polymorphisms are also related to the variability of cortical thickness in the parietal and temporal associated regions during childhood development. Methods Brain measures and behavioral scores were assessed using a longitudinal dataset of 76 randomly selected children and young adults (aged between 6 to 25 years) who were scanned up to 3 times, each 2 years apart. Cortical regions of interest were defined based on the fiber tracking of white matter regions previously associated with the three polymorphisms. Homologous regions in the right hemisphere were also included. Results Analyses confirmed the association of all polymorphisms to white matter volume connecting the inferior parietal and middle temporal lobes. Out of the 3 SNPs, rs793842 in DCDC2 was also significantly associated with cortical thickness of the left angular ($p = 0.008$) and supramarginal gyri ($p = 2.68\times10\text{-}4$). The cortex was significantly thicker for T-allele carriers, who also had lower white matter volume. Rs793842 was the only polymorphism that showed significant association with reading comprehension scores ($p = 0.014$), with lower reading scores identified amongst T-allele carriers. Conclusion These results show how normal variability in reading comprehension is related to genes, white matter volume and cortical thickness in the inferior parietal lobe. Possibly, the variability of gray and white matter structures could both be related to the role of DCDC2 in cilia function and neuronal migration.

ORAL PRESENTATION
ABSTRACTS

OP3: Language cont'd

OP3 003: Electrophysiological Evidence Of Statistical Learning In Preverbal Infants

Ghislaine Dehaene-Lambertz, INSERM U992, France

Statistical learning is a powerful implicit learning mechanism that infants can use to perform complex computations of co- occurrences among adjacent or more distant elements. We investigated infants' ability to extract the underlying structure of a continuous speech stream using electroencephalography. We also explored the interplay between experience and maturation, comparing 8-months-old full-term with preterm infants matched by maturational age or duration of exposure to speech. First, during a training session, infants were exposed to a 2 minutes synthesized speech stream comprising nine AxC words (3 families with 3 words), randomly presented separated by a subliminal 25ms pause. Then, during the subsequent test session, infants were presented with either "rule-words", which did not appear during training, but followed the AxC training rule, or "part-words" (xCA), that appeared in the stream, but violated the rule. Using a frequency tagging approach to analyze the training, we found a significant phase-locking at the syllables frequency but also at the word frequencies relative to surrogate data. It suggests that infants were indeed segmenting the stream in words. Rule learning was confirmed by the significantly different responses to rule- words and part-words during the test at 400-700ms and 1200-1600 ms post word-onset. These results observed in each of the 3 groups suggest that as soon as 6 months of maturational age and/or 8 months of exposure to speech, infants can compute long distance dependencies in speech and generalize them to new tokens.

OP3 004: Functional Near Infrared Spectroscopy (fNIRS) To Investigate Language Patterns Development Over Ages

Julie Tremblay, Ste-Justine Hospital Research Center, Canada

Neuroimaging techniques such as fMRI have been the object of many studies aiming to localise language areas and find a replacement for the amobarbital procedure. Although good results have been obtained in adults, fMRI is not always conclusive in children, mainly because fMRI scanner is a stressful environment for young children and it is difficult to verify if they perform the task correctly. Functional near infrared spectroscopy (fNIRS) seems to be a good alternative to investigate language, especially in paediatric populations. We recorded fNIRS data during a verbal fluency task performed aloud by 41 individuals. Participants were divided in 4 groups: 1 – younger children (3-6 years (n=10)), 2- older children (7-10 years (n=10)), adolescents (11-16 years (n=12)) and adults (18 years + (n=9)). A method to detect and correct abrupt variations due to movement artefact developed by our group has been applied on individual data. Then, modified Beer Lambert Law was applied to estimate variations in HbO2 and HbR concentrations. For all groups an increase in HbO2 concentration was seen during the language task in Broca's area along with a weaker activation in the homologous area. The effect of age on hemodynamic response was further assessed using a mixed design ANOVA with Hemisphere as a within-subject factor and age groups as the between- subject factor. Results revealed a significant main effects for factors Group ($F(3, 37) = 5.42$, $p < 0.05$) indicating an increase of amplitude with age and a main effect for hemisphere ($F(1, 37) = 35.63$, $p < 0.001$) indicating a higher HbO2 concentration in the left hemisphere than in the right hemisphere in all groups. fNIRS is a good technique to investigate language dominance in participants from as young as 3 years old. Finally, our results suggest that our movement artefact rejection and correction tool increases significantly the NIRS data quality especially in young participants.

OP4: Sensation & Perception

Auréliane Pajani, Laboratory of Cognitive Sciences and Psycholinguists, France
Simon van Gaal, University of Amsterdam, Netherlands
Thomas Carlson, Macquarie University, Australia
Oliver Baumann, The University of Queensland, Australia

OP4 001: Hallucinated And Correctly Detected Stimuli Evoke Similar Activity Patterns In Early Visual Cortex

Auréliane Pajani, Laboratory of Cognitive Sciences and Psycholinguists, France

When you are trying to detect a faint stimulus in noisy background, you can correctly detect it when it is there ('Hit') and correctly report its absence when it is not there ('Correct Rejection', CR), but you can sometimes miss the stimulus when it is there ('Miss'), and sometimes report seeing it even though it is not there ('False Alarms', FAs). Previous research has shown that during a challenging contrast-detection task, Hits and FAs elicited greater activity in early visual cortex than Misses and CRs (Ress & Heeger, Nature Neuroscience, 2003). This suggests that the activity in early sensory cortices correlates more strongly with subjects' percepts than with the physically presented stimulus. However, it is unclear whether this activity is stimulus-specific, or if it reflects a non-specific arousal response. Here, we investigated the representational content of neural activity in visual cortex during FAs in a challenging detection task, using functional magnetic resonance imaging (fMRI). Subjects had to detect a low- contrast gabor at detection threshold, embedded in Gaussian white noise. Crucially, the experiment was organised in blocks: when present, gabors always had the same orientation within one block (either 45° or 135°), which is the orientation that we assume subjects see when incorrectly reporting a gabor. Our results show that FAs are associated with a feature-specific pattern of activity in early visual cortex similar to that observed during Hits, which is not observed during CRs. Hallucinated stimuli are hence represented in early visual cortices through activity patterns that resemble those evoked by actual stimuli. This supports the view that false alarms arise at the perceptual level, as a result of erroneous sensory inference driven by predictions.

OP4 002: Qualitatively Different Neural Mechanisms For Conscious And Subliminal Multiple Word Integration

Simon van Gaal, University of Amsterdam, Netherlands

Although great progress has been made in characterizing the flow of information triggered by a single unconscious visual stimulus, whether and how multiple sources of unconscious information can be integrated is strongly debated. Influential models suggest that consciousness is required for multiple-step rule-based algorithms, for example in doing mental arithmetic or performing grammatical language operations. Here we tested this hypothesis and explored whether language circuits can process simple grammatical constructions unconsciously, and integrate the meaning of several unseen words. Using behavioral priming and electroencephalography (EEG), we studied a specific rule-based linguistic operation traditionally thought to require conscious cognitive control: the negation of valence.

Two subliminal/visible words were successively (Exp. 1) or simultaneously presented (Exp. 2), a modifier ("not"/"very") and an adjective (e.g., "good"/"bad"), followed by a visible target noun (e.g., "peace"/"murder") that required a response. The combination of these three words could either be contextually consistent (e.g., "very bad - murder") or inconsistent (e.g., "not bad - murder"). EEG recordings revealed that grammatical negations could unfold partly unconsciously, as reflected in similar occipito-parietal N400 effects for conscious and unconscious three-word sequences forming inconsistent combinations. However, only conscious word sequences elicited P600 effects, later in time. Overall, these results suggest that multiple unconscious words can be rapidly integrated and that an unconscious negation can automatically "flip the sign" of an unconscious adjective. However, they also highlight that consciousness modulates the grammatical integration of multiple words. We speculate that the time-consuming re-analysis of the preceding word sequence, which relies on active working memory mechanisms and is reflected in the P600, might require conscious awareness.

OP4 003: The Emerging Perceptual Representation Of Faces Decoded From Human Neuromagnetic Recordings

Thomas Carlson, Macquarie University, Australia

As highly social creatures, face perception is essential to daily human life. From the moment we turn our gaze to an individual, our brain begins to form a perceptual representation of the individual's face to promote recognition and ultimately guide our social interactions. In the present study we used a generative model of face perception, human behaviour, and a magnetoencephalography (MEG) decoding approach to study when and how the brain constructs a perceptual representation of a face. We first generated 18 individual face exemplars using a generative model of face perception that encodes faces using a range of metric features, e.g. eye width. In a behavioural experiment, we then measured the human capacity to discriminate faces for all possible pairwise comparisons between face exemplars. The behavioural data was then used to estimate a perceptual geometry of the face stimuli, which is described quantitatively in a dissimilarity matrix (DSM). Next, in a MEG experiment, we used a sliding window decoding approach to measure the neural discriminability between the face stimuli as a function of time (100Hz temporal resolution). The decoding analysis produced a set of time varying DSMs, which describe the brain's emerging representational geometry of the stimuli. To determine when the brain forms a perceptual representation of a face, we compared the perceptual geometry (from behaviour) to the time varying representational geometry of the stimuli in the brain. Our analysis found a significant correspondence between perception and the brain's representation 80ms after stimulus onset that peaked at 100ms. Our results show that the brain rapidly constructs a perceptual representation of a face;; and the extremely short latency further suggests this representation is constructed using feed forward mechanisms. This early (fast) representation might underlie our capacity to rapidly recognize individuals and their emotional state, and to guide social interactions.

OP4 004: Effects Of Attention And Perceptual Uncertainty On Cerebellar Activity During Visual Motion Perception

Oliver Baumann, The University of Queensland, Australia

Recent research suggests that the cerebellum plays an important role in the processing of visual motion, but the nature of its contribution is unknown. Some studies point to a role in discriminating motion signals under conditions of high perceptual uncertainty. Others suggest that it might facilitate motion perception by aiding attentive tracking of visual objects. We aimed to determine the degree to which cerebellar activity during visual motion perception can be explained by a role in aiding attentive tracking of visual motion, in contrast to a role in facilitating visual motion discrimination under levels of high perceptual uncertainty. Using functional magnetic resonance imaging, we monitored neural activity in the cerebellum while 18 participants engaged in a task, which required them to identify and covertly monitor a directional visual motion signal in noise. The stimuli were random-dot arrays containing a central stationary fixation spot whose colour alternated periodically. While holding the visual displays constant, we manipulated attention by having participants attend covertly to the dot motion or the coloured spot at fixation. Perceptual uncertainty was manipulated by varying the percentage of coherently moving dots contained within the random-dot arrays. Image processing and statistical analyses were performed using SPM8, at a significance-threshold of p=0.05 (FWE-corrected). We found that attention to motion under high perceptual uncertainty was associated with activity in two left hemispheric cerebellar clusters. The first was located at the border between lobules VI and crus I. The second cluster was located at the border between lobules crus II and VIIB. Our results support the notion that the cerebellum facilitates the detection and discrimination of moving objects under conditions of high perceptual uncertainty, but are inconsistent with the idea that the cerebellum is crucial for sustained attentive tracking of salient motion stimuli.

POSTER SESSION 3

TOPICS IN THIS POSTER SESSION ARE:

TOPIC	CODE
Cognition and Executive Processes	WCE
Emotion and Social Processes	WES
Memory and Learning	WML
Methods Development	WME
Motor Behaviour	WMO
Sensation & Perception	WPE

Cognition & Executive Processes

WCE001: Cross-Sectional Variation in Cognitive Skills Achievement: A Gender Gap Analysis

Presented by: Afiza Akashah John, University of Malaya, Malaysia

Authors: Afiza Akashah John, Siti Nurani Mohamed Nor

WCE002: Individual Differences In Salience And Executive-Control Networks

Presented by: Jaime Rennie, University of Newcastle, Australia

Authors: Jaime Rennie, Patrick Cooper, Renate Thienel, Frini Karayanidis

WCE003: Double Dissociation In The Roles Of The Left And Right Prefrontal Cortices In Anticipatory Regulation Of Action

Presented by: Stephanie Ries, University of California, Berkeley, USA

Authors: Stephanie Ries, Ian Greenhouse, Nina F. Dronkers, Kathleen Y. Haaland, Robert T. Knight

WCE004: The Effects Of Early Onset Type 1 Diabetes On The Young Adult Brain: A Voxel-Based Morphometry Study

Presented by: Gareth Roberts, Murdoch University, Australia

Authors: Gareth Roberts, Mike Anderson, Timothy Jones, Elizabeth Davis, Trang Ly

WCE005: Music Training, Executive Functions and the P3a Response: Training-Related Changes in Performance and Neural Correlates

Presented by: Katri Saarikivi, University of Helsinki, Finland

Authors: Katri Saarikivi, Vesa Putkinen, Mari Tervaniemi, Minna Huotilainen

WCE007: Mismatch Negativity in Autism Spectrum Disorder

Presented by: Ulrich Schall, University of Newcastle, Australia

Authors: Ulrich Schall, Benjamin Weismueller, Renate Thienel, Anne-Marie Youlden, Ross Fulham

WCE008: Early Post-Stroke Measures Of Slowed Frontal Lobe Activity Can Help Predict Cognitive Outcomes

Presented by: Emma Schleiger, The University of Queensland, Australia

Authors: Emma Schleiger, Nabeel Sheikh, Tennille Rowland, Andrew Wong, Stephen Read, Simon Finnigan

WCE009: A Man vs Machine Shootout Duel: Do We Have Control Over Our Intention-Predictive Brain Signals? In A Real-Time Duelling Game Subjects Try To Execute Self-Initiated Movements Before Being Predicted And Interrupted By An EEG-Based Brain-Computer Interface

Presented by: Matthias Schultze-Kraft, Berlin Institute of Technology, Germany

Authors: Matthias Schultze-Kraft, Daniel Birman, Marco Rusconi, Sven Daehne, Benjamin Blankertz, John-Dylan Haynes

WCE011: Changes Of Single Word-Induced Cerebral Oxy-Hb Using Japanese And English Shiritori In Schizophrenia: Comparison With Healthy Subjects

Presented by: Yoshihisa Shoji, Kurume University, School of Medicine, Japan

Authors: Yoshihisa Shoji, Kiichiro Morita, Ryo Fujiki, Youhei Ishii, Mamoru Satou, Yuusuke Katou, keiichiro Mori, Naohisa Uchimura

WCE012: Single Word-Related Changes In Cerebral Oxy-Hb During Discrimination Task In Schizophrenic Patients: Comparison With Healthy Subjects

Presented by: Mamoru Satou, Kurume University, School of Medicine, Japan

Authors: Mamoru Satou, Kiichiro Morita, Yoshihisa Shoji, Ryo Fujiki, Yuusuke Katou, Hiroyuki Yamashita, Keiichiro Mori, Youhei Ishii, Naohisa Uchimura

WCE013: Anticipatory Processes In Brain State Switching – Implicating Default Mode And Salience Networks

Presented by: Justina Sidlauskaite, Ghent University, Belgium

Authors: Justina Sidlauskaite, Jan R. Wiersema, Herbert Roeyers, Ruth M. Krebs, Eliana Vassena, Wim Fias, Marcel Brass, Eric Achten, Edmund Sonuga-Barke, Edmund Sonuga-Barke

WCE014: Reactive Inhibitory Control Is Reduced In Older Adults: A Behavioural And Electroencephalographic Study

Presented by: Paul Sowman, Macquarie University, Australia

Author: Paul Sowman

WCE015: Manipulating Item Proportion And Deception Reveals Crucial Dissociation Between Behavioral, Autonomic And Neural Indices Of Concealed Information

Presented by: Kristina Suchotzki, Ghent University, Belgium

Authors: Kristina Suchotzki, Bruno Verschuere, Judith Peth, Geert Crombez, Matthias Gamer

POSTER SESSION 3

WCE016: The Value Of Steady State Models Of Cognition-Emotion

Presented by: Kelly Trezise, University of Melbourne, Australia

Authors: Kelly Trezise, Robert Reeve

WCE017: Brain DC Potential Changes Associated with Meditation Techniques of Concentration and Mindfulness

Presented by: Michael Trimmel, Medical University of Vienna, Austria

Authors: Michael Trimmel, Christina Pieringer, Karin Trimmel

WCE018: Hypoactive Error-Related Activity Associated With Failure To Learn From Errors In Substance Dependent Individuals

Presented by: Daniel Upton, University of Melbourne, Australia

Authors: Daniel Upton, David O'Connor, Kathleen Charles-Walsh, Sarah Rossiter, Jennifer Moore, Robert Hester

WCE019: Noradrenaline And Dopamine Neurons Integrate Reward Value And Effort Cost: A Direct Electrophysiological Comparison In Behaving Monkeys

Presented by: Chiara Varazzani, ICM - Brain & Spine Institute, France

Authors: Chiara Varazzani, Aurore San-Galli, Sebatien Bouret

WCE020: Differential Activation Patterns During Visual And Spatial Working Memory In Children With ADHD, Dysthymic Disorder And Typically Developing Children

Presented by: Veronika Vilgis, University of Melbourne, Murdoch Childrens Research Institute. Australia

Authors: Veronika Vilgis, Alasdair Vance, Timothy Silk

WCE021: Investigating The Role Of The Internal Features Of The Face In Competition For Representation By Modulation Of The Face-Sensitive N170

Presented by: Sreekari Vogeti, University of Auckland, New Zealand

Authors: Sreekari Vogeti, Paul Corballis

WCE023: Oscillatory Mechanisms Related To (Pre-)Reflective Decision-Making

Presented by: Martijn E Wokke, University of Amsterdam, Netherlands

Authors: Martijn E Wokke, K. Richard Ridderinkhof

WCE024: Variability In Inter-Trial Coherence Predicts Variability In Cognitive Control Efficiency

Presented by: Aaron S.W. Wong, The University of Newcastle, Australia

Authors: Aaron S.W. Wong, Patrick S. Cooper, Renate Thienel, Patricia T. Michie, Frini Karayanidis

WCE025: How Domain General Is Information Coding In The Brain? A Meta-Analysis Of 93 Multi-Voxel Pattern Analysis Studies

Presented by: Alexandra Woolgar, Macquarie University, Australia

Authors: Alexandra Woolgar, Jade Jackson, John Duncan

WCE026: MicroRNA-200 Family Promotes Neurite Outgrowth by Suppression of PTEN Expression in PC12 Cells and SCG Neurons

Presented by: Wu Qi, Biomedical Research Institute, Shenzhen-PKU-HKUST Medical Center, China

Authors: Qi Wu, Jun Wan

WCE028: Construal Level and Perceived Distance – A Psychophysical Test of Construal Level Theory

Presented by: Mark Yates, University of Melbourne, Australia

Authors: Mark Yates, James Scully

WCE029: IL23/IL17-Mediated Inflammation Induced by A? Accelerates Alzheimer's Disease Development

Presented by: Xiaoyang Ye, Biomedical Research Institute, Shenzhen-PKU-HKUST Medical Center, China

Authors: Xiaoyang Ye, Jun Wan

WCE032: ERPs in Young and Older Adults in the Equiprobable Auditory Go/NoGo Task

Presented by: Robert Barry, University of Wollongong, Australia

Authors: Robert Barry, Frances De Blasio, Adele Cave

WCE033: Moral Judgment About Socio-Scientific Issues

Presented by: Wen Hua Chang, National Taiwan Normal University, Taiwan

Authors: Wen Hua Chang, Miao Hsuan Yen, Sufen Chen, Chia Wen Tsai

WCE034: The Internet Addiction Level on Resting-state Brain Connectivity

Presented by: Shulan Hsieh, National Cheng Kung University, Taiwan

Authors: Jen-Tang Chang, Der-Yow Chen, Shulan Hsieh

WCE035: Total And Relative Prestimulus EEG Band Power Contributions To The ERP And Behavioural Outcomes In An Equiprobable Auditory Go/NoGo Task

Presented by: Frances M. De Blasio, University of Wollongong, Australia

Authors: Frances M. De Blasio, Robert J. Barry

WCE036: The Neural Timecourse Of Metacognition. Investigating The Subjective Experience Of Response Conflict

Presented by: Kobe Desender, Free University Brussels, Belgium

Authors: Kobe Desender, Filip Van Opstal, Gethin Hughes, Eva Van den Bussche

WCE037: Functional Organization of Brain Cortex at Stages of Professional Creative Problem Solving in Highly-Creative Individuals

Presented by: Liudmila Dikaya, Southern Federal University, Russia

Author: Liudmila Dikaya

WCE038: The Distribution of Event-Related Potentials Components in Participants With Different Modes of Thinking during False Responses

Presented by: Igor Dikiy, Southern Federal University, Russia

Author: Igor Dikiy

WCE039: Examining The Effect Of Oral Contraceptive Use On Verbal Learning And Memory, Verbal Fluency And Mental Rotation

Presented by: Andrea Gogos, University of Melbourne, Australia

Authors: Andrea Gogos, Loic Tse, Amy Scarlett, Jane Ackerl, Tracey Woodhead, Linda Byrne

WCE040: Under the Influence: Alcohol Impairs Inhibition of Negative Distractors, But Only In Men

Presented by: Laura Kranz, Victoria University of Wellington, New Zealand

Authors: Laura Kranz, Lauren Bell, David Carmel, Matt Crawford, Natalija Andrejic, Gina Grimshaw

POSTER SESSION 3

Cognition & Executive Processes cont'd

WCE041: Neural Correlates of Creativity in Schizotypy: An fMRI Study
Presented by: Haeme Park, University of Auckland, New Zealand
Authors: Haeme Park, Reece Roberts, Ian Kirk, Karen Waldie

WCE042: Maturation of Neural Oscillations in the Anterior Cingulate Cortex During Response Conflict: An EEG Study using Measure Projection Analysis
Presented by: Gareth Roberts, Murdoch University, Australia
Authors: Gareth Roberts, Chris Brydges, Corinne Reid, Mike Anderson

WCE043: Prefrontal Contributions To Initiation, Suppression And Strategy: A Neuropsychological Study Of Focal Frontal Patients
Presented by: Gail Robinson, The University of Queensland, Australia
Authors: Gail Robinson, David Walker, Lisa Cipolotti, Vivien Biggs, Marco Bozzali, Tim Shallice

Emotion & Social Processes

WES001: Is the Devil (or Angel) Located in Frontal Cortical Areas?
Presented by: Martial Mermillod, Grenoble-Alpes University, France
Authors: Martial Mermillod, Brice Beffara, Amélie Bret, Johan Lepage, Tiffany Morisseau, Nicolas Vermeulen

WES002: Moving Beyond Valence And Arousal: Emotional Processing Of Human Injury, Snake And Gun Images Is Indexed By N2 Activity
Presented by: Rosemaree Miller, University of Newcastle, Australia
Authors: Rosemaree Miller, Frances Martin

WES004: Complex Hyper-Brain Networks Emerge During Kissing
Presented by: Viktor Müller, Max Planck Institute for Human Development, Germany
Authors: Viktor Müller, Ulman Lindenberger

WES006: Reactance to Deterrence: How Discouragement Impels Success
Presented by: Charlotte Prevost, University of Geneva, Switzerland
Authors: Charlotte Prevost, Hakwan Lau, Dean Mobbs

WES007: Older Adults Suppress Emotion as Effectively as Young Adults But Only the Young Incur Memory Costs
Presented by: Peter G Rendell, Australian Catholic University, Australia
Authors: Peter G Rendell, David Pedder, Gill Terrett, Julie Henry, Phoebe Bailey, Ted Ruffman

WES008: Brain Responses To Disgusting And Fearful Pictures With And Without High Spatial Frequencies
Presented by: Elisabeth Ruiz-Padial, University of Jaén, Spain
Authors: Elisabeth Ruiz-Padial, M. Teresa Mendoza, Francisco Esteves, Jose Luis Mata-Martin

WES009: Does Deception Always Require Cognitive Control?
Presented by: Justyna Sarzynska, University of Social Sciences and Humanities, Poland
Authors: Justyna Sarzynska, Marcel Falkiewicz, Edward Necka

WES010: An Improved Human Anxiety-Specific Biomarker: Personality, Pharmacology, Frequency Band, and Source Characterisation.
Presented by: Shabah Shadli, University of Otago, New Zealand
Authors: Shabah Shadli, Paul Glue, Ian Kirk, Neil McNaughton

WES011: A Prospective Study Of Stress Sensitivity: Emotion Regulation As A Moderator Of The Stress-Depression Relationship
Presented by: Michael Tooley, Victoria University of Wellington, New Zealand
Authors: Michael Tooley, Paul Jose, Gina Grimshaw

WES013: Multimodal Emotion Integration In Bipolar Disorder: An Investigation Of Involuntary Cross-Modal Influences Between Facial And Prosodic Channels
Presented by: Tamsyn Van Rheenen, Swinburne University of Technology, Australia
Authors: Tamsyn Van Rheenen, Susan Rossell

WES015: Losing The Feel For Social Judgements: Age-Related Physiological Changes When Evaluating The Approachability Of Emotional Faces
Presented by: Megan Willis, Australian Catholic University, Australia
Authors: Megan Willis, Christina Netscher, Gill Terrett, Peter Rendell

WES016: EEG Functional Connectivity Is Associated With The Valence Of Experienced Affective States
Presented by: Miroslaw Wyczesany, Jagiellonian Universiy, Poland
Authors: Miroslaw Wyczesany, Magdalena A. Ferdek

WES017: Age-Differences In Brain Correlates Of Attentional Control Of Emotional Items During Working Memory Encoding
Presented by: Maryam Ziaei, The University of Queensland, Australia
Authors: Maryam Ziaei, Nathalie Peira, Jonas Persson

WES018: Changes In miRNA Expression Profile Between Stress-Vulnerable And Stress-Resilient Rats In Chronic Mild Stress (CMS) – An Animal Model Of Depression
Presented by: Dariusz Zurawek, Institute of Pharmacology, Polish Academy of Sciences, Poland
Authors: Dariusz Zurawek, Agata Faron-Gorecka, Maciej Kusmider, Magdalena Kolasa, Paulina Pabian, Joanna Solich, Kinga Szafran, Piotr Gruca, Mariusz Papp, Marta Dziedzicka-Wasylewska

WES019: fMRI Activation and Graph Theoretical Analysis of Unfamiliar Versus Self-Selected Music Towards Developing An Optimal Paradigm for Music Therapy
Presented by: Christof Karmonik, Houston Methodist Research Institute, USA
Authors: Christof Karmonik, Anthony Brandt, Jeff Anderson, Steve Fung, Forrest Brooks, Todd Frazier

WES022: Implicit Measurement of Environmental Concern: The Potential of Startle Eyeblink Modulation
Presented by: Royce Willis, Southern Cross University, Australia
Authors: Royce Willis, Stephen Provost

POSTER SESSION 3

Methods Development

WME003: Restoring Latency-Variable ERP Components from Single Trials: A New Approach to ERP Analysis with Residue Iteration Decomposition (RIDE)?

Presented by: Guang Ouyang, Hong Kong Baptist University, Hong Kong

Authors: Guang Ouyang, Werner Sommer, Changsong Zhou

WME004: Correcting Sample Size Bias in d' and A'

Presented by: Bradley Patten, University of Auckland, New Zealand

Authors: Bradley Patten, Jeff Hamm

WME005: Machine Learning Techniques Show Sensory and Association Network Alterations in Severe Epilepsy

Presented by: Mangor Pedersen, University of Melbourne, Australia

Authors: Mangor Pedersen, Evan K. Curwood, John S. Archer, David F. Abbott, Graeme D. Jackson

WME006: Towards a Methodology for Neuronal Mental Workload Registration during Execution of Cognitive Tasks

Presented by: Thea Radüntz, Federal Institute for Occupational Safety and Health, Germany

Author: Thea Radüntz

WME009: Magnetic Resonance Spectroscopy and Cognitive Function: The Role of Plasma B vitamin Status

Presented by: Tamara Simpson, Swinburne University of Technology, Australia

Authors: Tamara Simpson, Chao Suo, Helen Macpherson, Andrew Pipingas, Con Stough

WME011: A Free And Open Source BCI System In Python

Presented by: Bastian Venthur, Berlin Institute of Technology, Germany

Authors: Bastian Venthur, Benjamin Blankertz

WME012: 2nd Level Modelling In fMRI Analysis With A Clinically Depressed Sample - Comparisons Between Classical And Bayesian Methods

Presented by: Peter Goodin, Swinburne University of Technology, Australia

Authors: Peter Goodin, Joseph Ciorciari, Susan Rossell, Matt Hughes, Richard Nibbs

WME013: Clinical Applicability Of The Prosocial Effects Of Oxytocin And Inter-/Intrapersonal Models Of Social Dysfunction: A Methodological Review

Presented by: Yasuko Kitano, The University of Tokyo, Japan

Author: Yasuko Kitano

Memory & Learning

WML001: Connectivity Across Recognition Memory Circuits Is Reduced In Carriers Of The BDNF Val66Met Single Nucleotide Polymorphism

Presented by: Nicole Mckay, University of Auckland, New Zealand

Authors: Nicole Mckay, Ian Kirk

WML002: Long-Lasting Effects Of Social Defeat On Spatial Learning And Hystone Acetylation In The Hippocampus

Presented by: Jose Miñarro, University of Valencia, Spain

Authors: Jose Miñarro, Sandra Montagud-Romero, M. Carmen Blanco-Gandia, Asunción Aguilar, Maria Pascual, Consuelo Guerri, Marta Rodríguez-Arias

WML003: Effects of DHEA Administration On Learning Memory, PKC Activity, Membrane Fluidity And CREB levels in iron-Induced Epileptic Model

Presented by: Monika Mishra, Jawaharlal Nehru University, India

Authors: Monika Mishra, Deepak Sharma

WML005: Does Naturally Occurring High Salience For Speech Sounds Impact The Primacy Bias Observed In Mismatch Negativity (MMN)?

Presented by: Daniel Mullens, University of Newcastle, Australia

Authors: Daniel Mullens, Alex Provost, István Winkler, Juanita Todd

WML006: Decoupling of Haptic Components Suggests that Somatosensory Percepts are Differentially Processed in Working Memory

Presented by: Michael Notaras, University of Melbourne, Australia

Authors: Michael Notaras, George Van Doorn, Mark Symmons

WML007: Chronic Activation of the Glucocorticoid Receptor Alters Memory Function of Val66Met Polymorphism Knock-in hBDNF Mice

Presented by: Michael Notaras, University of Melbourne, Australia

Authors: Michael Notaras, Rachel Hill, Joseph Gogos, Maarten van den Buuse

WML008: Passively Improving Face Processing with LTP-like Visual Stimulation

Presented by: Felipe Pegado, University of Leuven , Belgium

Authors: Felipe Pegado, Bart Boets, Hans OpDeBeeck

WML009: A, B, C As Linear As 1, 2, 3: Numerical And Non-Numerical Representation In Adults

Presented by: Christine Podwysocki, University of Melbourne, Australia

Authors: Christine Podwysocki, Jacob Paul, Jason Forte

WML010: Frontal-Parietal Alpha Networks Reflect A Compensatory Mechanism To Overcome The Associative Deficit In Mild Cognitive Impairment

Presented by: Laura Prieto, University Pablo de Olavide, Spain

Authors: Laura Prieto, José Luis Cantero Lorente, Mercedes Atienza Ruiz

WML012: Effects Of Gestational Administration Of Vitamine E On Learning And Memory In APPswe/PS1dE9 Transgenic Mice

Presented by: Marta Rodriguez-Arias, University of Valencia, Spain

Authors: Marta Rodriguez-Arias, M Carmen Blanco-Gandia, Ana Lloret, Esther Giraldo, Jose Viña, Jose Miñarro

POSTER SESSION 3

Memory & Learning cont'd

WML013: The Relationship Between Dorsolateral Prefrontal Cortical Inhibition And Working Memory Performance: A Combined TMS-EEG study.
Presented by: Nigel Rogasch, Monash University, Australia
Authors: Nigel Rogasch, Zafiris Daskalakis, Paul Fitzgerald

WML014: Age Related Changes of MEG Alpha and Gamma-Band Activity Reflect the Late Maturation of Distractor-Inhibition during Working Memory Maintenance
Presented by: Frédéric Roux, Basque Center for Cognition, Brain & Language (BCBL), Spain
Authors: Frédéric Roux, Harald Mohr, Michael Wibral, Wolf Singer, Peter Uhlhaas

WML015: Stimulus Uncertainty Enhances Motor Cortical Plasticity Induced With A Paired Associative Stimulation Paradigm
Presented by: Martin Sale, The University of Queensland, Australia
Authors: Martin Sale, Abbey Nydam, Marc Kamke, Jason Mattingley

WML016: Sleep and Social Memory Consolidation
Presented by: Amanda Santamaria, University of South Australia, Australia
Authors: Amanda Santamaria, Owen Churches, Alex Chatburn, Hannah Keage, Mark Kohler

WML017: Sleep-Dependent Memory Consolidation And Neurofeedback In Insomnia – A Long-Term Study
Presented by: Manuel Schabus, University of Salzburg, Austria
Authors: Manuel Schabus, Hermann Griessenberger, Dominik Heib, Daniel Koerner, Kerstin Hoedlmoser

WML019: Temporal Pattern Similarity In Human MEG And Intracranial EEG Reveals The Reinstatement Of Episodic Memory Trajectories
Presented by: Tobias Staudigl, University of Konstanz, Germany
Authors: Tobias Staudigl, Christian Vollmar, Soheyl Noachtar, Simon Hanslmayr

WML020: Visual Mismatch Response Dynamics Predict Social Cognitive Performance in Healthy Adults: An ERP study
Presented by: Gabor Stefanics, University Zurich & ETH Zurich, Switzerland
Authors: Gabor Stefanics, Justin Chumbley, Jakob Heinzle, Klaas Enno Stephan

WML023: The Impact of Movement Fluency, Complexity and Diverted Attention on Working Memory Processes
Presented by: Richard Tindle, Southern Cross University, Australia
Authors: Richard Tindle, Mitchell Longstaff

WML024: The Effects of Drug Induced Changes in Dopamine and Galantamine Levels on Attentional Selection and Working Memory Storage in Young and Elderly. A Pharmacological fMRI Study.
Presented by: Anne Vellage, DZNE Magdeburg, Germany
Authors: Anne Vellage, Andreas Becke, Hendrik Strumpf, Max Hopf, Ariel Schönfeld, Notger Müller

WML026: Gone For 60 Seconds: Reactivation Length Determines Motor Memory Degradation During Reconsolidation
Presented by: Nicole Wenderoth, ETH Zürich, Switzerland
Authors: Nicole Wenderoth, Toon T De Beukelaar, Daniel G Woolley

WML027: Frequency-Tagging In Memory – Context Or Reactivation?
Presented by: Maria Wimber, University of Birmingham, UK
Authors: Maria Wimber, Simon Hanslmayr, Rik Henson, Michael Anderson

WML028: Assessing The Role Of The Motor Cortex In Visuomotor Memory
Presented by: Hesam Alavi, The University of Queensland, Australia
Authors: Hesam Alavi, Stephan Riek, Welber Marinovic, Tim Carroll

WML029: Associative Memory And Sleep: A Systematic Review And Meta-Analysis Of Behavioural Evidence And Underlying EEG Mechanisms.
Presented by: Alex Chatburn, University of South Australia, Australia
Authors: Alex Chatburn, Kurt Lushington, Mark Kohler

WML030: Neuroprotective Effect Of Ginseng Against Alteration Of Calcium Binding Proteins Immunoreactivity In The Mice Hippocampus After Chronic Radiofrequency Exposure.
Presented by: Dhiraj Maskey, Nepalese Army Institute of Health Sciences, Nepal
Authors: Dhiraj Maskey, Myeung Ju Kim, Hyung Gun Kim

WML031: The Investigation of Social Anxiety Disorder, Depressive Symptoms and Self-Esteem, and its Effects on Autobiographical Memory Retrieval.
Presented by: Felicia Neo, Swinburne University of Technology, Australia
Authors: Felicia Neo, Joseph Ciorciari, Glen Bates

WML032: Behavioural Correlates of Periconceptional Ethanol Exposure in Aged Offspring
Presented by: Diana Zanfirache, The University of Queensland, Australia
Authors: Diana Zanfirache, Karen Moritz, Carlie Cullen

Motor Behaviour

WMO001: Constraints Upon Learning Novel Muscle Activation Patterns after Virtual Tendon Transfer
Presented by: Hossein Jahanabadi, The University of Queensland. Australia
Authors: Hossein Jahanabadi, Timothy Carroll, Andrew Cresswell, Aymar de Rugy

WMO002: On The Relationship Between LFP Oscillations And Spiking Activity In Monkey Motor Cortex
Presented by: Bjørg Kilavik, CNRS - Aix Marseille University, France
Authors: Bjørg Elisabeth Kilavik, Thomas Brochier, Sonja Grün, Alexa Riehle

WMO003: The Role Of The Cerebellum In Challenging Postural Control Conditions
Presented by: Inge Leunissen, KU Leuven, Belgium
Authors: Inge Leunissen, David Drijkoningen, Wouter Hoogkamer, Karen Caeyenberghs, Stephan Swinnen

WMO004: The Sense of Agency during Verbal Action
Presented by: Hannah Limerick, University of Bristol, UK
Authors: Hannah Limerick, David Coyle, James Moore

POSTER SESSION 3

WMO005: The Involuntary Initiation Of Timing Actions By Loud Sounds Depends On Attention To Sensory Modalities

Presented by: Welber Marinovic, The University of Queensland, Australia

Authors: Welber Marinovic, Fiona Cheung, James Tresilian, Stephan Riek

WMO009: Autism And The Sensorimotor Effects Of The Rubber-Hand Illusion

Presented by: Colin Palmer, Monash University, Australia

Authors: Colin Palmer, Bryan Paton, Melissa Kirkovski, Peter Enticott, Jakob Hohwy

WMO010: The Effect Of Acute Sports Concussion on Corticomotor Excitability in Australian Football Players.

Presented by: Alan Pearce, Deakin University, Australia

Authors: Alan Pearce, Mark Rogers, Daniel Corp, Brendan Major, Kate Hoy

WMO011: Using Transcranial Magnetic Stimulation as a valid tool to evaluate sports concussion. A systematic review with preliminary results.

Presented by: Brendan Major, Deakin University, Australia

Authors: Brendan Major, Mark Rogers, Alan Pearce

WMO012: Visuomotor Adaptation Generalizes Partially According To An Eye-Centred Coordinate Frame

Presented by: Eugene Poh, The University of Queensland

Authors: Eugene Poh, Guy Wallis, Stephan Riek, Aymar de Rugy, Timothy Carroll

WMO013: The Effects Of Six-Month Exercise Programs On Structural Changes In Gray And White Matter Volume And Balance Abilities In Senior Citizens: The Case For Dance Training

Presented by: Kathrin Rehfeld, Otto-von-Guericke University Magdeburg, Germany

Authors: Kathrin Rehfeld, Anita Hoekelmann, Angie Lueders, Joern Kaufmann, Notger G. Mueller

WMO014: Spatial Attention To Key Body Sites Is Sufficient For Goal-Irrelevant Motor Priming In Reach-To-Grasp Action When Eye Movement Is Constrained

Presented by: Samuel Sparks, The University of Queensland, Australia

Authors: Samuel Sparks, Maxwell Lyons, Ada Kritikos

WMO015: Experimental Pain Differentially Affects Cortical Involvement In Force And Position Control Tasks

Presented by: Kylie Tucker, The University of Queensland, Australia

Authors: Kylie Tucker, Peter Poortvliet, Dion Scott, Paul Sowman, Simon Finnigan, Paul Hodges

WMO017: Short-Term Musical Training Modulates Functional Connectivity Of The Sensorimotor System: An EEG coherence study

Presented by: Carolyn Wu, The University of Auckland,New Zealand

Authors: Carolyn Wu, Jeff Hamm, Vanessa Lim, Ian Kirk

Sensation & Perception

WPE001: Intracerebral Electrical Stimulation Of An Occipital Face-Selective Area Impairs Individual Face Discrimination

Presented by: Bruno Rossion, University of Louvain, Belgium

Authors: Bruno Rossion, Jacques Jonas, Julien Krieg, Laurent Koessler, Sophie Colnat-Coulbois, Jean-Pierre Vignal, Hélène Brissart, Corentin Jacques, Louis Maillard

WPE002: Rapid Definition Of Objective Electrophysiological Face-Selective Responses By Means Of Fast Periodic Visual Stimulation

Presented by: Bruno Rossion, University of Louvain, Belgium

Authors: Bruno Rossion, Katrien Torfs, Talia Retter, Joan Liu-Shuang

WPE003: Bottom-Up Predictive Processing Of Melodic Stimuli

Presented by: Narayan Sankaran, The University of Sydney, Australia

Authors: Narayan Sankaran, Francesca Meliton, Simon Carlile

WPE004: Information Content Of Electrophysiological Responses Elicited By Omissions Of Self-Initiated Sounds

Presented by: Iria SanMiguel, Leipzig University, Germany

Authors: Iria SanMiguel, Erich Schröger

WPE005: Does Timing Regularity Facilitate Sound Frequency Tracking At The Brainstem Level?

Presented by: Lenka Selinger, University of Barcelona, Spain

Authors: Lenka Selinger, Katarzyna Zarnowiec, Carles Escera

WPE006: Abnormal Patterns Of Attentional Network Communication Underlie Visual Hallucinations In Parkinson's Disease

Presented by: James Shine, The University of Sydney, Australia

Authors: James Shine, Claire O'Callaghan, Alana Muller, Glenda Halliday, Simon Lewis

WPE007: Binocular Rivalry Dynamics And Mixed Percept In Schizophrenia

Presented by: Jody Stanley, University of Melbourne, Australia

Authors: Jody Stanley, Sohee Park, Randolph Blake, Olivia Carter

WPE008: Broad Tuning Of Motion Streak Aftereffect Reveals Reciprocal Gain Interactions Between Orientation And Motion Neurons

Presented by: Matthew Tang, The University of Western Australia, Australia

Authors: Matthew Tang, J. Edwin Dickinson, Troy Visser, David Badcock

WPE009: Do Cross-Modal Phase Differences between Acoustic and Vibrotactile AM Stimuli Influence Audio-Tactile Integration? A Psychophysical and EEG Investigation

Presented by: Justin Timora, University of Newcastle, Australia

Authors: Justin Timora, Timothy Budd

WPE010: How Veridical Is Feedback Of Visual Object Information To Foveal Retinotopic Cortex?

Presented by: Kimberly Weldon, Macquarie University, Australia

Authors: Kimberly Weldon, Alexandra Woolgar, Anina Rich, Mark Williams

WPE011: Medial Temporal Lobe Roles in Human Path Integration

Presented by: Naohide Yamamoto, Cleveland State University, USA

Authors: Naohide Yamamoto, John Philbeck, Adam Woods, Daniel Gajewski, Joeanna Arthur, Samuel Potolicchio, Lucien Levy, Anthony Caputy

WPE012: A Model-Based Comparison Of Three Theories Of Audiovisual Temporal Recalibration

Presented by: Kielan Yarrow, City University London, UK

Authors: Kielan Yarrow, Shora Minaei

POSTER SESSION 3

Sensation & Perception cont'd

WPE013: Auditory Discrimination In Children With Autism Using The Magnetic Acoustic Change Complex (mACC)

Presented by: Shu Hui Yau, Centre for Cognition and its Disorders, Macquarie University, Australia

Authors: Shu Hui Yau, Genevieve McArthur, Jon Brock

WPE015: Viewing Hands And Specifically One's Own Hand Improves Movement Synchrony Perception

Presented by: Regine Zopf, Macquarie University, Australia

Authors: Regine Zopf, Jason Friedman, Mark Williams

WPE016: Do You See What I See? Personality And Perceptual Suppression

Presented by: Anna Antinori, University of Melbourne, Australia

Authors: Anna Antinori, Olivia Carter, Luke Smillie

WPE017: Oscillatory Activity In The Auditory Cortex Determines Auditory Temporal Resolution

Presented by: Alina Baltus, Carl von Ossietzky University of Oldenburg, Germany

Authors: Alina Baltus, Christoph S Herrmann

WPE018: Neural Processing Of Face Repetitions In Pre-Schoolers And Adults: An MEG Study

Presented by: Wei He, Macquarie University, Australia

Authors: Wei He, Jon Brock, Blake Johnson

WPE019: The benefit of two? : An Investigation Of Concurrent Segregation In Autistic Spectrum Disorder Using The Dichotic Pitch Paradigm

Presented by: Veema Lodhia, University of Auckland, New Zealand

Authors: Veema Lodhia, Blake Johnson, Jon Brock, Jeffrey Hamm, Michael Hautus

WPE020: Hierarchical Predictive Coding In Frontotemporal Networks With Pacemaker Expectancies: Evidence From Dynamic Causal Modelling Of Magnetoencephalography (MEG)

Presented by: Holly Phillips, University of Cambridge, UK

Authors: Holly Phillips, Alejandro Blenkmann, Laura Hughes, Tristan Bekinschtein, James Rowe

WPE021: Adults Can Be Trained to Acquire Synesthetic Experiences

Presented by: Anil Seth, University of Sussex, UK

Authors: Anil Seth, Daniel Bor, Nicholas Rothen, Stephanie Clayton, David Schwartzman

WPE022: Red, Green, Blue Equals 1, 2, 3: Investigating The Bidirectionality Of Digit-Colour Synaesthesia

Presented by: Lina Teichmann, Macquarie University, Australia

Authors: Lina Teichmann, Mark Nieuwenstein, Anina Rich

KEYNOTE ABSTRACTS

KEY008: Probabilistic Models Of Sensorimotor Control And Decision Making

Keynote Speaker: **Professor Daniel Wolpert**, University of Cambridge, UK

Overview

The effortless ease with which humans move our arms, our eyes, even our lips when we speak masks the true complexity of the control processes involved. This is evident when we try to build machines to perform human control tasks. While computers can now beat grandmasters at chess, no computer can yet control a robot to manipulate a chess piece with the dexterity of a six-year-old child. I will review our work on how the humans learn to make skilled movements covering probabilistic models of learning, including Bayesian and structural learning. I will also review our recent work showing the intimate interactions between decision making and sensorimotor control processes. This includes the relation between vacillation and changes of mind in decision making and the bidirectional flow of information between elements of decision formations such as accumulated evidence and motor processes such as reflex gains.Taken together these studies show that probabilistic models play a fundamental role in human sensorimotor control.

KEY009: The Role Of The Subthalamic Nucleus In Strategic Decision-Making: A Model-Based Approach

Keynote Speaker: **Professor Birte Forstmann**, University of Amsterdam, Netherlands

Overview

The basal ganglia are thought to implement a generic action–selection mechanism that releases from inhibition those actions that are desirable and maintains inhibitory control over all others. One key hypothesis that is shared by recent neurocomputational models of decision making is that the subthalamic nucleus (STN), a small nucleus in the basal ganglia (BG), plays a pivotal role in strategic adjustments of response thresholds. In this keynote lecture, I will first discuss the anatomo-functional role of the STN including ultra-high resolution 7Tesla magnetic resonance imaging (MRI) from post-mortem and in-vivo brains. I will provide a critical overview challenging the current academic consensus that the STN consists of three distinct parts, each selectively associated with cognitive, emotional, and motor functioning. I will then present structural and functional 3T and 7T data highlighting the role of the STN in strategic decision-making. The results will be discussed in light of the STN´s functional role in both healthy and clinical populations.

ACNS YOUNG INVESTIGATOR LECTURE
ABSTRACT

Mapping Context-Dependent Changes In Brain Functional Networks Using Event-Related Graph Analysis

Speaker: **Associate Professor Alex Fornito,** Monash University, Australia

Overview

Cognition emerges from complex and dynamic patterns of coordinated activity in spatially distributed neuronal ensembles. These patterns can be studied by analyzing statistical dependencies—functional connectivity—between neurophysiological signals recorded in distinct brain regions. Most studies of functional connectivity published to date have focused on spontaneous brain dynamics, recorded in the absence of an explicit task. Although this work has generated important insights into brain functional organization, its applications for understanding cognition are limited because neural activity evoked by active task performance is not considered. In this talk, I will describe recently developed methods that allow quantification of task-related modulations of functional connectivity that are scalable to the analysis of whole-brain networks. I will demonstrate how these techniques can be leveraged to map dynamic reconfigurations of large-scale neural systems in response to changing task conditions, and to understand how these network changes relate to individual differences in cognitive performance.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S19: ECoG Signatures Of Human Cognition

Chair & Speaker: **Josef Parvizi**, Stanford University, USA
Jean-Philippe Lachaux, INSERM Lyon, France
Robert T. Knight, University of California Berkeley, USA

Overview
Electrocorticography (ECoG) is a method for in-vivo sampling of electrical currents from precisely localizable neuronal populations with a high sampling rate and excellent signal to noise ratio. Simultaneous recordings from a large number of brain sites make it possible to study the local activity of neuronal populations along with their dynamic interactions with other brain regions in real time. The speakers of the symposium will highlight some of the latest breakthroughs in ECoG research that have given rise to new waves of discoveries in the field of cognitive neuroscience. They will argue that the anatomical precision and temporal resolution of ECoG, and the simultaneous access it provides to distributed brain networks, make it a suitable method for decoding the electrophysiological signature of human cognition in experimental as well as natural conditions.

S19 001: Combined ECoG, fMRI, And Electrical Brain Stimulation: A New Era For Localization Of Functions

Josef Parvizi, Stanford University, USA

In this talk, I will present ECoG data recorded from populations of neurons in the human brain during controlled experimental condition as well as natural conditions in which subjects freely interact with their environment. I will highlight the convergence of evidence across experimental and natural conditions and will compare the ECoG data with fMRI and electrical brain stimulation data obtained from the same individuals. Evidence from this multimodal approach has given us reasons to appreciate specialization of functions in the human brain.

Biography
Professor Parvizi is the director of Stanford Human Intracranial Cognitive Electrophysiology Program (SHICEP) and the PI the Laboratory of Behavioral and Cognitive Neurology (LBCN) at Stanford University School of Medicine. His expertise is in multimodal research using electrocorticography, electrical brain stimulation, and functional imaging methods.

S19 002: ECoG Signature Of Large-Scale Functional Connectivity In The Brain

Jean-Philippe Lachaux, INSERM Lyon, France

In this talk, I will present old and new evidence regarding amplitude coupling of high frequency activity recorded across different cortical regions in patients implanted with ECoG electrodes. I will discuss the issue of amplitude-amplitude coupling in light of phase-amplitude and phase-phase correlations.

Biography
Professor Lachaux works at INSERM Lyon and direct intracranial research in human participants. He is one of the pioneers of research in intracranial electrophysiology and many of his methods are widely used by other researchers in the field.

S19 003: The Past, The Present, And The Future Of ECoG

Robert T. Knight, University of California Berkeley, USA

In the last decade, there has been an explosion of interest in direct recordings from the surface of the cerebral cortex in patients implanted with intracranial electrodes. ECoG has revealed an extended frequency space in the human cortex extending up to 250 Hz. This high frequency signature of local neural activity coupled with novel methods to examine the role of low frequency oscillations in local and distributed network tuning has provided novel insights into a range of cognitive phenomena including memory, perception, emotion, language and motor control. Importantly, ECoG has also provided a new means for neuroprosthetic control. I will review current developments in human ECoG research and will highlight some of the new challenges to be tackled in the future.

Biography
Professor Knight is one of the pioneers of human ECoG research and has been involved in electrophysiological studies of network activity supporting goal-directed behavior in humans.

S20: The Interplay Of Attention And Prediction In The Human Brain

Peter Kok, Donders Institute for Brain, Cognition and Behaviour, Netherlands
Srivas Chennu, University of Cambridge, UK
Chair & Speaker: **Marta I. Garrido**, The University of Queensland, Australia
Angela J. Langdon, Princeton University, USA

Overview
Theoretical models and recent data suggest that the human brain is best viewed as a predictive machine. According to this view, brains learn by minimising the amount of prediction error, or surprise, caused by unexpected events. Neuroimaging and computational work have implicated several brain areas in feedforward propagation of predictions from higher- to lower-order regions and subsequent feedback of prediction errors from lower- to higher-order brain areas. Predictive coding models hypothesise that prediction errors are weighted by their precision, which ties into the notion of attention tuning. In this symposium, we will present a series of studies that support these ideas. Kok will show that attention can reverse the reduction of prediction errors that is observed in fMRI data when sensory inputs are predicted. Chennu will present results from intracranial and ERP recordings that demonstrate how attention can differentially modulate responses typically associated with probabilistic inference such as mismatch negativity (MMN), P300, and contingent negative variation (CNV). Garrido will show model-based connectivity evidence for a rightward attentional bias to unexpected events. Finally, Langdon will discuss the mechanisms by which attention modulates reward-based learning in a neural circuit model.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S20 001: On The Role Of Expectation In Visual Perception: A Top-Down View Of Early Visual Cortex

Peter Kok, Donders Institute for Brain, Cognition and Behaviour, Netherlands

Perception is not solely determined by the light that hits our eyes. Instead, what we perceive is strongly influenced by our prior knowledge of the world. I will discuss several ways in which prior expectations influence sensory processing. Using fMRI in conjunction with multivariate techniques, I will show that valid prior expectations concurrently enhance stimulus representations and reduce stimulus-evoked activity in V1. This suppression of neural activity by expectation seems at odds with the enhancing effect reported in Posner paradigms, where expectation is used to manipulate attention. However, this seeming contradiction can be resolved by recent predictive coding models wherein attention and expectation interact. Here, I will provide empirical evidence that supports such a view. Predictions do not only pertain to what is likely to happen in the near future, but may also occur across different layers of the visual cortex hierarchy. For example, in the famous Kanizsa triangle, higher-order visual areas may detect an (illusory) shape and send predictive feedback to those neurons in lower order visual areas that are expected to detect the lower level features that make up the shape. According to predictive coding theories, the effects of such feedback should depend on whether or not it is met by congruent bottom-up input. In line with this, using fMRI in conjunction with a novel retinotopic reconstruction method, we find evidence for enhanced activity of neurons whose receptive fields lie on the illusory shape, while the response to the local elements inducing the shape is suppressed.

Biography

Peter Kok is a post-doctoral researcher in the Prediction and Attention lab of Dr. Floris de Lange. The lab is part of the Donders Insitute for Brain, Cognition, and Behaviour, at the Radboud University Nijmegen, The Netherlands. Peter Kok's primary research interest lies in the effects of expectation on visual perception. According to theories of perceptual inference, expectation can affect how well we see something, and even what we see. Using sophisticated fMRI analyses (retinotopic mapping, multivoxel pattern analysis, DCM) Peter Kok studies how expectation modulates neural processing in sensory cortex.

S20 002: Expectation And Attention In Hierarchical Auditory Prediction

Srivas Chennu, University of Cambridge, UK

Recent neuroscientific advances have generated new theoretical understanding about the intuitive notion that the human brain is an adaptive prediction engine. There is a growing consensus that this engine is realised by a hierarchy of successively complex neural processes that feedforward prediction errors and feedback predictions to maintain a constantly updated model of the world. We investigate the empirical support for this broad conceptualisation, focusing on expectation and attention in hierarchical prediction. Drawing upon data from high-density E/MEG and intracranial recordings, our findings support an integrative interpretation of commonly observed electrophysiological signatures of neurodynamics, including the Mismatch Negativity (MMN), P300 and Contingent Negative Variation (CNV), as manifestations along successive levels of predictive complexity. Early first-level processing, indexed by the MMN, is sensitive to stimulus predictability: here, attentional precision enhances early responses, but expectation diminishes it. In contrast, later second-level processing, indexed by the P300, is contingent on attentional engagement, and in fact sharpened by top-down expectation. At the highest level, the CNV, a frontally centered negative EEG drift, is a fine-grained marker of expectation itself. Source reconstruction and formal modelling of the MMN and P300, backed by intracranial data, implicates temporofrontal regions differentially active at early and late levels. The CNV's cortical generators suggest that it facilitates the consolidation of context-salient stimuli into consciousness. These results provide convergent empirical support to promising recent accounts of predictive coding, and tie into the notion of attention as the cognitive manifestation of the precision of prediction.

Biography

Srivas Chennu is a post-doctoral scientist at the University of Cambridge. He received a PhD in Computer Science from the University of Kent, with a specialisation in computational and cognitive neuroscience. His current research focuses on the use of E/MEG for improving our understanding of altered states of consciousness, including the vegetative and minimally conscious states, sleep and sedation. This research, funded by the James S. McDonnell foundation and the Medical Research Council, aims to advance the scientific study of consciousness, inform diagnosis and prognosis for patients, and further the development of Brain-Computer Interfaces that might benefit some of them.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S20: The Interplay Of Attention And Prediction In The Human Brain cont'd

S20 003: Effective Connectivity Reveals Right-Hemisphere Dominance In Audiospatial Perception: Implications For Models Of Spatial Neglect

Marta I. Garrido, The University of Queensland, Australia

Detecting the location of salient sounds in the environment rests on the brain's ability to use differences in sound properties arriving at both ears. Functional neuroimaging studies in humans indicate that the left and right auditory spaces are coded asymmetrically - with a rightward attentional bias that reflects spatial attention in vision. Neuropsychological observations in patients with spatial neglect have led to the formulation of two competing models: the orientation bias and right-hemisphere dominance models. The orientation bias model posits a symmetrical mapping between one side of the sensory space and the contralateral hemisphere, with mutual inhibition of the ipsilateral hemisphere. The right-hemisphere dominance model introduces a functional asymmetry in the representation of space. According to this model, the left hemisphere represents the right side of space, whereas the right hemisphere represents both sides of the sensorium. We used dynamic causal modelling of effective brain connectivity and Bayesian model comparison to adjudicate between these alternative architectures – based on human electroencephalographic data acquired during an auditory location oddball paradigm. Our results support a hemispheric asymmetry in a fronto-parietal network that conforms to the right-hemisphere dominance model. This finding supports the disconnection hypothesis of unilateral neglect and has implications for theories of its aetiology.

Biography

Dr Marta Garrido is a research fellow at the Queensland Brain Institute. Her current work involves magneto- and electro-encephalographic methods to understand how humans make predictions about an uncertain environment. Before moving to the University of Queensland, Dr Garrido did her postdoctoral work at the Wellcome Trust Centre for Neuroimaging in London, and at the University of California Los Angeles. Dr. Garrido trained in Physics Engineering at the Technical University of Lisbon, and holds a PhD in Neuroscience from University College London, where she used computational models to study connectivity in the human brain.

S20 004: Attention For Learning: The Striatal Cholinergic System In Reward-Based Learning

Angela J. Langdon, Princeton University, USA

Humans routinely operate in complex, multi-stimulus environments in which it would behoove them to selectively attend to and learn about only those stimuli that are consistently predictive of rewards. It is by now well established that the dopaminergic inputs to the striatum signal errors in the prediction of reward, and as such are critical for learning mappings between stimuli and rewards. However, how does the striatum know which of the stimuli to be learning about in the first place? That is, how would the striatum focus its 'attention' on those stimuli that are relevant to the task at hand? Based on data ranging from physiology to behavior, we suggest that the striatal cholinergic system—a locally controlled system that is distinct from cholinergic pathways that innervate the cortex—mediates the striatal focus of attention during reward-based learning. We introduce a neural circuit model of the interaction of cholinergic and dopaminergic signals in the striatum, in order to study the cholinergic system as an attentional filter that modulates learning based on dopaminergic prediction errors. This work expands our understanding of the neural implementation of reward-based learning in the brain and provides a window on the interaction between attention and goal-directed behaviour in complex real-world scenarios.

Biography

Dr Angela Langdon is a postdoctoral research associate at the Princeton Neuroscience Institute and Department of Psychology at Princeton University. Her current research is focused on modelling the cholinergic system in the striatum in order to understand its functional role in modulating neural activity and behaviour during reward-based learning. She was awarded her Ph.D. from the University of New South Wales, in which she combined experimental and theoretical approaches to study neuronal population dynamics in the somatosensory system during tactile processing.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S21: Cognitive Modeling And Cognitive Neuroscience: A Symbiotic Relationship

Birte Forstmann, University of Amsterdam, Netherlands
Alexander Provost, University of Newcastle, Australia
Matthias Mittner, University of Amsterdam, Netherlands
Chair & Speaker: **Renate Thienel**, University of Newcastle, Australia

Overview

Cognitive modeling and cognitive neuroscience have traditionally been regarded as separate fields of study. Cognitive modelers infer underlying cognitive processes based on observable behavioral outcomes, while cognitive neuroscientists examine cognitive processes using neuroimaging measures. The emerging field of model-based neuroscience uses formal cognitive modeling to isolate specific cognitive processes and relate these to brain measurements to develop more fine-grained models of cognition. This approach allows for a reciprocal relationship between the fields of cognitive modeling and cognitive neuroscience that can both enhance our ability to make precise interpretations of patterns of brain activity, and also inform and constrain formal cognitive models based on brain measurements. This symposium highlights examples of the ways in which cognitive modeling and cognitive neuroscience can interact to address a broad range of questions. Birte Forstmann uses cognitive modeling to determine the necessity of basal ganglia structures in regulation of the speed-accuracy tradeoff. Alexander Provost describes a study in which neuroimaging and behavioral data are simultaneously modeled to examine spatial skill acquisition. Matthias Mittner presents a novel way of determining the specific cognitive processes that differentiate task-related from task-unrelated thoughts. Renate Thienel explores the association between networks supporting adjustments in response caution and adaptive functioning outcomes.

S21 001: Focal Striatum Lesions Impair Decision Threshold Adjustment In Humans

Birte Forstmann, University of Amsterdam, Netherlands

Birte U. Forstmann, Richard B. Ivry, Scott D. Brown, Roshan Cools & Jasper Winkel

Flexible adjustment of the Speed-Accuracy Tradeoff in decision making is known to activate the dorsal striatum and pre-supplementary motor cortex. However, the causal contribution of these regions to decision making behavior is currently unknown. In this experiment, we compare behavior on a Speed-Accuracy Tradeoff (SAT) task between a group of patients with a focal ischemic lesion in the dorsal striatum, and healthy matched controls. Using the Linear Ballistic Accumulator model, we analyze differences in the decision threshold parameter, which regulates fast versus accurate decision making. We show that a striatal lesion reduces the adjustment of the decision threshold between fast and accurate trials. Therefore, we conclude that the striatum is necessary to flexibly adjust the decision threshold to meet speed or accuracy demands.

Biography

Professor Birte Forstmann is Professor of Cognitive Neurosciences at the Cognitive Science Centre, University of Amsterdam, and tenured research fellow of the European Research Council. She completed her PhD in 2006 at the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig, Germany. Professor Forstmann's general research goal is to understand the brain mechanisms that allow people to adapt quickly to changes in their environment. Her work is motivated by a single strong conviction that behavioral data and brain measurements need to make contact with psychological theory via concrete mathematical models of latent cognitive processes, and combines mathematical modeling with functional magnetic resonance imaging (fMRI), diffusion tensor imaging (DTI), ultra-high resolution 7T MRI, and electroencephalography (EEG).

S21 002: Simultaneously Modeling The Cognitive And Neural Mechanisms Involving Different Types Of Expertise In Mental Rotation

Alexander Provost, University of Newcastle, Australia

Alexander Provost, Brandon Turner, Marieke van Vugt, Blake Johnson and Andrew Heathcote

In a recent study (Provost, Johnson, Karayanidis, Brown & Heathcote, 2013) we found marked improvements in mental rotation (MR) performance with practice in both a small and a large stimulus set. Converging evidence from behavior – mean response time (RT) – and event-related potentials (ERPs), supported different routes to expertise: direct retrieval of solutions from memory with the small set and algorithmic improvement (enhanced rotation speed) in the large set. Here we develop cognitive models for both small set performance, using a standard LBA (Brown & Heathcote, 2008), and for large set performance, by convolving an LBA with a stochastic rotation algorithm model. Using newly developed simultaneous modeling techniques (Turner et al., 2013) we combined choice accuracy and RT distribution data with spectral analyses of EEG and MEG epochs, combined with ERPs and event-related fields (ERFs), to fit these models. We discuss the implications of our results for understanding the cognitive and neural mechanism underpinning different types of expertise in spatial skill.

Biography

Alex Provost is an PHD student, under the supervision of Prof. Andrew Heathcote, Assoc Prof. Frini Karayanidis and Assoc Prof. Blake Johnson. He is first author of a recent publication in Cognitive Neuroscience investigating expertise in Mental Rotation. Alex has been published in Psychophysiology, International Journal of Psychophysiology, Neuropsychologia, Journal of Neurophysiology and Cognitive, Affective and Behavioral Neuroscience. His interests are spatial cognition, learning and signal processing.

S21 003: Analyzing The Multimodal Signature Of Task-Unrelated Thoughts

Matthias Mittner, University of Amsterdam, Netherlands

Matthias Mittner, Wouter Boekel, Adrienne M. Tucker, Andrew Heathcote and Birte U. Forstmann

Frequently, humans engage in task-unrelated processing, even under conditions of sustained attention (Smallwood, 2013). Estimates for the frequency of mind-wandering range from 40 to 50% of our waking time (Killingsworth & Gilbert, 2010). Obviously, such a high proportion of episodes of off-task cognition (task-unrelated thoughts, TUTs) poses a significant threat to the interpretation of many studies investigating cognitive functions. We acquire neuroimaging, pupil-diameter, and behavioural data in a Stop-Signal task (e.g., Forstmann et al., 2012) in which we randomly intersperse "thought-probes" (introspective questions about the content of the subject's current thoughts). In a machine-learning setup, we train a support-vector machine (SVM) on single-trial features derived from neuroimaging data and recordings of the pupil-diameter to predict subjects response to the thought-probes.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S21: Cognitive Modeling And Cognitive Neuroscience: A Symbiotic Relationship cont'd

A cross-validation procedure achieves a cross-subject classification performance of 75% using only brain-data and pupil-diameter as inputs. Based on predictions derived from this classifier regarding the state of mind during the remaining trials, we are able to apply the Stop-Signal Linear Ballistic Accumulator (SS-LBA; Forstmann et al., submitted) to the reaction time (RT) and accuracy data. Since this model can dissociate the RT distribution into underlying cognitive processes, we can derive conclusions about how processing differs in on-task vs. TUT-dominated trials.

Biography

Matthias Mittner (born Ihrke) is currently a Post-Doc at the Cognitive Science Centre Amsterdam in the group of Birte Forstmann. He received his PhD from the University of Frankfurt, Frankfurt, Germany, in 2011 and worked as a Post-Doc in the Max-Planck-Institute of Experimental Medicine, Goettingen, Germany. His current research interests are at the interface of cognitive modeling and neuroimaging research in bringing together data from different modalities in a modeling framework to investigate cognitive phenomena.

S21 004: Age-Related Changes In White Matter Pathways Underlying Response Threshold Adjustment

Renate Thienel, University of Newcastle, Australia

Flexibly adapting to changes in our everyday environment relies on the ability to balance fast and accurate decision-making. Evidence accumulation models of decision-making suggest that this trade-off is accomplished through the adjustment of response caution. Cortico-basal ganglia networks have been shown to underlie the ability to strategically adjust response caution on a trial-by-trial basis in both two-choice decision making tasks and in cued-trials task switching (Forstmann et al., 2008; Mansfield et al., 2011). These networks are also associated with intrinsic tendencies to take an overall more risky or more cautious approach to responding (Mansfield et al., in revision). We extend on this research, examining whether changes in these networks with age can explain the development of more adaptive decision-making strategies from adolescence to adulthood. We used diffusion-weighted imaging (DWI) to examine structural development in neural networks associated with response threshold adjustment in cued-trials task switching. Further, we examined whether the relationship between white matter integrity and threshold adjustment could be linked with the development of individuals ability to make adaptive behavioral, social and emotional adjustments to the challenges of everyday life. This represents the first attempt to relate structural integrity in networks supporting a specific cognitive process with adaptive functioning outcomes.

Biography

Dr Renate Thienel is an early to mid - career researcher and is a postdoctoral research fellow at the University of Newcastle. Her research focuses on studying event related potentials, functional magnetic resonance imaging, magnetic resonance spectroscopy, and diffusion tensor imaging. Renate is involved in neuroimaging research projects into cognitive control and brain maturation, schizophrenia, the prediction of transition to psychosis, and the shared biological basis of schizophrenia, and a genetically high risk population (22q11DS). Her strong translational approach also includes the creation of a normative database of electroencephalographically recorded sensory auditory memory function in children and adolescents with great potential as a tool for the detection of "at-risk mental state".

S22: Cognition And Connectomics

Co-Chair: **Alex Fornito**, Monash University, Australia
Co-Chair: **Michael Breakspear**, QIMR Berghofer, Australia
Luca Cocchi, Queensland Brain Institute, Australia
Andrew Zalesky, University of Melbourne, Melbourne, Australia.
Olaf Sporns, Indiana University, USA
Michael W Cole, Rutgers University, USA

Overview

Attempts to comprehensively map the constituent neural elements and interconnections of the brain—the so-called connectome—have spurred rapid advances in neuroimaging, with a plethora of methods now available for characterizing the macro-scale connectivity architecture of the entire cerebrum in unprecedented detail. These developments have caused a paradigm shift in cognitive neuroscience, with a major emphasis now being placed on understanding how cognition emerges from the functional integration of spatially distributed, functionally specialized neural systems. Traditionally, the bulk of imaging research into brain connectivity has focused on measurement of structural connectivity or functional interactions during task-free, so-called "resting-states", although recent studies have begun to apply the tools of network science to map stimulus-evoked changes in brain functional network organization in order to understand the network determinants of cognitive processes. This symposium will provide an up-to-date introduction and overview of this field by examining basic concepts and techniques, their application to cognitive neuroscience experiments, and fundamental questions such as how brain function is constrained by network structure.

S22 001: Transitory Networks Supporting Cognitive Control

Luca Cocchi, Queensland Brain Institute, Australia

The human brain is characterized by a remarkable ability to adapt its information processing based on current goals. This ability, which is encompassed by the psychological construct of cognitive control, involves activity throughout large-scale, specialized brain systems that support segregated functions at rest and during active task performance. Based on recent empirical findings, I will present a new account in which domain-general cognitive control functions rely on transitory changes in the patterns of integration and segregation between brain networks. Specifically, I will discuss how results from studies adopting cutting-edge analysis techniques allowing the characterization of task-based network interactions challenge current models of control functions that assume segregated or antagonistic activity of specialized brain networks. Finally, I will argue that the study of transitory task-based interplays between brain networks may be critical to understand the remarkable flexibility of normal control functions in health and its alterations in pathological conditions.

Biography

Dr Cocchi was awarded a PhD in neuroscience at the University of Lausanne and Geneva (Switzerland) in 2007 and is currently a postdoctoral fellow at the Queensland Brain Institute (The University of Queensland, Australia). Dr Cocchi's current studies use new tools from systems neuroscience to characterize large-scale brain network interactions supporting cognition in health and disease.

S22 002: Connectomic Methods For Functional Imaging

Andrew Zalesky, University of Melbourne, Melbourne, Australia.

Connectomics is a technically challenging field, rapidly advancing and often perceived as inaccessible for these reasons. In this talk, I will present recent advances in mapping the human connectome using functional MR imaging techniques, with an emphasis on demonstrating how these advances can be used to understand the neural basis of human cognition. I will debunk some fallacies about the connectome, flag limitations and discuss future challenges in the field. Foremost, I will briefly introduce the key methods for mapping functional properties of the human connectome using functional MR data. I will specifically focus on approaches for identifying changes in brain connectivity that can be attributed to changing psychological contexts. I will then discuss methods for dealing with the associated multiple comparisons problem. Finally, I will present several applications where these techniques have been used to understand the dynamic nature of brain connectivity in human cognition.

Biography

Andrew Zalesky is an honorary research fellow at the Melbourne Neuropsychiatry Centre (MNC) at the University of Melbourne, Australia. He currently holds the NHMRC Career Development Award. Previously he served as the inaugural Melbourne Neuroscience Institute Fellow (2012) and an ARC International Fellow. Dr Zalesky has developed internationally recognized methods for analyzing brain imaging data. These imaging methods have been applied to yield some of the first evidence of disrupted brain connectivity in schizophrenia and other psychiatric populations. His recent work identifying disrupted brain circuits in cannabis users received extensive media interest. He has published more than 60 peer-reviewed articles.

S22 003: How Brain Structure Constrains Brain Function

Olaf Sporns, Indiana University, USA

Numerous studies have shown that dynamic fluctuations of neural signals in the resting brain generate patterns of functional connectivity that exhibit characteristic topography and spatial patterns. When recorded over long time periods, for example with resting-state fMRI, these patterns of functional connectivity provide important information about the functional organization of intrinsic or resting-state networks. Resting-state networks are thought to be important components of the brain's functional architecture, and they have been shown to be differentially engaged in different tasks and modes of cognitive function and to exhibit significant variations across healthy individuals and across disease states. Hence, the generative mechanisms that shape functional connectivity patterns, including the topography of resting-state networks, are of great interest. In my talk I will survey empirical data that suggests an important role for structural brain networks (the connectome) in shaping and constraining endogenous and task-evoked neural dynamics. I will also provide examples of modeling approaches that further illuminate structure-function relations in the brain. These approaches include computational models of large-scale dynamic brain activity as well as analytic approaches for predicting functional connectivity based on measures of network communication.

Biography

Professor Olaf Sporns is Provost Professor and Director of the Computational and Cognitive Neuroscience Group in the Department of Psychological and Brain Sciences, Indiana University, USA. He has been awarded Junior Faculty and Distinguished Faculty Awards from Indiana University's College of Arts and Sciences, and was recently awarded a John Simon Guggenheim Memorial Fellowship. Professor Sporns' research area is theoretical and computational neuroscience, with an emphasis on complex systems, brain connectivity, and neurorobotics. Over his career, Professor Sporns has authored 150 peer-reviewed publications as well as the recent books Networks of the Brain and Discovering the Human Connectome, both published by MIT Press.

S22 004: Multi-Task Functional Connectivity And Flexible Hubs

Michael W Cole, Rutgers University, USA

Brain networks are shaped by evolution and experience for the ultimate purpose of implementing cognitive functions. Resting-state functional connectivity (FC) has become a popular approach for characterizing brain networks, yet cognitive mechanisms cannot be directly inferred from information provided by resting-state FC. A recently developed approach – multi-task FC – provides a bridge between brain network dynamics and cognitive functions by identifying dynamic network properties that generalize across many task contexts. Multi-task FC involves graph theoretical characterization of changes in functional connectivity across dozens (e.g., 64) of task states. This new approach was used to test for the existence of 'flexible hubs' – brain regions with extensive brain-wide functional connectivity that updates depending on the task context. Flexible hubs were identified in the fronto-parietal control network, suggesting that flexible hubs facilitate flexible control of cognition via updating of brain-wide functional connectivity patterns. Further, the identified flexible hubs were highly active and updated their functional connectivity patterns during novel tasks, suggesting a mechanism for rapid instructed task learning in humans. These results provide insight into the role of highly dynamic network properties in facilitating highly dynamic cognition, with the potential for further insights to be gained by applying multi-task FC to other dynamic network properties and their relationship with other cognitive functions.

Biography

Michael's research focuses on discovering the cognitive and neural mechanisms that make human behavior flexible and intelligent. This is accomplished primarily by characterizing functional brain connectivity using functional MRI and magnetoencephalography. Michael received his Ph.D. in neuroscience from the University of Pittsburgh, and received post-doctoral training at Washington University in St. Louis. He began as an assistant professor at Rutgers-Newark University in January.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S23: Formal Theories Of Dorsal Anterior Cingulate Cortex Function

William H. Alexander, Gent University, Belgium
Mehdi Khamassi, CNRS Paris, France
Amitai Shenhav, Princeton University, USA
Chair & Speaker: **Clay Holroyd**, University of Victoria, Canada

Overview

Dorsal anterior cingulate cortex (dACC) is one of the most studied neural systems in cognitive neuroscience yet an understanding of its specific function remains elusive. Evidence from multiple experimental methodologies militates against the development of a unifying theory, implicating dACC in roles as various as conflict monitoring, motivation of effortful behaviors, task maintenance, error prediction, and more. In this symposium we will discuss recent computational modeling efforts to elucidate dACC function. Presentations will reflect a range of approaches including neurobiologically-inspired models that account for detailed neurophysiological data, and more abstract or normative models that focus on explaining functional neuroimaging data and on behavioral impairments following brain damage. The theories propose a variety of different functions for dACC – meta-learning (Khamassi), predicting the outcomes of actions and signaling discrepancies between observed and predicted events (Alexander), evaluation and specification of appropriate control (Shenhav), and hierarchical control over effortful behavior (Holroyd) – but share in common a central role for dACC in the adaptive regulation of behavior. Together these efforts hold out the promise of reconciling the divergent views of dACC function within a unifying theoretical framework.

S23 001: E Cingulus Pluram: Multiple Computational Roles Of Anterior Cingulate Activity

William H. Alexander, Gent University, Belgium

Recent computational models of anterior cingulate cortex (ACC) have characterized the region as being involved in predicting the likely consequences of actions, and signaling surprising deviations from predicted outcomes. While these models are able to comprehensively account for activity observed within ACC from EEG, fMRI, and single-unit neurophysiology studies, it remains an open question what function the signal ultimately serves in regions of the brain receiving projections from ACC. Suggested roles for the ACC signal include behavioral inhibition and adjustment, attention shifting, selecting and maintaining options, modulation of associative learning rates, and several others. In this talk I describe current modeling work, building on the predicted response-outcome (PRO) model (Alexander & Brown, 2011), that investigates the role of the ACC signal from the perspective of hierarchical model-based reinforcement learning. First, in a generalization of the PRO model, we find that ACC activity reflects predictions of future states, as opposed to outcomes specifically, and signals surprising state transitions, suggesting that ACC activity may act as a model-based learning signal. In a second extension of the PRO model, we propose how ACC may interact with hierarchically-organized regions in lateral prefrontal cortex to train distributed representations of task-related error, and to select items to be maintained in working memory.

Biography

Will Alexander is a research fellow at Universiteit Gent. His work investigates the neural bases of cognitive control and decision-making using a combination of computational modeling and fMRI. He received his degree in cognitive psychology and cognitive science at Indiana University, Bloomington, and completed a postdoctoral fellowship in the lab of Joshua Brown. His work is currently funded by the FWO-Flanders through a 5-year Odysseus II award.

S23 002: Dorsal Anterior Cingulate Cortex And The Adaptive Regulation Of Reinforcement Learning Parameters: Neurophysiology, Model And Robotic Implementation

Mehdi Khamassi, CNRS Paris, France

To explain the high level of flexibility of decision making in primates, theoretical models usually invoke reinforcement-based mechanisms, performance monitoring functions, and core neural features within frontal cortical regions. However, the underlying biological mechanisms remain to be specified. In recent models, the regulation of exploration is based on meta-learning principles where exploratory actions are driven by varying a meta-parameter, the inverse temperature, regulating the contrast between competing action probabilities. Here we investigate how complementary processes between dorsal anterior cingulate cortex (dACC) and lateral prefrontal cortex (LPFC) implement decision regulation during exploratory and exploitative behaviors. Model-based analyses of unit activity recorded in these two areas in monkeys first revealed that adaptation of the decision function is reflected in a covariation between LPFC neural activity and the exploration level measured from the animal's behavior. Second, together with action values, ACC more prominently encoded a reflection of outcome history useful for regulating exploratory and exploitative decisions. Overall the data support a role of ACC in integrating reinforcement-based information to regulate decision functions in LPFC. We then deployed the model in a robot to test its ability to reproduce monkey behavioral performance in the real-world. A last experiment extends this to a human–robot interaction scenario where unexpected uncertainties are introduced by the human through cued task changes or by cheating. The robot could autonomously learn to reset exploration in response to such uncertain cues and events. The combined results provide concrete evidence specifying how prefrontal cortical subregions may cooperate to regulate decision making.

Biography

After graduating from a French engineering school in 2003, Dr. Khamassi obtained a PhD in Cognitive Neuroscience from Université Pierre and Marie Curie in 2007. He spent a short period at Kenji Doya's lab at Okinawa Institute of Science and Technology, Japan. Then he pursued a postdoctoral work at INSERM in Lyon, where his work was at the interface between Emmanuel Procyk's neurophysiology team and Peter F. Dominey's modelling and robotics team. He is currently a tenured research scientist at the Centre National de la Recherche Scientifique in Paris, working on computational neuroscience models of behavioral adaptation.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S23 003: Anterior Cingulate Cortex And The Expected Value Of Control

Amitai Shenhav, Princeton University, USA

The dorsal anterior cingulate cortex (dACC) has been a near-ubiquitous presence in the neuroscience of cognitive control, and yet the functions it subserves are still under debate. Particularly common in this literature has been the finding that dACC tracks the strength of cognitive control required of a task based on current task demands (e.g., conflict), and influences how control is deployed. More recent work has extended these earlier findings to show that dACC also tracks the experienced cost associated with exerting cognitive effort, suggesting an additional role for this region in estimating not only how much control is necessary, but how much is worth exerting (given available incentives). It therefore remains an open question to what degree the dACC is responsible for the evaluation of both control strength and control costs, and the regulation of control itself, and how these functions relate to what is known about the dACC's role in tracking reward, punishment, and violations of expectation in the domain of motor actions. Building on previous models of cognitive control and action valuation, we offer a normative model of cognitive control that considers how both the type and strength of control is determined based on available payoffs and costs (including the cost of exerting control), similarly to how these calculations might be made when choosing motor actions. Within this framework, we suggest that a central function of the dACC is to determine and specify the optimal type and strength of cognitive control to engage at any given time.

Biography

Amitai Shenhav received his B.A. from UC Berkeley and his Ph.D. from Harvard University, and is currently a postdoctoral fellow at Princeton University, working primarily in the labs of Matt Botvinick and Jonathan Cohen. He studies the influence of automatic processes – including affective reactions and choice heuristics – on value-based decision-making. He explores the computational mechanisms and neural substrates underlying such decision-making in contexts ranging from relatively simple (e.g., object/product preference) to more complex (e.g., moral judgments). He currently focuses on how response automaticity considerations are integrated into decisions regarding the type and amount of cognitive control to engage.

S23 004: Hierarchical Control Over Effortful Behavior By Dorsal Anterior Cingulate Cortex

Clay Holroyd, University of Victoria, Canada

Dorsal anterior cingulate cortex (dACC) and adjacent areas in medial frontal cortex are highly studied but poorly understood. Although current theories emphasize a critical role for dACC in cognitive control and decision making, none adequately explain the most salient consequence of dACC damage: decreased action production despite normal motor ability. Here we propose that dACC is a component of a multi-level hierarchy of brain areas involved in action selection. According to the theory, dACC integrates rewards across trials to learn the value of tasks, selects tasks for execution based on their learned values, and then allocates the level of control necessary for successful task performance by applying top-down control over a striatal mechanism for action selection. Because the deployment of control is assumed to deplete a conserved resource, dACC relaxes regulatory control over the striatum when events unfold smoothly and boosts control when they do not. Computational simulations of rodent behavior in several key maze tasks implicate caudal and rostral areas of midline prefrontal cortex in regulating physical effort and cognitive switch costs, respectively. This proposal accounts for the behavioral sequelae of dACC damage (impoverished action selection in the presence of normal motor ability), unifies many of the cognitive functions attributed to dACC (reward processing, decision making, and cognitive control), and provides a solution to an outstanding question in cognitive control research (how the control system determines and motivates what tasks to perform).

Biography

Clay Holroyd is a Professor of Psychology and a Canada Research Chair in Cognitive Neuroscience at the University of Victoria, Canada. He received a B.A. in physics and creative writing from the University of California, Santa Cruz (1991) and a PhD in neuroscience from the University of Illinois at Urbana-Champaign (2001). He subsequently worked for more than 3 years as a post-doctoral fellow in the laboratory of Jonathan Cohen at Princeton University. His research interests center on the role of anterior cingulate cortex in cognitive control, reward processing and decision making.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

S24: Prediction In Perception

Co-Chair & Speaker: Robert P. O'Shea, Southern Cross University, Australia
Bradley N. Jack, Southern Cross University, Australia
Co-Chair & Speaker: Juanita Todd, University of Newcastle, Australia
Peter Keller, University of Western Sydney, Australia

Overview

Do we make predictions from current sensory information about future sensory input? If so, what form to these predictions take? What are the brain mechanisms involved? Evidence that we do make predictions comes from wrong predictions: performance is reduced. There is a pattern of brain activity that is automatically recruited by prediction errors. What is not agreed is the form the predictions take—whether they simply involve down-regulation of the mechanisms, including memory mechanisms, encoding the current sensory input or whether there is an active process of constructing predicted inputs. The speakers will address these issues in audition and in vision. In both modalities regularities embedded in stimulus sequences are exploited to set up predictions about the what and the when of the forthcoming stimulus.

S24 001: We Make Predictions About Eye Of Origin Of Visual Input: Visual Mismatch Negativity From Binocular Rivalry

Robert P. O'Shea, Southern Cross University, Australia

The visual mismatch negativity (vMMN) is a negative deflection in an event-related potential (ERP) between 200 and 400 ms after onset of an unpredictable stimulus in a sequence of predictable stimuli. Binocular rivalry occurs when one image is presented to one eye and a different image is presented to the other. Although the images in the two eyes are unchanging, perception alternates unpredictably between the two images for as long as one cares to look. Binocular rivalry, therefore, provides a useful test of whether the vMMN is produced by low levels of the visual system at which the images are processed, or by higher levels at which perception is mediated. I will review research showing that a vMMN occurs when rival images are swapped between the eyes. This is interesting and important because we cannot tell which eye is viewing which image, showing that we make predictions about visual input of which we are not aware.

Biography

Robert O'Shea obtained his PhD in Psychology from University of Queensland. He had postdoctoral positions at Queen's University at Kingston, Northwestern University, and Dalhousie University before taking a Lectureship at University of Otago. In 2009 he moved to Southern Cross University for the Professorship of Psychology. O'Shea's research has mainly been in the psychophysics of various forms of visual perception, particularly binocular vision, although recently he has turned towards EEG studies of visual consciousness and prediction. He has published 52 papers, 11 book chapters, and 14 editions of various books.

S24 002: Prediction Of Vision From Invisible Stimuli

Bradley N. Jack, Southern Cross University, Australia

The human brain establishes predictive models encoding regularities in sensory input. For example, if we are stopped in a car at a traffic light and the indicator light of the car in front of us is blinking regularly, we form the prediction that it will continue to exist and to blink in the same way. Accordingly, we are not distracted by each blink of the indicator light, and we are able to attend to something else, such as a pedestrian crossing the road. However, when a prediction is violated (e.g., the indicator skips a blink), the predictive model has to be updated. An essential component of predictive models for visual information processing is that predictions are made even when objects are not consciously experienced (proto-objects). I review studies showing that the mismatch negativity (MMN; a well-established brain signature of prediction and prediction-error) can be elicited by prediction-violating stimuli that are invisible from binocular rivalry suppression. The MMN is essentially identical to that when the identical stimulus is visible during episodes of binocular rivalry dominance. This suggests that predictive models for visual information processing are established, tested, and updated similarly for objects (visible) and for proto-objects (invisible).

Biography

Bradley Jack obtained his Bachelor of Psychology (First Class Honours) from Southern Cross University in 2010 and is in the final year of his PhD there. In 2012, he won a German Academic Exchange Service (DAAD) scholarship to travel to the University of Leipzig for three months to conduct an experiment. His research uses event related potentials to investigate conscious and not-conscious processing of visual information. In particular, he is interested in how the brain makes predictions about visual perception. His work is funded by an Australian Postgraduate Award.

S24 003: When Auditory Mismatch Negativity Deviates From Simple Probabilistic Inference

Juanita Todd, University of Newcastle, Australia

When an acoustic sequence contains regularity, as few as 2-3 repetitions are sufficient for the auditory system to extrapolate that patterning within this sequence is likely to continue. If a subsequent sound fails to conform, a prediction-error signal known as mismatch negativity (MMN) is evident in auditory evoked potentials time-locked to the point at which the pattern-deviation occurred. An established assumption in research employing auditory MMN is that the underlying prediction process is reliant upon sensory memory. The strength of a perceptual inference (termed "predictive confidence") is weighted according to the precision in underlying estimates, and this confidence is proportional to amplitude of the MMN generated to a deviating event. This presentation will feature data from a series of studies suggesting that this weighting process may be: (a) subject to bias; and (b) sensitive to accumulation of evidence over periods that extend well beyond sensory memory limitations. The relevance of such observations will be discussed in relation to the potential impact in shaping the theory of how perceptual inferences are formed, modified and updated over time.

SYMPOSIA OVERVIEW
& SPEAKER ABSTRACTS

Biography

Juanita Todd completed a Masters (Clinical)/PhD at the University of Western Australia and is currently employed as a Senior Lecturer in Psychology, University of Newcastle. Dr Todd's research features the use of clinical, psychophysical and neuroimaging techniques to study differences in brain function in persons with schizophrenia. Her particular focus is using auditory sequences to study perceptual inference.

Her most recent contributions to the field include new protocols (developed for use in schizophrenia) that challenge existing theories of the mechanisms that underlie perceptual inference.

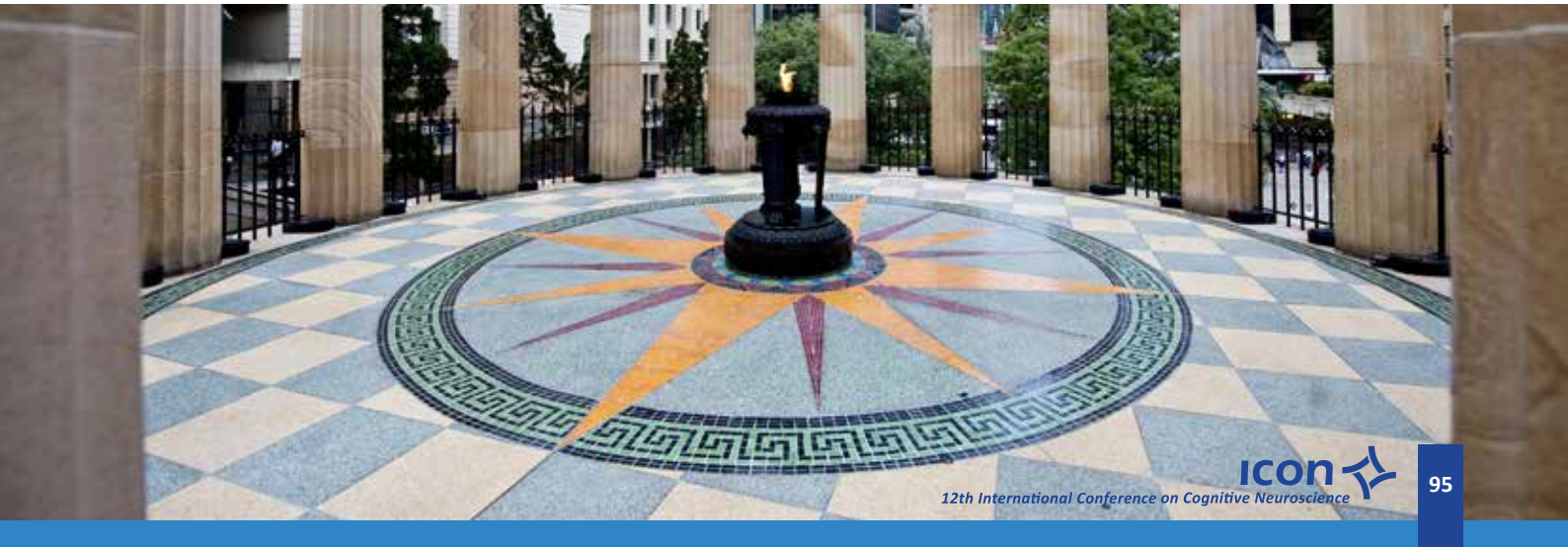
S24 004: Neural Entrainment During Musical Rhythm Perception Is Correlated With Individual Differences In Temporal Prediction During Sensorimotor Synchronization

Peter Keller, University of Western Sydney, Australia

The perception of temporal regularities in auditory rhythms is central to many human activities. In ensemble performance of music and dance, for example, the synchronization of movements and sounds is facilitated by the perception of a periodic beat. Electroencephalographic (EEG) studies measuring steady-state evoked potentials (SSEPs; i.e., peaks at specific frequencies in the EEG power spectrum) provide evidence for neural entrainment to the beat even in rhythms where sounds do not occur on each beat. This suggests that beat-related SSEPs partially reflect endogenous processes that may play a role in predicting the timing of upcoming sounds. The current study tested this hypothesis by examining relations between SSEPs in an auditory beat perception task and individual differences in temporal prediction in a sensorimotor synchronization task. SSEPs were measured in 15 individuals with various levels of musical training as they listened to two auditory rhythm patterns, one syncopated (tone onsets were not present on all beats) and the other unsyncopated (tones were present on all beats). Participants were afterwards asked to tap the beat of the patterns. In a later session, the same individuals completed a finger-tapping task assessing the degree to which they predicted timing variations while synchronizing with tempo-changing auditory sequences. Results indicate that SSEP amplitude at the beat frequency was positively correlated with accuracy at tapping in time with the beat. Furthermore, while beat-related SSEPs were generally weaker for the syncopated than the unsyncopated pattern, the size of this difference was negatively correlated with temporal prediction abilities. These findings suggest that SSEP measures of neural entrainment to the beat reflect a mixture of exogenously and endogenously driven oscillatory processes, and that the endogenous component, in particular, supports temporal predictions that allow individuals to synchronize movements with the beat.

Biography

Peter Keller received degrees in Music and Psychology from the University of New South Wales in Australia. His research is aimed at understanding the behavioural and brain bases of human interaction in musical contexts. Peter has held research positions at Haskins Laboratories (New Haven, USA), the Max Planck Institute for Psychological Research (Munich, Germany), and the Max Planck Institute for Human Cognitive and Brain Sciences (Leipzig, Germany), where he led the Music Cognition and Action group from 2007 until 2012. He is currently an Associate Professor of Cognitive Science in the MARCS Institute at the University of Western Sydney.



ORAL PRESENTATION
ABSTRACTS

OP5: Motor, Social & Emotional Processes

Aina Puce, Indiana University, USA
Tam Ho, Max Planck Institute for Human Cognitive and Brain Sciences, Germany
Simmy Poonian, The University of Queensland, Australia
Giacomo Novembre, The Marcs Institute, University of Western Sydney, Australia

OP5 001: Neural Activity To Viewed Dynamic Gaze Is Affected By Social Decision

Presented by: **Aina Puce**, Indiana University, USA

Puce et al. (2000) reported larger N170s to gaze aversion in a passive viewing task, while Conty et al. (2007) described larger N170s to gaze change toward the subject in a social judgment task. We aimed to reconcile these studies by recording ERPs in two tasks in the same subjects. In a Social Task, subjects judged if a gaze transition moved Away or Toward them. In a Non- social Task, a gaze transition was judged as moving to the Left or Right. Continuous 256 channel EEG was recorded from 22 healthy adults viewing dynamic gaze stimuli in 6 conditions: (1) Direct to Extreme gaze [Dir-Ext] (2) Extreme to Direct gaze [Ext-Dir] (3) Intermediate to Extreme [Int-Ext] (4) Intermediate to Direct gaze [Int-Dir] (5) Direct gaze to Intermediate [Dir-Int] (6) Extreme to Intermediate [Ext-Int] Conditions (1) and (2) were from Puce et al. (2000), whereas (3) and (4) were a subset from Conty et al. (2007). Conditions (5) and (6) were not used previously. N170 peak latencies and amplitudes were calculated from two occipitotemporal 9-electrode clusters. Repeated measures ANOVAs were run for behavior and N170 latency and amplitude. Behavior: Subjects were faster in the non-social task, and more accurate for gaze aversions (non-social task). In the social task, faster RTs occurred for gaze transitions made toward subjects. ERP findings: In the non-social task, N170s were significantly larger for gaze aversions relative to gaze changes toward subjects. In the social task, this difference disappeared in the right hemisphere. The current study reconciled differences of two earlier studies. The brain's response to a gaze change depends on the decision being made. When not in a 'social' mode, the brain selectively responds (with a larger N170) to another's averted gaze. Operating in 'social' mode leads to larger N170s to gaze transitions toward the subject, suggesting that social context increases salience of direct gaze consistent with our behavioral data.

OP5 002: Re-Assesssing The Pre-Attentive Nature Of Integrating Emotional Faces And Voices: An Event-Related Potential (ERP) Study

Tam Ho, Max Planck Institute for Human Cognitive and Brain Sciences, Germany

Research on emotional face-voice integration has been predominated by the hypothesis that facial and vocal emotional information interacts pre-attentively. We investigated this hypothesis using event-related potentials (ERP). Twenty-nine participants (15 female, 20–35 years old) were presented with congruent and incongruent combinations of angry and neutral facial and vocal expressions in an oddball paradigm. In 2 out of 4 blocks (1 block: angry voice;; 1 block: neutral voice), participants encountered congruent and incongruent combinations as standards (~80%) and deviants (~10%), respectively. Standards and deviants were then switched in the two remaining blocks. Participants were tested in 2 consecutive sessions. In Session 1, they watched the videos passively.

In Session 2, they were instructed to detect and respond when lip movement and voice onset were out of sync (that occurred in ~10% trials). Auditory evoked potentials elicited by deviants were inspected for a mismatch negativity (MMN) – an ERP component associated with pre-attentive deviance detection. Our results indicate that no MMN was elicited in either passive or active condition. Instead, we found effects of emotional face-voice incongruity in the auditory N1 and P2. This suggests that facial and vocal emotional information interacted early. The interaction was most robust in the passive condition when deviant stimuli captured involuntary attention. However, it weakened in the active condition, possibly due to task demand. Therefore, our finding refutes the above hypothesis. It shows that even early interactions of facial and vocal emotional information requires some degree of attention.

ORAL PRESENTATION
ABSTRACTS

OP5 003: Neural Correlates Of The Attribution Of Agency For Self-Made And Others' Actions: The Role Of The Medial Portion Of The Anterior PFC In Attributing Expected Consequences To The Self

Simmy Poonian, The University of Queensland, Australia

An important distinction to make is between the sense of agency we infer over own actions and consequences and those that are caused by other agents'. It is thought that the way in which we attribute causality over actions and effects involves a comparison between the expected and actual consequences of a goal-directed action. If this comparison matches, then consequences are attributed as being self-caused rather than caused by another agent. In particular, the neural correlates involved in the comparator model where actions are attributed to the self over another agent, are still to be fully understood in relation to automatic action-effect processing. In this experiment we examined the neural correlates of the comparator model during a task measuring sense of agency in our own and others' actions. By manipulating the expectation that a specific sensory consequence would occur after an action we compared the BOLD signal between trials where consequences were expected and presented and when they were not expected. It was found that the medial portion of the anterior PFC was more activated when consequences matched the expectation in self-made actions over the actions of others'. We conclude that this area is involved in the attribution that expected consequences are self-made rather than caused by another agent.

OP5 004: Functional Segregation Of Self And Other In Joint Action. A Dual-EEG Study With Piano Duos

Giacomo Novembre, The Marcs Institute, University of Western Sydney, Australia

Real-time joint action requires the brain not only to integrate representations of one's own and other's movements, but also to maintain a level of autonomy between the two (segregation). This capacity for simultaneous integration and segregation was explored in a dual-EEG study in which pairs of pianists played complementary musical phrases under conditions where co- performers were familiar or unfamiliar with each other's part. We observed a suppression of alpha power (8-12 Hz) over centro- posterior scalp regions that varied as a function of interpersonal synchrony at the millisecond timescale. This suppression was: 1) stronger when interpersonal keystroke synchrony was high, 2) particularly when pianists were familiar with each others' parts, and 3) negatively correlated with indices of mutual adaptation and perspective taking (empathy). Thus, alpha suppression might constitute a neuromarker for the functional segregation (rather than integration) of self and other, determining the success of joint performance, cognitive autonomy and leadership.

OP6: Attention

Hannah Filmer, The University of Queensland, Australia
Elexa St. John-Saaltink, Radboud University Nijmegen, Netherlands
Nicholas Myers, University of Oxford, UK
Oscar Jacoby, The University of Queensland, Australia

OP6 001: tDCS Of Prefrontal Cortex Improves Multitasking

Hannah Filmer, The University of Queensland, Australia

Making two decisions simultaneously typically leads to substantial performance impairments. Such impairments are thought to reflect a bottleneck in the mapping of sensory information to motor responses (Pashler, 1984, 1994;; Welford, 1952). Brain imaging studies have implicated the left posterior lateral prefrontal cortex (pLPFC) in response selection processes using single- task, dual-task and training paradigms (Dux et al., 2006, 2009;; Ivanoff et al., 2009). More recently, a study using transcranial direct current stimulation (tDCS) showed that the left posterior lateral prefrontal cortex (pLPFC) is causally involved in single-task response selection (Filmer et al., 2013). As yet, however, there is no causal evidence to implicate the left pLPFC in dual-task performance. Here, we used tDCS to test whether the left pLPFC is causally involved in completing two temporally overlapping tasks. Participants completed three sessions, and received nine minutes of anodal, cathodal, or sham stimulation in each. The behavioural paradigm consisted of two tasks, one auditory and one visual. Participants completed a mixture of single- and dual- task trials, where a sound, or an image, or both were presented. Participants responded to the relevant stimuli as quickly and accurately as possible in each of three sessions: before stimulation, immediately after stimulation, and 20 minutes later. For the single-task trials, both anodal and cathodal stimulation disrupted RTs, in line with the findings of Filmer et al. (2013). For the dual- task trials, however, only cathodal stimulation reduced reaction times immediately following stimulation. This reduction was not found for anodal or sham stimulation. Overall, the results confirm that the left pLPFC is causally involved in the central bottleneck that limits multitasking performance. The findings also suggest that response selection may vary for single- and dual-task responses, indicating a potential dissociation within the left pLPFC.

ORAL PRESENTATION
ABSTRACTS

OP6: Attention cont'd

OP6 002: Task Demands Modulate The Effects Of Perceptual Expectations In Early Visual Cortex

Elexa St. John-Saaltink, Radboud University Nijmegen, Netherlands

Predicted stimuli often lead to a reduced neural response (Summerfield et al., 2008;; Todorovic et al., 2011;; Kok et al., 2012);; however, it is unclear whether this suppressive effect of expectation is automatic (Den Ouden et al., 2009;; Alink et al., 2010), or rather requires attention (Larsson & Smith, 2012). To investigate this, we orthogonally manipulated spatial attention and perceptual expectation. To investigate whether the effects of expectation depend on perceptual and working memory (WM) resources, we included two different types of distracting tasks. We acquired fMRI data in 23 healthy human subjects. On each trial, a grating annulus surrounding a noisy, coloured letter at fixation was presented following a tone. Tones predicted the orientation of the upcoming grating with either 100% or 50% validity. Attention was manipulated per scanner run: participants responded to the spatial-frequency of the gratings (grating task) or performed one of two fixation tasks: a 1-back task on letter (perceptual task) or 2-back task on colour (WM task). The grating-evoked response in early visual cortex was strongest during the grating task, weakest during the perceptual task, and intermediate during the WM task ($F(2,22) = 35.4$, $p < .001$). Task set determined whether predictions led to a suppression or enhancement of grating activity ($F(1,22) = 5.03$, $p = .035$). During the perceptual task, activity was reduced when perceptual expectations about the grating were strong (100% blocks) versus weak (50% blocks). However, during the grating task, activity was increased with strong expectations. There was no effect of expectation during the WM task. Our results suggest that task demands modulate the effect of perceptual expectations on the response. The neural response to predicted stimuli is facilitated when stimuli are task relevant;; suppressed when they compete with task resources (perceptual task); and unaffected when they do not (WM task).

OP6 003: Temporal Expectation Improves Real-Time Decoding of Visual Feature Representations as Measured By Magnetoencephalography

Nicholas Myers, University of Oxford, UK

Temporal expectation is increasingly understood to improve the perceptual analysis of visual stimuli. Rhythms are arguably the most common source of temporal predictions of events. Recent evidence has shown that entrainment of sensory areas to rhythmic stimulus presentation improves perceptual gain of attended stimuli. However, it is unknown how this modulation occurs. One possibility is that temporal expectation improves perception by sharpening the neural representation of visual stimuli. Here, we tested this idea using magnetoencephalography (MEG) in combination with electroencephalography (EEG) and multivariate pattern analysis to see whether decoding accuracy improves when stimuli are presented rhythmically. We measured brain activity via combined MEG-EEG in 10 observers as they performed a visual target detection task. In regular rhythmic blocks, observers saw streams of oriented gratings appearing rhythmically at 1.54 Hz, and responded with a button press every time they saw the target orientation. In irregular rhythmic blocks, stimuli were also presented at an average rate of 1.54 Hz, but individual stimulus onsets were temporally jittered around this average, reducing their temporal predictability. Target orientations could change from block to block. The orientation of each presented grating was decoded from the MEG and EEG data using a multivariate pattern analysis approach that capitalizes on the parametric nature of the orientation feature space via a forward encoding model. Orientations could be decoded robustly in a range between approximately 100 and 400 ms after stimulus onset ($p<10^{-5}$ in regular and irregular blocks). We found that stimulus decoding was significantly higher in regular blocks, compared to irregular blocks, beginning around 200 ms (175-225 ms, $p=0.035$), and lasting between approximately 200 and 400 ms ($p=0.019$). We conclude that rhythmic temporal expectation sharpens the neural representation of task-relevant visual features.

OP6 004: Interactive Effects of Task Set and Working Memory on Attentional Capture

Oscar Jacoby, The University of Queensland, Australia

When we search for objects with particular features, activity in brain networks is biased to preferentially process any objects possessing those features. Maintaining such biases, or attentional sets, may involve similar neural resources to those involved in working memory (WM). If so, taxing WM should reduce top-down influences on attentional capture. We used electroencephalography (EEG) to record brain activity while observers monitored dynamic stimulus streams at the midline for targets defined by a particular feature value (e.g., red), and ignored lateralized distractors. First, we replicated previous evidence for top-down modulation of attentional capture by demonstrating an enhanced N2pc component and slowed target responses when distractors possessed the target feature. We then investigated whether taxing WM reduces the effect of task set on attentional capture. A concurrent n-back task, which requires information to be maintained and manipulated in memory, eliminated the influence of task set by reducing the N2pc associated with task-relevant distractors. By contrast, a concurrent digit rehearsal task, which only requires information maintenance, did not change the effect on task set on the N2pc. Neither WM load manipulation affected the extent to which distractors slowed target responses. These results indicate that some – but not all – WM load manipulations compromise set-related biases associated with visual search for specific object features. The findings support the notion that WM and selective attention compete for common neural resources.

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PROGRAMME SUMMARY

SUNDAY 27 JULY 2014						
2.00pm – 7.30pm	Registration Desk Open					
CONFERENCE OPENING AND PLENARY SESSION – PLAZA AUDITORIUM						
5.30pm – 6.00pm	**OFFICIAL OPENING – Associate Professor Ross Cunnington**, The University of Queensland, Australia					
6.00pm – 7.00pm	**KEYNOTE LECTURE 1 – Professor Jason Mattingley**, The University of Queensland, Australia					
7.00pm – 8.30pm	**Welcome Reception**					

MONDAY 28 JULY 2014						
8.00am	Registration Desk Open					
PLENARY SESSION – PLAZA AUDITORIUM						
9.00am – 10.00am	**KEYNOTE LECTURE 2 – Professor Russell A Poldrack**, University of Texas at Austin, USA					
10.00am – 10.30am	**Morning Tea with Exhibitors**					
CONCURRENT SESSIONS						
10.30am – 12.00pm	**S01 - Frontal-Striatal Interaction In Reward-Guided Decision Making**	**S02 - Multi-Frequency Brain Network Dynamics In Human Memory**	**S03 - Implications Of Age-Related Cerebrovascular Changes On Brain Structure And Function**	**OP1 - Methods Development**		
	Plaza Auditorium	Room P6	Room P7	Room P8		
12.00pm – 1.00pm	**Lunch at Leisure**					
CONCURRENT SESSIONS						
1.00pm – 2.30pm	**S04 - The Role of Brain Oscillations in Perception, Attention, and Memory**	**S05 - Neural Indices Of Primitive Intelligence: From The Midbrain To Cortex**	**S06 - Cross-Modal Integration And Plasticity Of Sensory Systems In The Normal And Peripherally Deprived Brain**	**D01 - Translational Cognitive Neuroscience: Understanding Attention And Multitasking On The Roadway**		
	Plaza Auditorium	Room P6	Room P7	Room P8		
PLENARY SESSION – PLAZA AUDITORIUM						
2.30pm – 3.30pm	**KEYNOTE LECTURE 3 – Professor Michael C. Corballis**, University of Auckland, New Zealand					
3.30pm – 4.00pm	**Afternoon Tea with Exhibitors**					
4.00pm – 6.00pm	**POSTER SESSION 1 –** Rooms P9, 10 & 11 (Combined)					
	ATTENTION	**COGNITION & EXECUTIVE PROCESSES**	**LANGUAGE**	**MEMORY & LEARNING**	**MOTOR BEHAVIOUR**	**SENSATION & PERCEPTION**

TUESDAY 29 JULY 2014						
8.00am	**Registration Desk Open**					
PLENARY SESSION – PLAZA AUDITORIUM						
9.00am – 10.00am	**KEYNOTE LECTURE 4 – Professor Olaf Sporns**, Indiana University, USA					
10.00am – 10.30am	**Morning Tea with Exhibitors**					
CONCURRENT SESSIONS						
10.30am – 12.00pm	**S07 - Understanding High-Level Vision, Attention And Decision Making By Means Of Frequency-Tagging EEG**	**S08 - The Dynamic Brain**	**S09 - New Approaches To The Neural Basis Of Mathematical Cognition**	**OP2 - Cognition, Memory & Learning**		
	Plaza Auditorium	Room P6	Room P7	Room P8		
12.00pm – 1.00pm	**Lunch at Leisure**					
CONCURRENT SESSIONS						
1.00pm – 2.30pm	**S10 - TMS And TDCS As A Tool In Cognitive Neuroscience: How Does Transcranial Stimulation Influence Behavior?**	**S11 - The Menzies Foundation Symposium: A Window Into Normal Cognition: Insights From Synaesthesia**	**S12 - Working Memory 2014: 40 Years On Since Baddeley & Hitch**	**D02 - How Do We Improve Medical Translation? Developing Translational Approaches Towards Exploring Cognitive And Behavioural Endophenotypes In Animal Models Of Disease**		
	Plaza Auditorium	Room P6	Room P7	Room P8		
PLENARY SESSION – PLAZA AUDITORIUM						
2.30pm – 3.30pm	**KEYNOTE LECTURE 5 – Professor Heidi Johansen-Berg**, University of Oxford, UK					
3.30pm – 4.00pm	**Afternoon Tea with Exhibitors**					
4.00pm – 6.00pm	**POSTER SESSION 2 –** Rooms P9, 10 & 11 (Combined)					
	ATTENTION	**COGNITION & EXECUTIVE PROCESSES**	**EMOTIONAL & SOCIAL PROCESSES**	**LANGUAGE**	**METHODS DEVELOPMENT**	**SENSATION & PERCEPTION**
7.00pm – 10.30pm	**CONFERENCE DINNER** Riverlife, Kangaroo Point. Free river transfer departs 6.00pm and 6.40pm from Southbank A Jetty (behind the Wheel of Brisbane).					

PROGRAMME SUMMARY

WEDNESDAY 30 JULY 2014						
PLENARY SESSION – PLAZA AUDITORIUM						
9.00am – 10.00am	**KEYNOTE LECTURE 6 – Professor Stanislas Dehaene**, Collège de France, Paris, France					
10.00am – 10.30am	**Morning Tea with Exhibitors**					
CONCURRENT SESSIONS						
10.30am – 12.00pm	**S13 - Segregation And Integration Of Cortical Laminar Information Streams And Their Role In Attention**	**S14 - Consciousness, Integrated Information And The Free Energy Principle**	**S15 - Task Set Representation And Updating: Aging, Training And Reward Motivation**	**OP3 - Language**		
	Plaza Auditorium	Room P6	Room P7	Room P8		
12.00pm – 1.00pm	**Lunch at Leisure**					
CONCURRENT SESSIONS						
1.00pm – 2.30pm	**S16 - Brain Processes Associated With Cognitive Control**	**S17 - Sensorimotor Foundations Of Understanding And Interacting With Others**	**S18 - Mechanisms Of Cognitive Decline In Normal Aging**	**OP4 - Sensation & Perception**		
	Plaza Auditorium	Room P6	Room P7	Room P8		
2.30pm – 3.00pm	**Afternoon Tea with Exhibitors**					
PLENARY SESSION – PLAZA AUDITORIUM						
3.00pm – 4.00pm	**KEYNOTE LECTURE 7 – Emeritus Professor Pat Michie**, University of Newcastle, Australia					
4.00pm – 6.00pm	**POSTER SESSION 2** – Rooms P9, 10 & 11 (Combined)					
	COGNITION & EXECUTIVE PROCESSES	**EMOTION & SOCIAL PROCESSES**	**MEMORY & LEARNING**	**METHODS DEVELOPMENT**	**MOTOR BEHAVIOUR**	**SENSATION & PERCEPTION**
6.00pm till late	**ICON KICK ON** Dandy's Rooftop, The Fox Hotel, South Brisbane					

THURSDAY 31 JULY 2014				
PLENARY SESSION – PLAZA AUDITORIUM				
9.00am – 10.00am	**KEYNOTE LECTURE 8 – Professor Daniel Wolpert**, University of Cambridge, UK			
10.00am – 10.30am	**Morning Tea with Exhibitors**			
CONCURRENT SESSIONS				
10.30am – 12.00pm	**S19 - ECoG Signatures Of Human Cognition**	**S20 - The Interplay Of Attention And Prediction In The Human Brain**	**S21 - Cognitive Modeling And Cognitive Neuroscience: A Symbiotic Relationship**	**OP5 - Motor, Social & Emotional Processes**
	Plaza Auditorium	Room P6	Room P7	Room P8
12.00pm – 1.00pm	**Lunch at Leisure**			
CONCURRENT SESSIONS				
1.00pm – 2.30pm	**S22 - Cognition And Connectomics**	**S23 - Formal Theories Of Dorsal Anterior Cingulate Cortex Function**	**S24 - Prediction In Perception**	**OP6 - Attention**
	Plaza Auditorium	Room P6	Room P7	Room P8
2.30pm – 3.00pm	**Afternoon Tea with Exhibitors**			
PLENARY SESSION – PLAZA AUDITORIUM				
3.00pm – 3.30pm	**ACNS YOUNG INVESTIGATOR LECTURE – Associate Professor Alex Fornito**, Monash University, Australia			
3.30pm – 4.30pm	**KEYNOTE LECTURE 9 – Professor Birte Forstmann**, University of Amsterdam, Netherlands			
4.30pm – 5.30pm	**CLOSING ADDRESS – Associate Professor Frini Karayanidis, University of Newcastle, Australia**			

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