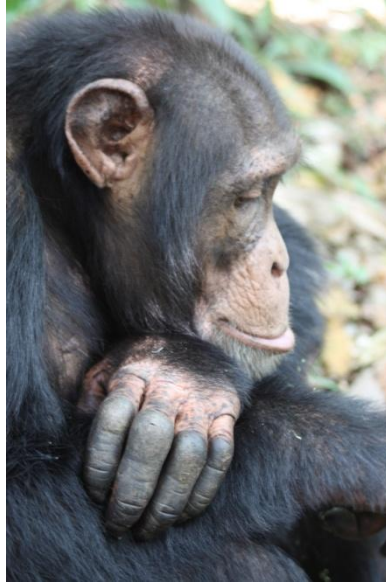




Draft Version, 28 May, 2011

ASSC15
Kyoto

Program and Summary of the ASSC15



The 15th Annual Meeting
of
The Association for the Scientific Study of Consciousness
(June 9-12, 2011, Kyoto)

Sponsored by
the Priamte Research Institute, Kyoto University



Welcome address

Welcome to Kyoto, and welcome to ASSC15. On behalf of the local organizing committee, I would like to express my heartfelt gratitude to all participants for their attendance.

March 11th, 2011 turned to be a very important day for all the people living in Japan. A magnitude 9.0 earthquake hit the Sanriku area, a region along the Pacific coast of northern Japan. It was followed by a huge tsunami, with waves up to 39 m high. Several cities and towns near the coast were completely destroyed and swept away. We found 14,998 dead, and 9,761 are still missing (as of May 12th). In addition, the Fukushima nuclear power plant suffered serious damage. The loss of electricity for cooling the nuclear fuel rods resulted in a meltdown. The radiation problem still continues.

The triple disaster was a serious burden for us. This is the most severe disaster that we have experienced in our lives. We received a lot of e-mails from foreign friends expressing their condolences in connection with the events. The sympathy pouring in from many remote places encouraged us a lot. We understand that security reports based on scientific evidence cannot easily outweigh the psychological evaluation of safety. Even though there are no problems in Kyoto whatsoever, many foreign participants may have paused to reconsider whether to come or not to come. Your families and friends may be anxious about your visit to Japan. Nonetheless, you eventually decided to take the trip, at a time when the country was in trouble. In that sense, your participation itself carries a strong message and is the real encouragement for us.

In Japanese, the word “*kokoro*” covers many concepts, including mind, spirit, heart, emotion, will, consciousness, awareness, feeling, and compassion. In other words, we take a holistic approach to representing the human mind and related matters. All these aspects are highly interconnected and cannot be easily partitioned. The ASSC15 meeting focuses on consciousness. Personally, I am not an expert on consciousness: my studies have examined the mind of the chimpanzee, as a whole, through studies both in the laboratory and in the wild. From an evolutionary perspective, one of the key questions that interests me is what made us human.

Based on my studies I have come to recognize that chimpanzees live in a world of the here and now. They are not worried about their

future, not even about tomorrow. In contrast, humans can reflect on a past long before their birth, think about a future that will follow their death, and can empathize with people suffering on the other side of the world. This is thanks to the power of imagination that is uniquely human. It may sometimes make us feel desperate when thinking about difficult situations. However, through our imagination, we humans can have hope too.

Japan is a country surrounded by sea and located along a tectonic plate boundary. It has suffered a great number of natural disasters such as typhoons, earthquakes, tsunamis, and fires. In a sense, the country has been in the front line of the battle against disasters for centuries. There is a Japanese proverb which says “Fall seven times, stand up eight”. As far as we keep hoping, we can make a change.

Flexibility may be important in many physical, mental, and social aspect of human life. You can sense such flexibility in every corner in Kyoto. Kyoto was the capital of Japan between 794 and 1868. It persisted as the heart of the country for more than 1000 years. When you take a walk in the city, you can encounter various interesting things. Most of them are so tiny and so subtle that you may not immediately notice their importance. However, please follow the way of Zen meditation. Try being quiet for a few minutes: Stop walking, stop speaking, stop looking, and stop thinking. You will still feel something through your *kokoro*.

I wish you a very pleasant and fruitful stay throughout the ASSC15 conference. We appreciate the efforts of all participants giving keynote speeches, tutorials, and oral or poster presentations. I hope you enjoy your various encounters both at the conference and in the city. Thank you again.

Tetsuro Matsuzawa
Chair
Local organizing committee
ASSC15, Kyoto, Japan



Acknowledgement

The financial support for the ASSC15 was given by the Primate Research Institute of Kyoto University (KUPRI) and The Mind Science Foundation. The travel award for 37 young scholars was given by the KUPRI-HOPE program. The local organizing committee appreciate the above organizations.

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Ikuma Adachi (Kyoto University), secretary
Naotsugu Tsuchiya (JST & RIKEN, Japan), secretary

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Mitsuko Matsuzawa
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Stefan Bode, Australia
Lucie Charles, France
Yi-Chia Chen, Taiwan
Michael Cohen, US
Rachel Denison, US
Olivia Gosseries, Italy
Joseph Gottlieb, US
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Yao-Wen Hsieh, Taiwan
Po-Jang Hsieh, US
Myrto I. Mylopoulos,
Elizabeth Irvine, UK
Hanmo Kang, Korea
Jean-Remi KING, France
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Philip Pärnamets, Sweden
Christian Pfeiffer, Switzerland
Yair Pinto, Netherlands
Martina Poletti, US
Kristian Sandberg, Denmark
Kranti Saran, US
Eun-Hea Shin, Korea
Soon, Siong, Singapore
Monika Sobczak, UK
Moritz Stolte, UK
Ana Tajadura-Jiménez, UK
Anouk van Loon, the Netherlands
Jennifer Windt, Germany
Yuan-chieh Yang, Taiwan
Yung-Hao Yang, Taiwan

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ASSC15 Program Overview

	Thurs. Jun 9	Fri. Jun 10	Sat. Jun 11	Sun. Jun 12
9:30 AM	<u>Morning Tutorial</u>	<u>Keynote 1</u> Edmund T Rolls	<u>Keynote 3</u> Fiona Macpherson	<u>Keynote 5</u> David Eagleman
10:30 AM		<u>Break</u>	<u>Break</u>	<u>Break</u>
	T1. Barrett & Seth T2. Bekinschtein, Boly & Gosseries T3. Ro & Lau T4. Carruthers	<u>Symposium 1</u> Ryota Kanai Stephen Fleming Robert Hampton Peter Carruthers	<u>Poster 1</u> *Poster exhibits up all day	<u>Concurrent session 3</u> a:Blindsight & perceptual blindness b:Measures of consciousness c:Theories & models d:Self & other
12:30 PM	<u>Lunch</u>	<u>Lunch</u> (Business Lunch)	<u>Lunch</u>	<u>Lunch</u> (Business Lunch)
	<u>Afternoon Tutorial</u> T6. Tsuchiya & Kanai T7. Ned Block	<u>Concurrent session 1</u> a:Decoding consciousness b:Implicit perception c:Embodied cognition d:Perception & decision	<u>Poster 2</u> *Poster exhibits up all day	<u>Symposium 3</u> Shinsuke Shimojo Yasuo Kuniyoshi Hiroshi Ishiguro Thomas Metzinger
3:45 PM		<u>Break</u>	<u>Break7</u>	<u>Break</u>
	<u>Opening Remark</u> & <u>James Prize</u>	<u>Concurrent session 2</u> a:Attention & Consciousness b:Body & mind c:Representaiton & introspection d:Clinical insights	<u>Symposium 2</u> Roy F. Baumeister Hakwan Lau Al Mele Simon van Gaal	<u>Special Session</u> Mitsuo Kawato Toshio Yanagida Atsushi Iriki Tetsuro Matsuzawa
4:45 PM				
5:45 PM	<u>Presidential address</u> Ralph Adolphs	<u>Keynote 2</u> Takamitsu Yamamoto	<u>Keynote 4</u> Nicholas Humphrey	<u>Closing remarks & award announcement</u>
6:45 PM	<u>Opening reception</u> (2F Hall I-III)	<u>Student social</u>	<u>Conference dinner</u> (2F Hall I-III)	
8:00 PM				

*Day tour to ATR
*Day tour to PRI

Venue

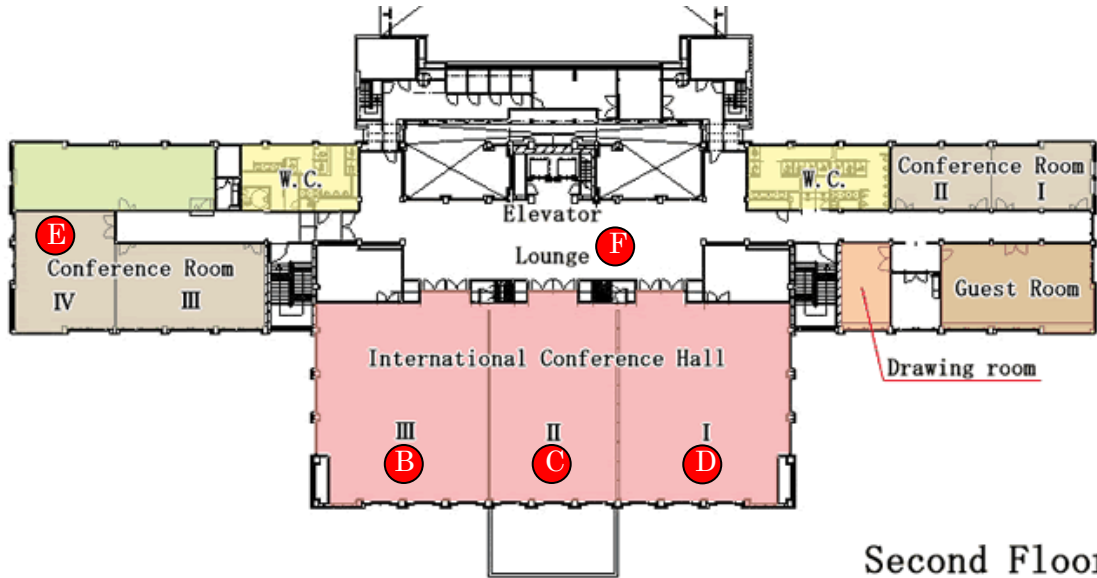
Registration: 2F Lounge **F**
 Tutorial 1 & 6: 2F Hall I **B**
 Tutorial 2: 2F Conference Room IV **E**
 Tutorial 3: 2F Hall II **C**
 Tutorial 4 & 7: 2F Hall III **D**
 Opening Remark: 1F Centennial Hall **A**
 Presidential address: 1F Centennial Hall **A**

Keynotes & Symposium : 1F Centennial Hall **A**
 Concurrent session a: 1F Centennial Hall **A**
 Concurrent session b: 2F Conference Hall I **B**
 Concurrent session c: 2F Conference Hall II **C**
 Concurrent session d: 2F Conference Hall III **D**
 Poster sessions: 2F Conference Hall I to III **B~D**

The photo exhibition: 1F University Lounge **G**

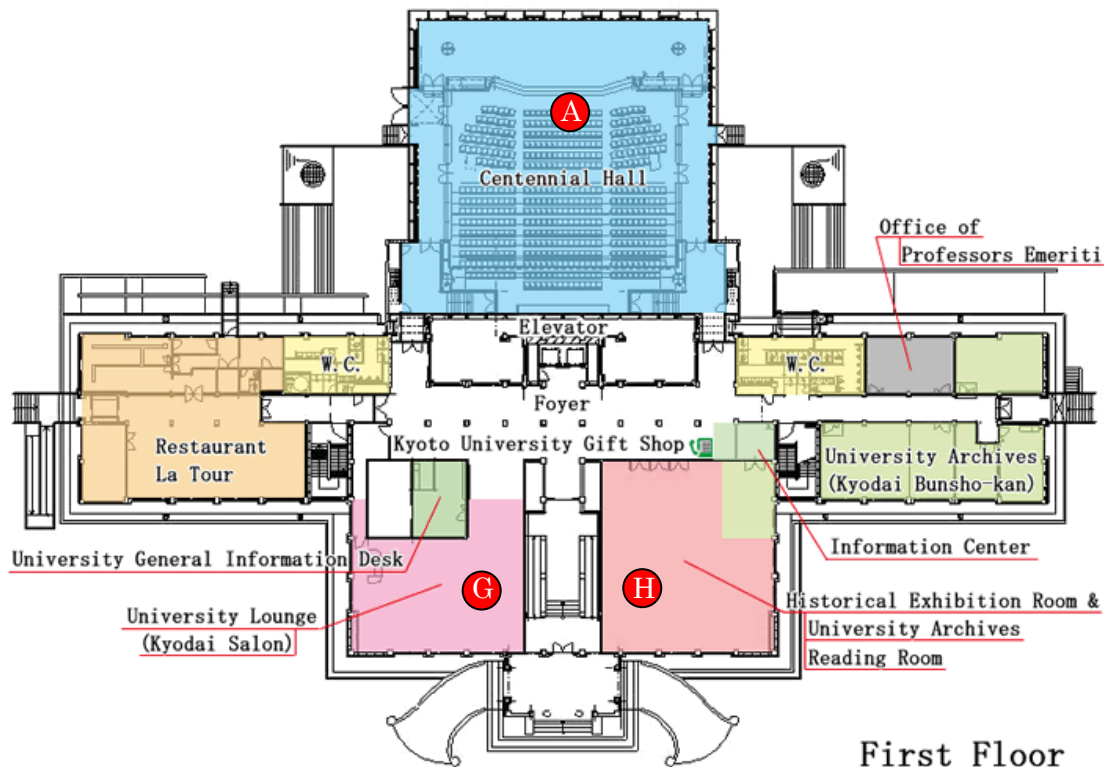
The exhibition of the AI project: 1F Historical Exhibition Room **H**

2F



Second Floor

1F



First Floor

ASSC15 Conference Scheule Thursday, June 9th

Morning Tutorials (9:30am-12:30pm) *You must register for tutorials

TUTORIAL 1: "Integrated information, causal density and conscious level"

Adam Barrett (University of Sussex, UK)

Anil Seth (University of Sussex, UK)

Venue: 2F Hall I

TUTORIAL 2: "Disorders of consciousness: Coma, vegetative state and minimally conscious state"

Tristan A Bekinschtein (MRC Cognition and Brain Sciences Unit, UK)

Melanie Boly (University of Liege Sart-Tilman, Belgium)

Olivia Gosseries (University of Liege Sart-Tilman, Belgium)

Venue: 2F Conference Room IV

TUTORIAL 3: "Transcranial magnetic stimulation and conscious awareness"

Tony Ro (The City University of New York, USA)

Hakwan Lau (Columbia Univ, USA)

Venue: 2F Hall II

TUTORIAL 4: "Self-knowledge: Philosophy meets cognitive science"

Peter Carruthers (University of Maryland, USA)

Venue: 2F Hall III

Afternoon Tutorials (1:30pm-4:30pm) *You must register for tutorials

TUTORIAL 6: "Towards the neuroscientific definition and empirical investigation of Qualia"

Naotsugu Tsuchiya (RIKEN BSI, Japan)

Ryota Kanai (University College London, UK)

Venue: 2F Hall I

TUTORIAL 7: "Comparison of the major scientifically oriented theories of consciousness"

Ned Block (New York University, USA)

Venue: 2F Hall III

Program Overview Day 1

OPENING WELCOME (4:45pm-5:00pm)

Tetsuro Matsuzawa (Kyoto University Primate Research Institute, Japan)

Venue: 1F Centennial Hall

WILLIAM JAMES PRIZE (5:00pm-5:45pm)

Winner to be announced

Venue: 1F Centennial Hall

PRESIDENTIAL ADDRESS

"Consciousness and emotion"

Ralph Adolphs (California Institute of Technology, USA)

Venue: 1F Centennial Hall

OPENING RECEPTION

Venue: 2F Hall I-III

Friday, June 10th

KEYNOTE 1 (9:30am-10:15am)

"Pleasure, emotion, decision-making, oscillations, higher order syntactic thoughts, and consciousness."

Edmund T Rolls (Oxford Centre for Computational Neuroscience, UK)

SYMPOSIUM 1 (10:30am-12:30pm)

"Metacognition and consciousness"

Chair: Ryota Kanai (University College London, UK)

Venue: 1F Centennial Hall

Talk 1: Decisions about decisions: neural construction of metacognitive confidence”
Stephen Fleming (University College London, UK)

Talk 2: “Metacognition and memory systems in primates: Successes and limitations”
Robert Hampton (Emory University, USA)

Talk 3: “Metacognitive processes in nonhuman animals?”
Peter Carruthers (University of Maryland, USA)

CONCURRENT SESSION 1 (1:30pm-3:30pm)

CS1a: Decoding consciousness

Chair: Anil Seth (University of Sussex, UK)

Venue: 1F Centennial Hall

- 1:30pm-
CS1a-1 Correlation within default mode network can be manipulated by unconscious operant conditioning with real-time fMRI neurofeedback
 Megumi Fukuda [1,2], Mitsuo Kawato [1,2], Hiroshi Imamizu [2,3]
 [1] Nara Institute of Science and Technology [2] Advanced Telecommunications Research Institute International [3] National Institute of Information and Communications Technology megumi-f@atr.jp
- 1:50pm-
CS1a-2 Predicting the conscious experience of other people
 Kristian Sandberg [1,2], Bahador Bahrami [2,3], Ryota Kanai [2], Gareth Robert Barnes [4], Morten Overgaard [1], Geraint Rees [2,4]
 [1] Cognitive Neuroscience Research Unit, Hammel Neurorehabilitation and Research Center, MindLab, Aarhus University, Denmark, [2] UCL Institute of Cognitive Neuroscience, London, United Kingdom, [3] Interacting Minds Project, Institute of Anthropology, Archaeology, Linguistics, Aarhus University, & Centre of Functionally Integrative Neuroscience, Aarhus University Hospital, Aarhus, Denmark, [4] Wellcome Trust Centre for Neuroimaging, Institute of Neurology, London, United Kingdom. krissand@rm.dk
- 2:10pm-
CS1a-3 Detecting conscious and unconscious processing at the single trial level
 Jean-Rémi KING [1], Alexandre Gramfort [2], Aaron Schurger [1], Frédéric Faugeras [3], Tristan Bekinschtein [4], Etienne Labyt [1], Catherine Wacongne [1], Lionel Naccache [3], Stanislas Dehaene [1,5].
 [1] INSERM-CEA Cognitive Neuroimaging unit, CEA, Neurospin center, Gif-sur-Yvette, FRANCE [2] Martinos Center for Biomedical Imaging, Harvard - Massachusetts General Hospital, Boston, USA [3] CRICM - UPMC, Inserm UMR S975, CNRS UMR7225, Hôpital Pitié-Salpêtrière, Paris cedex, FRANCE [4] MRC Cognition and Brain Sciences Unit, Cambridge, UK [5] Collège de France, Paris FRANCE jeanremi.king@gmail.com
- 2:30pm-
CS1a-4 Identifying multisensory representations within high-level convergence regions
 Kingson Man, Jonas Kaplan, Antonio Damasio, Kaspar Meyer
 Brain and Creativity Institute, University of Southern California, Los Angeles, CA USA kman@usc.edu
- 2:50pm-
CS1a-5 Extracting spatiotemporal pattern of neural network during awake and anesthetic conditions in monkeys
 Toru Yanagawa [1], Kazuhito Takenaka [2], Naomi Hasegawa [1], Naotaka Fujii [1]
 [1] RIKEN Brain Science Institute, [2] Grad. School of Information Science and Technology, Univ. of Tokyo toru-yanagawa@brain.riken.jp
- 3:10pm-
CS1a-6 Neural and behavioral indices of perceptual awareness in infants
 Sid Kouider
 CNRS & Ecole Normale Supérieure, Paris, France sid.kouider@ens.fr

CS1b: Implicit perception

Chair: Katsumi Watanabe (University of Tokyo, Japan)

Venue: 2F Hall I

- 1:30pm-
CS1b-1 Behavioural and neural evidences for nonconscious processing during crowding
 Nathan Faivre [1], Sid Kouider [1]
 [1] Laboratoire de Sciences Cognitives et Psycholinguistique, CNRS/EHESS/DEC-ENS, Paris, France.
 nathan.faivre@ens.fr
- 1:50pm-
CS1b-2 Experience-dependent induction of hypnagogic images during daytime naps: a combined
 behavioral and EEG study
 Kussé Caroline, Shaffii - Le Bourdieu Anahita, Schrouff Jessica, Matarazzo Luca, Maquet
 Pierre
 Cyclotron Research Centre, University of Liège, Belgium Caroline.Kusse@doct.ulg.ac.be
- 2:10pm-
CS1b-3 A novel procedure for identifying unconscious structural knowledge in artificial grammar
 learning
 Elisabeth Norman [1], Mark C. Price [1], Ryan B. Scott [2], Emma Jones [1], Zoltan Dienes [2]
 [1] University of Bergen, Norway, [2] University of Sussex, UK Elisabeth.Norman@psysp.uib.no
- 2:30pm-
CS1b-4 The flexible nature of unconscious cognition
 Martijn E. Wokke [1], Simon van Gaal [1,4], H. Steven Scholte [1], K. Richard Ridderinkhof
 [2,3], Victor A. F. Lamme [1,3]
 [1] Cognitive Neuroscience Group, Department of Psychology, University of Amsterdam, Roetersstraat 15, 1018 WB,
 Amsterdam, the Netherlands [2] Amsterdam center for the study of adaptive control in brain and behavior (Acacia),
 Department of Psychology, University of Amsterdam, Roetersstraat 15, 1018 WB, Amsterdam, the Netherlands [3]
 Cognitive Science Center, University of Amsterdam, Sarphatistraat 104, 1018 GV, Amsterdam, the Netherlands [4]
 INSERM-CEA Cognitive Neuroimaging unit, France martijnwokke@gmail.com
- 2:50pm-
CS1b-5 Fast unconscious fear acquisition
 David Carmel [1,2], Candace Raio [1], Elizabeth A. Phelps [1,2], Marisa Carrasco [1,2]
 [1] Department of Psychology, New York University, [2] Center for Neural Science, New York University
 davecarmel@nyu.edu
- 3:10pm-
CS1b-6 Lessons from studies of unreported perceptual stimuli: A possible functional role for phenomenal
 content?
 Guven Guzeldere
 Department of Philosophy and Center for Cognitive Neuroscience, Duke University; Departments of Philosophy and
 Psychology, Harvard University (visiting) guven.guzeldere@duke.edu

CS1c: Embodied cognition

Chair: :Yukihiro Nobuhara (University of Tokyo, Japan)

Venue: 2F Hall II

- 1:30pm-
CS1c-1 A volitional account of agentive awareness
 Myrto I. Mylopoulos
 Graduate Center, City University of New York (CUNY) myrto.mylopoulos@gmail.com
- 1:50pm-
CS1c-2 The transtemporal identity argument for subject-body dualism
 Kirk Ludwig
 Philosophy Department Indiana University Bloomington, IN 47405-7005 USA ludwig@indiana.edu
- 2:10pm-
CS1c-3 Two types of proprioceptive content
 Hao Pang [1], Allen Y. Hough [2]
 [1] National Taiwan University, College of Life Science, [2] National Yang-Ming University, Institute of Philosophy of
 Mind and Cognition howpan@gmail.com
- 2:30pm-
CS1c-4 Stressing the flesh: In defense of the strongly embodied nature of cognition and experience
 Itay Shani [1], Liam P. Dempsey [2]
 [1] Department of Philosophy Kyung Hee University 1 Hoegi-dong Dongdaemun-gu Seoul 130-701 Korea, [2]
 Department Of Philosophy Lady Eaton College Trent University Peterborough Ontario Canada. ishani479@hotmail.com
- 2:50pm-
CS1c-5 The social dimension of perceptual experience
 Axel Seemann
 Bentley University, Department of Philosophy RNVANGUL@syr.edu
- 3:10pm-
CS1c-6 Do schizophrenic patients actually misidentify the owner of their thought? An approach from
 brain's default network
 Yao-Wen Hsieh, Allen Y. Hough
 Institute of Philosophy of Mind and Cognition, National Yang Ming University, Taiwan zechsxie@gmail.com

CS1d: Perception and decision

Chair: Satoshi Shioiri (Tohoku University, Japan)

Venue: 2F Hall III

- 1:30pm-
CS1d-1 **Perceptual load broadens orientation tuning**
Moritz Stolte [1], Bahador Bahrami [1,2,3], Nilli Lavie [1]
[1] UCL Institute of Cognitive Neuroscience, University College London, Alexandra House, 17 Queen Square, London WC1N 3AR UK, [2] Interacting Minds Project, Institute of Anthropology, Archaeology, Linguistics, Aarhus University, [3] Centre of Functionally Integrative Neuroscience, Aarhus University Hospital, Norrebrogade 44, Building 10 G, 8000 Aarhus C, Denmark moritz.stolte.09@ucl.ac.uk
- 1:50pm-
CS1d-2 **Predictive context biases perceptual selection during binocular rivalry**
Rachel N. Denison [1], Elise Piazza [2], Michael A. Silver [1,2]
[1] Helen Wills Neuroscience Institute, University of California, Berkeley, [2] School of Optometry, University of California, Berkeley rdenison@berkeley.edu
- 2:10pm-
CS1d-3 **The key to finding a target object rapidly: preparatory biases in lateral occipital area**
Soon Chun Siong[1], Praneeth Namburi[1,2], Michael WL Chee[1]
[1] Cognitive Neuroscience Laboratory, Program in Neuroscience and Behavioral Disorders, Duke-NUS Graduate Medical School, Singapore [2] Laboratory of Synaptic Circuitry, Program in Neuroscience and Behavioral Disorders, Duke-NUS Graduate Medical School, Singapore soonchunsiong@gmail.com
- 2:30pm-
CS1d-4 **Subliminally presented reward cues bias incidental economic decisions and the encoding of subjective values in the brain**
Stefan Bode[1,2], Carsten Murawski [3], Philip G. Harris [4], Juan F. Domínguez D. [2], Gary F. Egan [2,5]
[1] Psychological Sciences, The University of Melbourne, Australia, [2] Florey Neuroscience Institutes, Melbourne, Australia, [3] Department of Finance, The University of Melbourne, Australia, [4] Department of Management and Marketing, The University of Melbourne, Australia, [5] Centre for Neuroscience, The University of Melbourne, Australia bode.st@googlemail.com
- 2:50pm-
CS1d-5 **Unconscious influences on morality: manipulating moral decisions using the gaze cascade effect**
Philip Pärnamets [1], Lars Hall [1], Petter Johansson [2], Richard Andersson [1], Christian Balkenius [1]
[1] Lund University Cognitive Science, Lund University, [2] Division of Psychology and Language Sciences, University College London philip.parnamets@lucs.lu.se
- 3:10pm-
CS1d-6 **Investigating dose-dependent effects of placebo analgesia: A psychophysiological approach**
Yoshio Nakamura [1,2,3], Gary W. Donaldson [2,3], C. Richard Chapman [2,3]
[1] Utah Center for Exploring Mind-Body Interactions, [2] Pain Research Center, [3] Department of Anesthesiology, University of Utah School of Medicine, Utah, U.S.A. yoshi.nakamura@utah.edu

CONCURRENT SESSION 2 (3:45pm-5:45pm)

CS2a: Attention & consciousness

Chair: Melanie Wilke (University Medicine Goettingen, Germany)

Venue: 1F Centennial Hall

- 3:30pm-
CS2a-1 Cognition is nice, but consciousness is better
 Victor A.F. Lamme
 Department of Psychology, Cognitive Science Center Amsterdam, University of Amsterdam, The Netherlands
 v.a.f.lamme@uva.nl
- 3:50pm-
CS2a-2 Consciousness is not necessary for feature binding
 André W Keizer [1], Bernhard Hommel [2], Victor Lamme [1]
 [1] University of Amsterdam Cognitive Neuroscience Group, Department of Psychology Amsterdam, the Netherlands [2]
 Leiden University Institute for Psychological Research & Leiden Institute for Brain and Cognition Leiden, The
 Netherlands a.w.keizer@uva.nl
- 4:10pm-
CS2a-3 Attention is necessary for awareness
 Michael A. Cohen, Ken Nakayama
 Department of Psychology, Harvard University michaelthecohen@gmail.com
- 4:30pm-
CS2a-4 Unconscious pop-out: attentional capture by unseen feature singletons only when top-down
 attention is available
 Po-Jang Hsieh, Jaron Colas, Nancy Kanwisher
 Department of Brain and Cognitive Sciences, McGovern Institute, MIT hsieh.pj@gmail.com
- 4:50pm-
CS2a-5 Unconscious cognition isn't that dumb: Subliminal primes exert top-down modulations
 Filip Van Opstal [1], Wim Gevers [2], Cristian Buc Calderon [2], Tom Verguts [1]
 [1] Department of Experimental Psychology at Ghent University, [2] Unescog at Université Libre de Bruxelles
 filip.vanopstal@ugent.be
- 5:10pm-
CS2a-6 Spatial awareness after pulvinar inactivation
 Igor Kagan [1], Melanie Wilke [1,2], Richard A. Andersen [1]
 [1] Div. Biology, California Institute of Technology, Pasadena, CA, USA [2] Dept. Cognitive Neurology, University
 Medicine Goettingen, Germany igor@vis.caltech.edu

CS2b: Body and mind

Chair: Zoltan Dienes (University of Sussex, UK)

Venue: 2F Hall I

- 3:30pm-
CS2b-1 Superior haptic shape recognition in adults with autism
Tamami Nakano [1], Nobumasa Kato [2], Shigeru Kitazawa [1]
[1] Department of Neurophysiology, Juntendo University School of Medicine [2] Department of Psychiatry, Showa University School of Medicine tanakano@juntendo.ac.jp
- 3:50pm-
CS2b-2 Reality substitution platform and its application to research on déjà vu experience
Sohei Wakisaka [1], Keisuke Suzuki [2], Naotaka Fujii [2]
[1] Laboratory for Dynamics of Emergent Intelligence, RIKEN Brain Science Institute [2] Laboratory for Adaptive Intelligence, RIKEN Brain Science Institute wakisaka@brain.riken.jp
- 4:10pm-
CS2b-3 Upside Down: Visual-vestibular conflict induces illusory changes in the experienced direction of the first-person perspective
Christian Pfeiffer [1], Roberto Martuzzi [1], Julio Duenas [1], Roger Gassert [2], Olaf Blanke [1,3]
[1] Laboratory of Cognitive Neuroscience Ecole Polytechnique Fédérale de Lausanne Switzerland, [2] Rehabilitation Engineering Laboratory Eidgenössische Technische Hochschule Zürich Switzerland, [3] Department of Neurology University Hospital Geneva Switzerland christian.pfeiffer@epfl.ch
- 4:30pm-
CS2b-4 Distal perception via use of distal-to-tactile sensory substitution interface does not lead to extension of body image
Tom Froese [1,2], Marek McGann [3], Anil Seth [1]
[1] Sackler Centre for Consciousness Science, University of Sussex, UK, [2] Ikegami Laboratory, University of Tokyo, Japan, [3] MIC, University of Limerick, Ireland t.froese@gmail.com
- 4:50pm-
CS2b-5 Sensitivity on discrepancy between aimed action and its visual feedback in chimpanzees and humans
Takaaki Kaneko[1,2], Masaki Tomonaga[1]
[1] Primate Research Institute, Kyoto University, [2] Japan Society for the Promotion of Science tkaneko@pri.kyoto-u.ac.jp
- 5:10pm-
CS2b-6 Can young infants extend their own sense of agency outside the body?
Michiko Miyazaki, Hideyuki Takahashi, Hiroyuki Okada, and Takashi Omori
Tamagawa University myzk@lab.tamagawa.ac.jp

CS2c: Representation & introspection

Chair: Dan Lloyd (Trinity College, USA)

Venue: 2F Hall II

- 3:30pm-
CS2c-1 Inner speech and introspective self-knowledge
 Kengo Miyazono [1,2]
 [1] Department of Philosophy, The University of Tokyo, [2] Research Fellow (DC2), Japan Society for the Promotion of
 Science kengomiyazono@yahoo.co.jp
- 3:50pm-
CS2c-2 Is naive introspection really unreliable?
 Kranti Saran
 Harvard University saran@fas.harvard.edu
- 4:10pm-
CS2c-3 When to trust first-person reports—and when not to. A new approach towards first-person
 methods in consciousness research
 Jennifer M. Windt
 Johannes Gutenberg University of Mainz windt@uni-mainz.de
- 4:30pm-
CS2c-4 What metarepresentation is for
 Tillmann Vierkant
 School of Philosophy, Psychology and Language Sciences, University of Edinburgh t.vierkant@ed.ac.uk
- 4:50pm-
CS2c-5 Two levels of metacognition
 Santiago Arango-Munoz
 Ruhr-Universität Bochum, santiagoarangom@gmail.com
- 5:10pm-
CS2c-6 Perception versus memory: An argument against representationalism
 Joseph N. Gottlieb
 University of Illinois: Chicago, Department of Philosophy joseph.gottlieb@gmail.com

CS2d: Clinical insights

Chair: Noam Sagiv (Brunel University, UK)

Venue: 2F Hall III

- 3:30pm-
CS2d-1 Is the cortex the seat of conscious unity?
 Yair Pinto
 University of Amsterdam yair.pinto@gmail.com
- 3:50pm-
CS2d-2 Do chimpanzees have better working memory of numerals than humans?
 Ting-An Lin [1], Allen Y. Houng [2]
 [1] College of Life Science, National Taiwan University, [2] Institute of Philosophy of Mind and Cognition, National Yang-Ming University isly17@gmail.com
- 4:10pm-
CS2d-3 Mirror-touch synaesthesia in the phantom limbs of amputees
 Jamie Ward, Aviva Idit Goller, and Kerrie Richards
 School of Psychology, University of Sussex, Brighton, UK and Sackler Centre for Consciousness Science, University of Sussex, Brighton, UK jamiew@sussex.ac.uk
- 4:30pm-
CS2d-4 Measuring cortical effective connectivity in non-communicating patients with severe brain injury
 Mario Rosanova [1], Olivia Gosseries [2], Silvia Casarotto [1], Mélanie Boly [2], Adenauer G. Casali [1], Marie-Aurélie Bruno [2], Maurizio Mariotti [1], Pierre Boveroux [2], Giulio Tononi [3], Steven Laureys [2], Marcello Massimini [1]
 [1] Department of Clinical Sciences “Luigi Sacco”, University of Milan, Milan, Italy, [2] Coma Science Group, Cyclotron Research Center & Department of Neurology, University of Liège, Liège, Belgium, [3] Department of Psychiatry, University of Wisconsin, Madison, USA ogosseries@ulg.ac.be
- 4:50pm-
CS2d-5 Functional MRI studies of aberrant self-experience: depersonalization disorder before and after treatment
 Medford N [1,2], Sierra M [3], Stringaris AK [3], Giampietro V [3], Brammer M [3], David AS [3].
 [1] Brighton and Sussex Medical School, Sussex, UK, [2] Sackler Centre for Consciousness Science, Sussex, UK, [3] Institute of Psychiatry, London, UK n.medford@bsms.ac.uk
- 5:10pm-
CS2d-6 Automatic attributions of human qualities to graphemes and linguistic sequences in synaesthesia: an fMRI study
 Monika Sobczak, Noam Sagiv, Adrian Williams
 Centre for Cognition and Neuroimaging, Brunel University, West London sobmon@gmail.com

KEYNOTE 2 (5:45pm-6:30pm)

"Cerebrospinal stimulation therapy for the treatment of vegetative state and minimally conscious state"

Takamitsu Yamamoto (Nihon University School of Medicine, Japan)

Venue: 1F Centennial Hall

STUDENT SOCIAL

Friday, June 11th

KEYNOTE 3 (9:30am-10:15pm)

"Cognitive penetration of colour experience"

Fiona Macpherson (University of Glasgow, UK)

Venue: 1F Centennial Hall

POSTER 1 (10:30am-12:30pm) * Poster Exhibits up all day

POSTER 2 (1:30pm-3:30pm) * Poster Exhibits up all day

SYMPOSIUM 2 (3:45pm-5:45pm)

"Consciousness: Powerful or useless?"

Chair: Simon van Gaal (University of Amsterdam, Netherlands)

Venue: 1F Centennial Hall

Talk 1: "Answering Libet: How conscious thoughts cause behavior"

Roy F. Baumeister (Florida State University, USA)

Talk 2: "Performance capacity matching as a new approach to studying the functions of sensory awareness"

Hakwan Lau (Columbia University, USA)

Talk 3: "A model of conscious deciding"

Al Mele (Florida State University, USA)

Talk 4: "Non-conscious high-level information processing and the implications for the functional relevance of consciousness"

Simon van Gaal (INSERM-CEA, France)

KEYNOTE 4 (5:45pm-6:30pm)

"Soul Dust: the Magic of Consciousness"

Nicholas Humphrey (London School of Economics)

Venue: 1F Centennial Hall

CONFERENCE DINNER

Venue: 2F Hall I-III

Friday, June 12th

KEYNOTE 5 (9:30am-10:15am)

“Kaleidoscopic varieties of conscious experience”

David Eagleman (Baylor College of Medicine, USA)

Venue: 1F Centennial Hall

CONCURRENT SESSION 3 (10:30am-12:30pm)

CS3a: Blindsight & perceptual blindness

Chair: Hakwan Lau (Columbia University, USA)

Venue: 1F Centennial Hall

10:30am-
CS3a-1 Event-related potential (ERP) evidence for a common neural pathway of a GABA-a agonist and backward masking in disrupting visual awareness

Anouk M. van Loon[1], H Steven Scholte[1], Simon van Gaal[1,2,3], Bjorn J. J. van der Hoort [1], & Victor A. F. Lamme [1,4]

[1]Cognitive Neuroscience Group, Department of Psychology, University of Amsterdam, Roetersstraat 15, 1018 WB, Amsterdam, the Netherlands [2] Inserm, Cognitive Neuroimaging Unit, Gif-sur-Yvette, France [3] Commissariat à l’Energie Atomique, Neurospin Center, Gif-sur-Yvette, France [4] Cognitive Science Center, University of Amsterdam, Amsterdam, the Netherlands anouk.vanloon@gmail.com

10:50am-
CS3a-2 Moving without knowing: Discrepancy between action and perception during eye movements
Martina Poletti and Michele Rucci

Department of Psychology, Boston University, Boston, 02215 MA, USA martinap@bu.edu

11:10am-
CS3a-3 Neural correlates of visual awareness studied with adaptation induced blindness
Kaoru Amano [1,2], Toshimasa Takahashi [3], Tsunehiro Takeda [1], Isamu Motoyoshi [4]

[1] The University of Tokyo, [2] Precursory Research for Embryonic Science and Technology (PRESTO), JST, [3] Keio University, [4] NTT Communication Science Laboratories amano@brain.k.u-tokyo.ac.jp

11:30am-
CS3a-4 Neural correlate of blindsight generated in the superior colliculus
Masatoshi Yoshida [1,2], Kana Takaura [1,2], Tadashi Isa [1,2]

[1] Laboratory of Behavioral Development, National Institute for Physiological Sciences (NIPS), [2] the Graduate University for Advanced Studies (SOKENDAI) pooneil68@gmail.com

11:50am-
CS3a-5 Blindsight in normals: Binding features without awareness
Hsin-I Liao, Yung-Hao Yang, Su-Ling Yeh

Department of Psychology, National Taiwan University f91227005@ntu.edu.tw

12:10am-
CS3a-6 Orienting or intention? Unconscious processing of human gaze
Yi-Chia Chen, Su-Ling Yeh

Department of Psychology, National Taiwan University reldahschen@gmail.com

CS3b: Measures of consciousness

Chair: Naotsugu Tsuchiya (RIKEN, BSI, Japan)

Venue: 2F Hall I

- 10:30am-
CS3b-1 **Querying the octopus visual system: Complex vision and a possible model for invertebrate consciousness studies**
David B. Edelman
Experimental Neurobiology The Neurosciences Institute San Diego, CA 92121 david_edelman@nsi.edu
- 10:50am-
CS3b-2 **Signal detection theory is not a good model or measure of consciousness**
Anil K Seth [1,2], Adam B. Barrett [1,2], Ryan C. Scott [1,3], Zoltan Dienes [1,3], Daniel Bor [1,2]
[1] Sackler Centre for Consciousness Science, University of Sussex [2] School of Informatics, University of Sussex [3] School of Psychology, University of Sussex a.k.seth@sussex.ac.uk
- 11:10am-
CS3b-3 **Granger causality analysis of steady-state EEG during propofol-induced anaesthesia**
Adam B Barrett [1], Mike Murphy [2], Mélanie Boly [3], Steven Laureys [3], Pierre Boveroux [3], Quentin Noirhomme [3], Marie-Aurélié Bruno [3], Anil K Seth [1]
[1] Sackler Centre for Consciousness Science and School of Informatics, University of Sussex, Brighton, UK, [2] Neuroscience Training Program, Department of Psychiatry, University of Wisconsin, Madison, USA, [3] Coma Science Group, Cyclotron Research Centre and Neurology Department, University of Liège, Liège, Belgium adam.barrett@sussex.ac.uk
- 11:30am-
CS3b-4 **Know thyself: Metacognitive networks and measures of consciousness**
Antoine Pasquali [1,3*], Bert Timmermans [2*], Axel Cleeremans [1*]
[1] Consciousness, Cognition, and Computation Group, Université Libre de Bruxelles, 1050 Bruxelles, Belgium, [2] Neuroimaging Group, Department of Psychiatry, University Hospital of Cologne, 50937 Köln, Germany, [3] Neurogenetics Research Unit, Adam Neurogenetics, 20240 Solaro, France, [*] Shared first-authorship antoine.pasquali@ulb.ac.be
- 11:50am-
CS3b-5 **Converging on consciousness?**
Liz Irvine
Philosophy PhD student, University of Edinburgh elizabethirv@gmail.com
- 12:10am-
CS3b-6 **Higher-order awareness without first-order accuracy: Implications for models of consciousness**
Ryan Scott [1,3], Zoltan Dienes [1,3], Anil Seth [2,3]
[1] School of Psychology, University of Sussex, [2] School of Informatics, University of Sussex, [3] Sackler Centre for Consciousness Science, University of Sussex r.b.scott@sussex.ac.uk

CS3c: Theories and models of consciousness

Chair: Timothy Lane (National Chengchi University, Taiwan)

Venue: 2F Hall II

- 10:30am- CS3c-1 Dolphin consciousness and higher-order thought theories
Ryoji Sato
the University of Tokyo ryoji80@dol.hi-ho.ne.jp
- 10:50am- CS3c-2 Attention and the structure of consciousness
Adrienne Prettyman
University of Toronto adrienne.prettyman@gmail.com
- 11:10am- CS3c-3 The sensorimotor approach and higher-order representationalism
Oliver Kauffmann [1] , John Michael [2]
[1] Research Center Gnosis, University of Aarhus, Denmark. [2] Research Center Gnosis, University of Aarhus, Denmark
olka@dpu.dk
- 11:30am- CS3c-4 Consciousness, Intentionality, and Naturalization
Amir Horowitz
The Open University of Israel amirho@openu.ac.il
- 11:50am- CS3c-5 Inner clock model and conscious judgments of duration
Michał Klincewicz
Graduate Center, City University of New York michal.klincewicz@gmail.com
- 12:10am- CS3c-6 Self-oscillator model of bistable perception explains percept stabilization and reversal rate characteristics with interrupted ambiguous stimulus
Norbert Fürstenau
German Aerospace Center, Inst. of Flight Guidance, Human Factors Dptm., Lilienthalplatz 7, D-38108 Braunschweig, Germany norbert.fuerstenau@dlr.de

CS3d: Self & other

Chair: Kenji Matsumoto (Tamagawa University, Japan)

Venue: 2F Hall III

- 10:30am- Social cognition - A 360° panorama
CS3d-1 Marisa Przyrembel, Dipl.-Psych., M.A.
Humboldt-Universität zu Berlin Berlin School of Mind and Brain Luisenstraße 56, Room 317 10099 Berlin Germany
marisa.przyrembel@hu-berlin.de
- 10:50am- A cognitive model of the imagination and emotions
CS3d-2 Jordan C.V. Taylor
Macquarie Centre for Cognitive Science (MACCS), Macquarie University, Sydney, Australia jordan.taylor@gmail.com
- 11:10am- Monkey medial prefrontal cortical involvement in social-based decision-making
CS3d-3 Mariana F. P. de Araujo [1], Etsuro Hori [1], Rafael Souto Maior [1,2], Carlos Tomaz [2], Taketoshi Ono [1], Hisao Nishijo [1]
[1] System Emotional Science, Graduate School of Medicine and Pharmaceutical Science, University of Toyama, Sugitani 2630, Toyama 930-0194. [2] Laboratory of Neuroscience and Behavior, Department of Physiological Sciences, Institute of Biology, University of Brasília, Brasilia-DF, Brazil. mfparaujo@gmail.com
- 11:30am- Depersonalization is due to damage to right fronto-parietal cortex: relevance for bodily aspects of
CS3d-4 self-consciousness
Guillaume Marillier [1], Lukas Heydrich* [1,2], Margitta Seeck [2], Nathan Evans [1] , Olaf Blanke [1,2]
[1] Laboratory of Cognitive Neuroscience, Brain Mind Institute, Ecole Polytechnique Federale Lausanne, Switzerland [2] Presurgical Epilepsy Unit, University Hospital Geneva, Switzerland * presenting author Lukas Heydrich
lukas.heydrich@epfl.ch
- 11:50am- The other in me: Interpersonal multisensory stimulation changes the mental representation of the
CS3d-5 self
Ana Tajadura-Jiménez [1], Stephanie Grehl [2], Manos Tsakiris [3]
Department of Psychology, Royal Holloway, University of London ana.tajadura@rhul.ac.uk
- 12:10am- Implicit influence of other's intention in prisoner's dilemma game
CS3d-6 Haruaki Fukuda [1], Hiroaki Suzuki [1,2], Ayumi Yamada [1]
[1] Human Innovation Research Center, Aoyama Gakuin University, [2] Department of Education, Aoyama Gakuin University fukuda@cs.c.u-tokyo.ac.jp

SYMPOSIUM 3 (1:30pm-3:30pm)

" Robotics & Consciousness "

Chair: Shinsuke Shimojo (California Institute of Technology, USA)

Venue: 1F Centennial Hall

Talk 1: "Short introduction to the scope and limits of robotics research on the problems of consciousness"

Shinsuke Shimojo (California Institute of Technology, USA)

Talk 2: "Emergence of consciousness from embodied interaction dynamics: A constructivist approach with a simulated human fetus"

Yasuo Kuniyoshi (University of Tokyo, JAPAN)

Talk 3: "Consciousness appears on robots and androids"

Hiroshi Ishiguro (Osaka University/ATR, Japan)

Talk 4: "Short commentary on robotics and consciousness"

Thomas Metzinger (Johannes Gutenberg-Universität, Germany)

Panel discussion: "Towards the interaction between robotics and consciousness research"

SPECIAL SESSION (3:45pm-5:45pm)

" Japanese contribution toward understanding consciousness "

Chair: Tetsuro Matsuzawa (Kyoto University Primate Research Institute, Japan)

Venue: 1F Centennial Hall

Four speakers will illuminate various approaches to understanding consciousness: brain-machine interface, biological molecules, neuroscience, and primatology.

Manipulating conscious and unconscious brain states by decoded fMRI neurofeedback

Mitsuo Kawato (ATR, Japan)

Let's make some noise! How the brain uses fluctuations to process information

Toshio Yanagida (Osaka University, NICT CiNet, Riken QBiC, Japan)

Triadic (ecological, neural, cognitive) niche construction viewed through primate brain evolution

Atsushi Iriki (RIKEN Brain Science Institute, Japan)

What is uniquely human? A view from comparative cognitive development in humans and chimpanzees

Tetsuro Matsuzawa (Primate Research Institute of Kyoto University, Japan)

CLOSING REMARKS & AWARD ANNOUNCEMENT

Poster Session Overview

Saturday, June 11th

POSTER SESSION 1 (10:30am-12:30pm)

Venue: 2F Hall I-III

P1-1: Far elements guide attention before near elements do

Ryuji Takeya[1], Akimi Ogihara[2], Tetsuko Kasai[3]

[1]Graduate School of Education, Hokkaido university, [2]school of Education, Hokkaido university, [3]Faculty of Education, Graduate School of Education, Hokkaido university takeryu200@gmail.com

P1-2: On the role of physics and subjective space-time in an understanding of perceptual experience

Gert J. van Tonder

Laboratory of Visual Psychology Department of Architecture and Design Kyoto Institute of Technology 606-8585 Kyoto, Japan
gvtonder@yahoo.co.uk

P1-3: Phenomenal stability vs. neural dynamics

Alexandra Elbakyan

Kazakh National Technical University mindwrapper@gmail.com

P1-4: Eye movement differences between implicit and explicit contextual cuing effects

Satoshi Shioiri [1,2], Takuro Mano [2], Kazumichi Matsumiya [1,2], Ichiro Kuriki [1,2]

[1] Research Institute of Electrical Communication, Tohoku University, [2] Graduate School of Information Sciences, Tohoku University
shioiri@riec.tohoku.ac.jp

P1-5: What can developmental amnesic patients memorize about their personal past? In-depth investigation of episodic memory and the self in one new case

Picard Laurence[1,4], Claire Mayor-Dubois[2], E. Roulet-Perez[2], C. Duval[1], P. Maeder[3], M. Abram[4], F. Eustache[1], P. Piolino[1,4]

[1] Inserm - EPHE - Université de Caen/Basse-Normandie, Unité U923, GIP Cyceron, CHU Côte de Nacre, Caen, France ; Université Paris Descartes, Institut de Psychologie, Paris, France [2] Pediatric neurology and neurorehabilitation unit, Department of pediatrics, Centre Hospitalier Universitaire Vaudois (CHUV), Lausanne, Switzerland [3] Department of Radiology, Centre Hospitalier Universitaire Vaudois (CHUV) and University of Lausanne, Lausanne, Switzerland [4] Université Paris Descartes, Institut de Psychologie, Paris, France ; CNRS UMR 8189, Groupe Mémoire et Apprentissage, Paris, France laurence.picard@gmail.com

P1-6: Large-billed crows (*Corvus macrorhynchos*) have retrospective but not prospective metamemory

Kazuhiro Goto [1], Shigeru Watanabe [2]

[1] Kyoto University, [2] Keio University kgoto@kuhp.kyoto-u.ac.jp

P1-7: Implicit association between sound frequency and visual motion

Maori Kobayashi[1], Wataru Teramoto [1,2], Souta Hidaka [3], Yoichi Sugita [4]

[1] Research Institute of Electrical Communication, Tohoku University, [2] Department of Psychology, Graduate School of Arts and Letters, Tohoku University, [3] Department of Psychology, Rikkyo University, [4] Neuroscience Research Institute, National Institute of Advanced Industrial Science and Technology (AIST). maori@ais.riec.tohoku.ac.jp

P1-8: The Web as a new framework for understanding the mind

Mizuki Oka [1], Takashi Ikegami [2]

[1] Center for Knowledge Structuring, The University of Tokyo [2] Graduate School of Arts and Sciences, The University of Tokyo
mizuki@cks.u-tokyo.ac.jp

P1-9: Self-specificity and mineness

Timothy Lane

Research Center for Mind, Brain, and Learning, National Chengchi University, Taipei, Taiwan ROC 11605 tlan@nccu.edu.tw

P1-10: Measuring implicit and explicit anxiety: Using implicit association test

Tsutomu Fujii

Department of Psychology, Gakushuin University pyfpy037@yahoo.co.jp

P1-11: Ten design rules for a conscious system

Ricardo Sanz, Carlos Hernandez, Guadalupe Sanchez, Jaime Gomez

Autonomous Systems Laboratory, Universidad Politécnica de Madrid ricardo.sanz@upm.es

P1-12: Pathological gamblers exhibit metacognitive biases during decision making under uncertainty

Damien Brevers [1], Axel Cleeremans [1], Antoine Bechara [2,3], Paul Verbanck [1], Xavier NOËL [1]

[1] Université Libre de Bruxelles (ULB), Belgium, [2] McGill University, Canada, [3] University of Southern California, USA dbrevers@ulb.ac.be

P1-13: Neural synchrony, causation and consciousness

David Bhowmik, Andreas Fidjeland, David Gamez, Murray Shanahan, Mark Wildie

Department of Computing, Imperial College, London, SW7 2BZ, UK. db910@doc.ic.ac.uk

P1-14: Passivity experience in schizophrenic elusions of alien control

Philip Gerrans

Department of Philosophy University of Adelaide philip.gerrans@adelaide.edu.au

P1-15: Modified measure for integrated information theory and its application to 128-channel electrocorticogram data recorded in macaque monkeys

Masafumi Oizumi [1,2], Kazuhito Takenaka [1], Toru Yanagawa [1], Shun-ichi Amari [1], Naotsugu Tsuhiya [1,3], Naotaka Fujii [1]

[1] RIKEN Brain Science Institute, [2] JSPS fellow, [3] PRESTO fellow oizumi@brain.riken.jp

P1-16: Retinotopic activities in extrastriate visual areas predict individual variations in binocular rivalry dynamics

Hiroyuki Yamashiro [1], Hiroki Yamamoto [1], Jun Saiki [1], Hiroaki Mano [2], Masahiro Umeda [3], Chuzo Tanaka [3,4]

[1] Graduate School of Human and Environmental Studies, Kyoto University, Kyoto [2] Brain Activity Imaging Center, ATR, Kyoto [3] Department of Medical Informatics, Meiji University of Integrative Medicine, Kyoto [4] Department of Neurosurgery, Meiji University of Integrative Medicine, Kyoto yamashi@cv.jinkan.kyoto-u.ac.jp

P1-17: Hint seeking in pigeons

Sumie Iwasaki, Sota Watanabe, Kazuo Fujita

Kyoto University s.iwasaki623@gmail.com

P1-18: A battle over implicit resources – does it affect modus operandi in AGL?

Marta Kwiecien [1], Agnieszka Popławska [2], Radosław Sterczyński [3]

[1,2,3] Warsaw School of Social Psychology, Faculty in Sopot, Poland kwiecien.marta@gmail.com

P1-19: Examining the role of vicarious trial-and-error in a robotic experiment

Eiko Matsuda, Julien Hubert, Takashi Ikegami

Department of General Systems Studies, The University of Tokyo, Tokyo 153-8902, Japan eiko@sacral.c.u-tokyo.ac.jp

P1-20: Priming effect of sense of agency in handwritten traces

Kiyomi Yatabe [1,2], Chihiro Hosoda [2], Katsumi Watanabe [1], Takashi Hanakawa [2]

[1] University of Tokyo, [2] National Center of Neurology and Psychiatry yatabe@fennel.rcast.u-tokyo.ac.jp

P1-21: A disappearance of the face inversion effect in unconscious visual processing

Megumi Suzuki, Yasuki Noguchi

Department of Psychology, Kobe University g_bt_bs_88@yahoo.co.jp

P1-22: Neural basis for associative face memory in the monkey anterior inferior temporal cortex

Satoshi Eifuku, Ryuzaburo Nakata, Taketoshi Ono, Ryoji Tamura

Dept Integr Neurosci, Univ Toyama, Grad Sch Med Pharm Sci, Toyama, Japan se@med.u-toyama.ac.jp

P1-23: A direct interview with a patient who recovered from the persistent vegetative state

Ayaka Sugiura [1], Hiromasa Takemura [2,3], Takamitsu Yamamoto [4], Naotsugu Tsuchiya [5-7]

[1] Department of Life and Cognitive Sciences, The University of Tokyo, [2] JSPS Research Fellow, [3] Department of Life Sciences, The University of Tokyo, [4] Department of Advanced Medical Science and Neurological Surgery, Nihon University School of Medicine, Japan, [5] Japan Science and Technology Agency, [6] RIKEN Brain Science Institute, [7] Division of Biology, California Institute of Technology king_of_currumpaw@mac.com

P1-24: Cognitive rehabilitation using a brain activation measuring instrument patients with disturbance of consciousness (two cases)

Kimihiko Suzuki [1], Atushi Tujio [2], Kyosuke Kobuchi [2], Aya Yoshida [2], Ai Shimozawa [2], Shoji Nakamura [3], Tomohiro Imai [3], Mana Kitera [3], Koki Ide [3], Yuko Okumura [3], Kiyoshi Hasegawa [4], Takeshi Ogino [4]

[1] Taisei Gakuin University Faculty of Human Studies, [2] Nogami Hospital Department of Rehabilitation, [3] Katsuragi Hospital Department of Rehabilitation, [4] Hitachi Corporation Human Oriented Business Unit Business Incubation Division suzuki@tgu.ac.jp

P1-25: Stimulating the dream body. Transcranial direct current stimulation (tDCS) of the sensorimotor cortex during rapid eye movement (REM) sleep dreaming

Valdas Noreika [1], Bigna Lenggenhager [2], Ahmed Karim [3], Tonio Ball [4], Tiina Kontto [1], Riitta Parkkola [1], Antti Revonsuo [1], Katja Valli [1], Jennifer Windt [5]

[1] University of Turku, [2] Sapienza University of Rome, [3] University of Tübingen [4] University of Freiburg, [5] Johannes Gutenberg University, Mainz bigna.lenggenhager@gmail.com

P1-26: Experimental and computational approach to dynamic body boundary problem .

Yuki Sato [1], Hiroyuki Iizuka [2], Takashi Ikegami [1]

[1] General Systems Sciences, The Graduate School of Arts and Sciences, The University of Tokyo, Japan, [2] Graduate School of Information Science and Technology, Osaka University, Japan yuki@sacral.c.u-tokyo.ac.jp

P1-27: Forward displacement of the final position of a non-retinotopically moving bar

Yuki Yamada [1,2], Takahiro Kawabe [1]

[1] Kyushu University, [2] Japan Society for the Promotion of Science yy@psycho.hes.kyushu-u.ac.jp

P1-28: Rubber hand illusion, empathy, and schizotypal experiences in terms of self-other representations

Tomohisa Asai, Yoshihiko Tanno

The University of Tokyo as@beck.c.u-tokyo.ac.jp

P1-29: The problem of the symmetry thesis

Ling-Fang Kuo [1], Allen Houg [2]

[1] Institute of Philosophy of Mind and Cognition, National Yang Ming University, [2] Institute of Philosophy of Mind and Cognition, National Yang Ming University sierra214135@gmail.com

P1-30: Neural processes for pseudo perceptual switching using bistable figure

Yusuke Yokota, Tetsuto Minami, Shigeki Nakauchi

Toyoashi University of Technology yokota07@vpac.cs.tut.ac.jp

P1-31: Mind-sightedness: autism and the theory of mind

Emma Chien

Department of Philosophy, University of Alberta, Canada emmapchien@gmail.com

P1-32: Body scheme derives body image in a flock, swarm and herd

Yukio-Pegio Gunji, Takashi Murakami, Yuta Nishiyama, Takayuki Niizato, Kohei Sonoda

Department of Earth & Planetary Sciences, Faculty of Science, Kobe University yukio@kobe-u.ac.jp

P1-33: An attempt to analyze cell assembly dynamics by using a dual information task

Tomoaki Nakazono [1,2], Susumu Takahashi [3,4], Yoshio Sakurai [1]

[1]Dept Psychology, Kyoto Univ., Kyoto, Japan, [2]JSPS Research Fellow, Tokyo, JAPAN [3]Intelligent Systems, Kyoto Sangyo Univ., Kyoto, Japan, [4]PRESTO, JST, Kawaguchi, Japan tnakazono@psy.bun.kyoto-u.ac.jp

P1-34: Acquisition of innate abilities

Richard Davies Gill

Three Wells House, Station Road, Bourton on the Water, Gloucestershire, GL54 2AA, UK richardgills@googlemail.com

P1-35: Does Attention Construct Our Experience?

Shun-Pin Hsu [1], Allen Y. Houg [2]

National Yang-Ming University [1] hsu.shunpin@gmail.com

P1-36: On saving the self: Postdictive shifts of sense of agency by monetary gain and loss

Keisuke Takahata [1,3], Hidehiko Takahashi [2,3], Takaki Maeda [1], Taro Muramatsu [1], Tetsuya Suhara [3], Motoichiro Kato[1]

[1] Department of Neuropsychiatry, Keio University School of Medicine [2] Department of Psychiatry, Kyoto University Hospital [3] Molecular Imaging Center, National Institute of Radiological Sciences ksk-takahata@nifty.com

P1-37: Analysis of playing clusters and cliques of wild chimpanzees: The physical and cognitive structure of social play among wild chimpanzees

Masaki Shimada

Department of Animal Sciences, Teikyo University of Science masakishimada@japan.email.ne.jp

P1-38: The influence of mind learning through writing on the knowledge transformation

Lih-Lin Leou

Information office Department of Education, Taipei city Government leou8518@ms27.hinet.net

P1-39: Attenuation of Rubber Hand Illusion coincides with detection of visual feedback delay

Tatsuya Suzuki, Sotaro Shimada

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ce11047@meiji.ac.jp

P1-40: Factors determining grapheme-color associations in multilingual synesthetes

Eun-Hye Shin, Chai-Youn Kim

Department of Psychology, Korea University 10638311@hanmail.net

P1-41: Entangled ego: consideration of consciousness of conjoined twins

Ryuta Aoki [1,2]

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P1-42: Significance of letter recognition concerning with letter familiarization

Mayumi Toshima [1], Tetsuo Ishikawa [2,3], Ken Mogi [3]

[1] The Graduate University for Advanced Studies, [2] Tokyo Institute of Technology, [3] Sony Computer Science Laboratories, Inc.
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P1-43: One's own name is connected to consciousness

Toshiki Nakane [1,2], Makoto Miyakoshi [2], Toshiharu Nakai [2], Shinji Naganawa [1]

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P1-44: Does perceptual learning require consciousness or attention?

Julia D.I. Meuwese [1], H. Steven Scholte [1], Victor A.F. Lamme [1,2]

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P1-45: Effect of facial color on subliminal/supraliminal processing of fearful facial expressions

Kae Nakajima, Tetsuto Minami, Shigeaki Nakauchi

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P1-46: Metaconsciousness: Information theory meets embedded consciousness

Francesco M.S. Giorlando [1], Anastasia A. Gorbunova [2]

[1] Melbourne University, [2] Monash University frank@giorlando.org

P1-47: What synesthesia tells us about functionalism

Yu-Shin Su

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P1-48: Where am I ? On localizing the Self

Heiko Hecht [1], Jakub Limanowski [2]

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P1-49: Where and how anscombe and descartes went wrong

Tomoyuki Yamada

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P1-50: Defense of the Innateness Hypothesis of the mental function

Chia-Hua Lin

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P1-51: An ERP study on temporal assimilation between the two neighboring short time intervals in the visual modality

Atsushi Nagaike [1], Takako Mitsudo [1], Yoshitaka Nakajima [2], Katsuya Ogata [1], Takao Yamasaki [1], Yoshinobu Goto [3], Shozo Tobimatsu [1]

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P1-52: Behavioral game theory in chimpanzees: building a novel experimental regime

Christopher Flynn Martin[1], Rahul Bhui[2], Peter Bossaerts[2], Tetsuro Matsuzawa[1], Colin Camerer[2]

[1] Department of Behavioral and Brain Sciences, Kyoto University [2] Department of Humanities and Social Sciences, California Institute of Technology martin@pri.kyoto-u.ac.jp

P1-53: Interpretation of utterances based on interactive sequences: Experimental comparisons between 6-year-olds and adults

Katsuhiko Ishikawa [1], Kazuhide Hashiya [2]

[1] Kyushu University, Graduate School of Human Environment Studies, [2] Kyushu University, Faculty of Human Environment Studies ishikawa.kt@gmail.com

P1-54: Disagreement internalized – normative implications of acting on self-trust

Amir Konigsberg

[1] Princeton University [2] The Hebrew University akonigsb@princeton.edu

P1-55: Dual-process shifting

Weng, Fu-te, Chiang, Tzu-ching

Department of Psychology, National Chung Cheng University zuxfoucault@gmail.com

P1-56: Implicit learning of sequential and non-sequential artificial grammar

Krzysztof T. Piotrowski, Zbigniew Stettner, Michal Wierzhon

Jagiellonian University stettner@apple.phils.uj.edu.pl

P1-57: Is semantic memory more primitive than episodic memory?

Ying-Tung Lin

Philosophisches Seminar, Johannes Gutenberg-Universität Mainz liny@uni-mainz.de

P1-58: Cueing prior probability of a target results in graded improvements in behavior but categorical changes in human early visual cortical activity

Yuko Hara, Justin L. Gardner

Gardner Research Unit, RIKEN Brain Science Institute, Wako, Saitama, JAPAN yuko_hara@brain.riken.jp

P1-59: Core self and the problem of the self

Jorge Gonçalves

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P1-60: How aliens help us to embrace content internalism

Thomas Benda

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P1-61: Silencing awareness of change by background motion

Jordan W. Suchow, George A. Alvarez

Department of Psychology, Harvard University suchow@fas.harvard.edu

P1-62: Attention and visual consciousness: How does the conceptual content of perception become conscious?

Mineki Oguchi

Brain Science Institute, Tamagawa University, Tokyo, Japan mineki0120@hotmail.com

P1-63: The person identity priming effect modulated by depersonalized tendency

Noriaki Kanayama [1,2] Hideki Ohira [3] Kazuo Hiraki [1]

[1] Graduate School of Arts and Sciences, The University of Tokyo [2] Japan Society for the Promotion of Science [3] Graduate School of Environmental Studies, Department of Psychology, Nagoya University kanayama@ardbeg.c.u-tokyo.ac.jp

P1-64: Underlying mechanism of subliminal mere exposure effect -When your pupil constricts, you will like what you unconsciously see-

Sanae Yoshimoto [1,2], Hisato Imai [3], Tsutsu Takeuchi [1]

[1] Department of Psychology, Japan Women's University, [2] JST CREST, [3] Department of Psychology, Tokyo Woman's Christian University s.yoshimoto3141@gmail.com

P1-65: Is there such a thing as normal perception? Lessons from synaesthesia and hallucinations

Noam Sagiv

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P1-66: Vection induction without the awareness of global motion

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P1-67: Free energy and continuous flash suppression

Bryan Paton [1,2], Jakob Hohwy [1], Joshua Skewes [3], Torben Lund [3]
[1] SOPHIS, Department of Philosophy, Monash University, Australia; [2] School of Psychology & Psychiatry, Monash University, Australia; [3] CFIN, Interacting Minds, Århus University, Denmark bryan.paton@monash.edu

P1-68: Sensing fear before seeing it: Fear detection independently of visual awareness

Bernard M.C. Stienen [1], Beatrice de Gelder [1,2]
[1] Laboratory of Cognitive and Affective Neuroscience, Tilburg University, Tilburg, The Netherlands, [2] Martinos Center for Biomedical Imaging, Massachusetts General Hospital and Harvard Medical School, Charlestown, Massachusetts, USA bstienen@gmail.com

P1-69: The prefrontal parietal network, theta burst TMS and metacognitive awareness

Daniel Bor [1,2], Arin Baboumian [3], Alex Henderson [3], Anil K. Seth [1,2]
[1] Sackler Centre for Consciousness Science, University of Sussex, UK, [2] School of Informatics, University of Sussex, UK [3] School of Psychology, University of Sussex, UK d.bor@sussex.ac.uk

P1-70: Forward and backward attention differently induce mislocalization of visual stimuli

Sung-en Chien[1], Fuminori Ono[1], Katsumi Watanabe[1,2,3]
[1]The University of Tokyo ,[2]Japan Science and Technology Agency,[3]National Institute of Advanced Industrial Science and Technology chiensungen@gmail.com

P1-71: Contextual cuing effect with self motion

Taiga Tsuchiai [1], Kazumichi Matsumiya [1,2], Ichiro Kuriki [1,2], Satoshi Shioiri [1,2]
[1] Graduate School of Information Sciences, Tohoku University, [2] Research Institute of Electrical Communication, Tohoku University taiga@iec.tohoku.ac.jp

P1-72: A computational model of conscious and unconscious level processing: Consciousness is module combinations formed on the fly

Oka Natsuki, Honda Toru, Sakamoto Yuta, Yonei Shoji, Sakato Tatsuya, Ozeki Motoyuki
Department of Information Science, Graduate School of Science and Technology, Kyoto Institute of Technology nat@kit.ac.jp

P1-73: Ruminative self-focus and heart rate variability in daily life

Keisuke Takano, Yoshihiko Tanno
Graduate School of Arts and Sciences, the University of Tokyo takano@beck.c.u-tokyo.ac.jp

P1-74: Adults with high-functioning autism learn explicitly in an implicit sequence learning task

Axel Cleeremans [1], Kai Vogeley [2], Bert Timmermans [2]
[1] Université Libre de Bruxelles, Consciousness Cognition & Computation group, [2] University of Cologne, Neuroimaging group, Dpt. of Psychiatry axcleer@ulb.ac.be

P1-75: Cognitive achievement of meditative “pure consciousness”: sentence comprehension by a Japanese speed-reading expert

Hiromitsu Miyata[1,2], Shigeru Watanabe[2], Yasuyo Minagawa-Kawai[2], Kazuhiro Ueda[3], Toyofumi Sasaki[4]
[1] Japan Society for the Promotion of Science, [2] Keio University, [3] The University of Tokyo, [4] NBS Japan Society of Speed Reading Education miyatahiromitsu@gmail.com

P1-76: The "fourth state of consciousness": a quantitative meta-analysis of neuroimaging studies on meditation

Marco Sperduti [1], Pénélope Martinelli [1], Pascale Piolino [1,2]
[1] CNRS, FRE 3292, Laboratoire de Psychologie et Neuropsychologie Cognitive, Paris, France, [2] Université Paris Descartes, Institut de Psychologie, Paris, France marcosperduti@yahoo.it

P1-77: Greater effect of less visible signals on implicit probability learning in perceptual decision making

Shigeaki Nishina[1], Dongho Kim[2], Kazuhisa Shibata[2], Yuka Sasaki[3], Takeo Watanabe[2]
[1] Honda Research Institute Japan, [2] Department of Psychology, Boston University, [3] Department of Radiology, Harvard Medical School nishina@jp.honda-ri.com

P1-78: Resting state brain activity during propofol sedation in healthy subjects and in patients with disorders of consciousness

P Guldenmund, P Boveroux, M Boly, A Vanhaudenhuyse, M-A Bruno, Q Noirhomme, A Demertzi, S Lauwick, M Lamy, C Degueldre, A Plenevaux, C Schnakers, V Bonhomme, S Laureys, A Soddu
Coma Science Group, Cyclotron Research Centre, University of Liège, Liège, Belgium / Neurology Department, CHU Sart Tilman Hospital, University of Liège, Liège, Belgium guldenmund@hotmail.com

P1-79: The predicted present in robotic and natural systems: implications for cognition and consciousness

Owen Holland

Sackler Centre for Consciousness Science School of Informatics University of Sussex O.E.Holland@sussex.ac.uk

P1-80: Decoding Attention for Real-time Real world applications

Jinendra Ekanayake [1,2] Sam Schwarzkopf [1,2] Geraint Rees [1,2]

[1] Wellcome Trust Center for Neuroimaging, University College London [2] Institute of Cognitive Neuroscience, University College London
jineks7@gmail.com

P1-81: The change in the body image induced by the rubber hand illusion according to the shape of the rubber hand

Koshiro Yamamoto, Naohiro Fukumura

Toyohashi University of Technology koshiro.y.tut@gmail.com

P1-82: Being in time

Shimon Edelman [1], Tomer Fekete [2]

[1] Cornell University, [2] Stony Brook University edelman@cornell.edu

P1-83: Synesthetic cross-modal sound-color mapping

J. Wang[1], D. Cai[1], Nobuyoshi Asai[2], Noriko Nagata[3], Asako Fukumoto[4]

[1] University of Tsukuba, [2] University of Aizu, [3] Kwansei Gakuin University, [4] University of Tokyo fukuasako@gmail.com

P1-84: Would cognitive control modulate the bottleneck of the mind ? Metacognition impaired by cognitive control magnitude

Sarah Kouhou, Timothy Shallice

SISSA-ISAS- International School of Advanced Studies, Trieste, Italy skouhou@sissa.it

P1-85: Activity of macaque prefrontal neurons during oculomotor delayed-response performance may reflect explicit memory processes

Akio Tanaka[1], Shintaro Funahashi [1,2]

[1] Graduate School of Human and Environmental Studies, Kyoto University, [2] Kokoro Research Center, Kyoto University
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P1-86: Who is the most effective in implicit learning process? The role of individual differences

Agnieszka Poplawska, Alina Kolanczyk, Radosław Sterczyński, Marta Kwiecień

Warsaw School of Social Sciences and Humanities apoplawska1@swps.edu.pl

P1-87: Synaesthetic letter-color binding is mediated by type-based association

Hiroki Koga, Jun Saiki, Hiroki Yamamoto

Graduate School of Human and Environmental Studies, Kyoto University koga@cv.jinkan.kyoto-u.ac.jp

P1-88: Resources and implicit learning

Radosław Sterczyński, Marta Kwiecień, Agnieszka Poplawska

Warsaw School of Social Sciences and Humanities Sopot Campus rsterczyński@swps.edu.pl

P1-89: Monkeys understand other's attentional state by reading gaze

Chizuko Murai [1], Masaki Tomonaga [2].

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POSTER SESSION 2 (1:30pm-3:30pm)

Venue: 2F Hall I-III

P2-1: Daisetz Suzuki's two layers of the unconscious

Futoshi Kobayashi

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P2-2: Neural correlates of the undermining effect of monetary reward on intrinsic motivation

Kenji Matsumoto [1], Kou Murayama [2], Madoka Matsumoto [1], Keise Izuma [1,3]

[1] Tamagawa University Brain Science Institute, [2] University of Munich, [3] California Institute of Technology matsumot@lab.tamagawa.ac.jp

P2-3: Agency and self-consciousness under cognitive load

Oliver A Kannape [1], Olaf Blanke [1,2]

[1] Laboratory of Cognitive Neuroscience, École Polytechnique Fédérale de Lausanne, Switzerland [2] Department of Neurology, University Hospital of Geneva, [Switzerland oliver.kannape@epfl.ch](mailto:Switzerland.oliver.kannape@epfl.ch)

P2-4: The emotion effect on facial emotion recognition

Ya-hsuan Chen [1], Ching-ling Yu [1], Yu-ting Huang [1], Yi-ru Chen [1], & Shiau-hua Liu [1,2]

[1] Department of Counseling and Clinical Psychology, National Dong-Hwa University, Taiwan. [2] Cognitive Neuropsychology Lab, National Dong-Hwa University, Taiwan. u9783044@ems.ndhu.edu.tw

P2-5: Avoidance of attentional blink in grapheme-color synesthesia

Takemasa Yokoyama, Hidekazu Yasuhara, Mai Saiki, Shinichi Kita

Department of Psychology Kobe University yokoyama@lit.kobe-u.ac.jp

P2-6: Contributions of configural information to the synchronization in the binocular rivalry change timing

Shinichirou Misaka[1], Yuichi Wada[1].

[1] Graduate School of Information Sciences, Tohoku University. misa22@cog.is.tohoku.ac.jp

P2-7: Do non-human animals have episodic memory?

Misa Wen, Jin Zhu

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P2-8: Is there a Nonconceptual Point of View?

Hui-Ming Chin[1], Allen Y. Houg[2]

Institute of Philosophy of Mind and Cognition, National Yang Ming University vhmchin@gmail.com

P2-9: Consciousness and the contentious hedonist

Jessica Maree Birkett

University of Sydney, Australia jessbirkett@gmail.com

P2-10: Accomodating abstractness across the perceptual/conceptual divide

Katarzyna Kobos

PhD earned from the University of Lodz, Poland (Chair of Analytic Faculty) Currently unaffiliated kasia.kobos@gmail.com

P2-11: Imitation and visual perspective of the model: Interactive effects of view and congruence of the body facilitate imitation

Rui Watanabe [1,2], Takahiro Higuchi [1], Kuniyasu Imanaka [1],

[1] Department of Health Promotion Science, Tokyo Metropolitan University, Japan, [2] Kiyose Rehabilitation Hospital, Japan atamatansan@hotmail.com

P2-12: Body language: measuring lateralized electromyographic response in the Implicit Association Test

Stéphane Doyen, Olivier Klein, Axel Cleerenans

University of Brussels sdoyen@ulb.ac.be

P2-13: Choice blindness in the attractiveness of paintings

Sayako Masuda [1], Seiko Hoshi [1], Shigeru Watanabe[1,2]

[1] Center for Advanced Research on Logic and Sensibility (CARLS), Keio University, [2] Department of Literature, Keio University masuda.s@flet.keio.ac.jp

P2-14: Differential factors for time retrospection and time production

Kohske Takahashi [1,2], Katsumi Watanabe [1,3]

[1] The University of Tokyo, [2] Japan Society for the Promotion of Science, [3] Japan Science and Technology Agency
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P2-15: Validation studies of the Consciousness Quotient Inventory (CQI)

Research director at Consciousness Quotient Institute [1], Lect. Univ. at Faculty of Psychology, Ecological University of Bucharest, Romania [2], Managing partner at Scientific American Mind Romania Info-Health Network [3], Managing partner at Info-Health Network [4].

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P2-16: Development of face perception in infant rhesus macaques

Ikuma Adachi, Masaki Tomonaga, Tetsuro Matsuzawa

Primate Research Institute, Kyoto University, Japan adachi@pri.kyoto-u.ac.jp

P2-17: Seeing without knowing: qualia are present during inattentive blindness

Annelinde R.E. Vandenbroucke, Johannes J. Fahrenfort, Victor A.F. Lamme

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P2-18: Dimensions of metacontrast

Jérôme Sackur

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jerome.sackur@gmail.com

P2-19: Representational primitives in perceptual experience

John O'Dea

University of Tokyo odea@aless.c.u-tokyo.ac.jp

P2-20: Exploring the texture of communication: The transparency of consciousness that links grammar and lexicon

Ryoko Uno [1], Keisuke Suzuki [2], Takashi Ikegami [3]

[1] Institute of Technology, Tokyo University of Agriculture and Technology, [2] Laboratory for Adaptive Intelligence, RIKEN, Brain Science Institute, [3] The Graduate School of Arts and Sciences, the University of Tokyo ryokouno@cc.tuat.ac.jp

P2-21: Differential BOLD activity associated with subjective and objective reports during "blindsight" in normal observers

Hesselmann G [1], Hebart M [2,3], Malach R [1]

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P2-22: Higher-order motion information increases perceived duration

Kentaro Yamamoto, Kayo Miura

Kyushu University yama-ken@kyudai.jp

P2-23: Development of contextual inference about the ambiguous referent in other's utterance: Experimental comparison between 3- and 5-year-old children

Taro Mutakami [1], Kazuhide Hashiya [2]

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P2-24: Crossmodal constraints on human visual awareness: Can auditory semantic context modulate binocular rivalry?

Yi-Chuan Chen [1], Su-Ling Yeh [2], Charles Spence [1]

[1] Department of Experimental Psychology, University of Oxford, [2] Department of Psychology, National Taiwan University
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P2-25: Self-consistent learning of the environment

Kukjin Kang

RIKEN Brain Science Institution. Amari's Lab for Mathematical Neuroscience kkang@brain.riken.jp

P2-26: Introspection: a little bit more than mere confabulation

John Michael [1], Oliver Kauffmann [2]

[1] Aarhus University, Denmark, [2] Aarhus University, Denmark joal@dpu.dk

P2-27: Neural correlates of implicit memory and subjective feeling of familiarity

Han-Yuan Lai [2], Chi-Lan Yang [1], I-Min Lai [2], Yi-Jing Jiang [2], Xing-Hao Ding [1], Jo-Mei Hung [2], Chun-Yu Lin [1,2]

[1] Department of Psychology, [2] Institute of Cognitive Science, National Cheng Kung University, Taiwan han8944@gmail.com

P2-28: Retino-tectal pathway is essential for visually guided saccades after V1 lesion: an implication for neural network of ‘blindsight’

Rikako Kato [1,2], Kana Takaura [1,3], Takuro Ikeda [1,2], Masatoshi Yoshida [1,3], Tadashi Isa [1,2,3]

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P2-29: Conscious perception affects unconscious perception with the deployment of attention

Yung-Hao Yang, Su-Ling Yeh

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P2-30: Self-consciousness and Indexicals: talking about the world without a “self”

Nevia Dolcini

University of Macau, Macau (China), Faculty of Social Sciences and Humanities, Department of History ndolcini@umac.mo

P2-31: Implicit modulation of visual detection of facial expression

Hiroshi Ueda [1], Aki Kondo [1], Kohske Takahashi [1,2], Katsumi Watanabe [1,3]

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P2-32: Cortical areas related to both the self-body parts drawing and the body image: a functional MRI study

Chisato Yamate[1], Masato Taira[2]

[1]ARISH,Nihon University, [2]Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University adti07005@g.nihon-u.ac.jp

P2-33: Selective face processing in the vegetative state: evidence from fMRI

Haggai Sharon [1,2,3], Yotam Pasternak [1], Eti Ben Simon [1,3], Michal Gruberger [1,4], Adi Maron-Katz [1,3], Talma Hendler [1,3,4]

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P2-34: Studying mind time structure with a video feedback machine

Alexander Woodward, Yuta Ogai, Takashi Ikegami

Department of General Systems Studies, University of Tokyo, Japan alex.w.nz@gmail.com

P2-35: Using complexity measures in consciousness

Jacobo D. Sitt [1,2,6], Frédéric Faugeras [5,6], Laurent Cohen [5,6,7], Lionel Naccache [5,6,7], Stanislas Dehaene [1,2,3,4]

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P2-36: Rethinking Consciousness and Communication

Tetsuya Kono [1], Yasuko Kitano [2]

[1] Rikkyo University, [2] Hosei University yasukos@sannet.ne.jp

P2-37: Dynamics of evidence accumulation in subliminal and conscious conditions: an EEG/MEG study

Lucie Charles [1,2,3,4], Stanislas Dehaene [1,2,3,4]

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P2-38: An extended case study on the phenomenology of spatial-form synaesthesia

Cassandra Gould, Tom Froese, Adam Barrett, Anil Seth

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P2-39: The gap effect in great apes

Fumihiko Kano [1,2], Masaki Tomonaga [1]

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P2-40: Anarchic Hand Syndrome and the sense of agency

Mads Jensen [1] Morten Overgaard [1,2]

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P2-41: Effect of processing fluency on visual one-shot learning

Tetsuo Ishikawa [1], Ken Mogi [2]

[1] Tokyo Institute of Technology, [2] Sony Computer Science Laboratories, Inc. bracket@cilas.net

P2-42: The interaction between embodiment of emotions and emotion discrimination

I-wen Huang [1], Yung-sheng Lin [1], Sih-han Liao [1], Syun-sian Zeng [1], Han-fang Hsiao [1], Chong-sin Syu [1], Li-shin Jhang [1,2], & Shiao-hua Liu [1,2]

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P2-43: Consonance and consciousness: Harmonies in fMRI signals correlate with perceptual and motor events in healthy subjects; dissonance characterizes schizophrenia

Dan Lloyd

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P2-44: Insights from anthropological and clinical research into altered (non-ordinary) states of consciousness

Angel Cvetkov [1,2], Stanislav Grof [3, 4], Jeremy Narby [5]

[1] Anthropology, [2] Philosophy of Mind, [3] Psychiatry, [4] Transpersonal Psychology, [5] Anthropology angelcvetkov@yahoo.com

P2-45: The ambivalent stimulus

Maxim I. Stamenov

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P2-46: Electrophysiological correlates of attention-spreading for a partly-occluded object

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P2-47: The relationship between subjective confidence and performance in implicit learning

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P2-48: Neural substrates of multifaceted autobiographical memory: A meta-analysis

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P2-49: Response strategies in sequential behavior in rats

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P2-50: Priming and awareness modulated by quality of representation

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P2-51: Older adults overestimate their physical ability in stepping over action

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P2-52: The effect of auditory stimuli on visual size perception

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P2-53: Conscious selection of unconscious representations in visual working memory

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P2-54: Effect of auditory stimuli in color perception; What cognitive/perceptual processes are involved in lightness-pitch correlation?

Tomoaki Nakamura, Yukio-Pegio Gunji

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P2-55: Separability and commonality of auditory and visual bistable perception

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P2-56: Brain mechanisms of bodily self-consciousness: neurological evidence from heautoscopy

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P2-57: Epiphenomenalism and methodologies for understanding consciousness

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P2-58: Towards the use of DTI techniques in the diagnostic process of the vegetative and the minimally conscious states

Davinia Fernández-Espejo [1], Damian Cruse [1], Beth Parkin [1], Srivas Chennu [2], Adrian M. Owen [1].

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P2-59: The relationship between self-awareness and theory of mind in healthy adults

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P2-60: Coherence between color and shape promotes interocular grouping during binocular rivalry

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P2-61: An experimental study of behavioral mimicry in chimpanzees using matching to sample task

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P2-62: Spatial working memory in the monkeys with unilateral lesion of V1

Kana Takaura [1,2], Masatoshi Yoshida [1,2], Tadashi Isa [1,2,3]

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P2-63: The capacity of visual short-term memory for expanding and contracting objects

Junichi Takahashi [1], Yousuke Kawachi [2], Jiro Gyoba [1]

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P2-64: Mental ownership and essential thoughts for perception

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P2-65: Unconscious processing of illusory line orientation

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P2-66: Constraints for Phenomenal Quality Realists

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P2-67: A dozen strategies for investigating the biological evolution of consciousness

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P2-68: Prediction of future memory cognition by multivariate pattern analysis

Takamitsu Watanabe [1], Satoshi Hirose [1], Hiroyuki Wada [2], Masaki Katsura [2], Junichi Chikazoe [1], Koji Jimura [1], Yoshio Imai [2], Toru Machida [2], Ichiro Shirouzu [2], Yasushi Miyashita [1], Seiki Konishi [1]

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P2-69: Neural networks for action representation

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P2-70: Number of delta oscillating neurons increases after ejaculation in the nucleus accumbens in male rats

Jumpei Matsumoto [1], Susumu Urakawa [2], Etsuro Hori [1], Taketoshi Ono [2], Hisao Nishijo [1]

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P2-71: Hierarchy of the dorsal attention network revealed by causal connectivity analysis

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P2-72: Temporal expectation of the first target onset attenuates the attentional blink

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P2-73: Neural correlates of subjective colors with Benham's top: a functional MRI study

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P2-74: Mental transformation between the self and others

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P2-75: Rapidly measuring the speed of unconscious learning: Amnesics learn quickly and happy people slowly

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P2-76: Restrictions in access: A cognitive account of the epistemic gap

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P2-77: Violent offenders are impaired in recognizing emotions in the context of task irrelevant yet threatening cues

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P2-78: Image-based and perceptual representation of materials

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P2-79: Sequential effects in attractiveness judgment for faces

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P2-80: Relationship between empathy and social skill

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P2-81: The role of local adaptation and target transience in subjective disappearance of a moving target with flickering flankers

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P2-82: Can Hume save himself? On the role of contiguity in the constitution of personal identity

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P2-83: Quantifying stimulus dissimilarity in binocular rivalry: Wheatstone revisited

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P2-84: A double positive forms a negative in perceptual enhancement of near-threshold emotional words

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P2-85: Cross cultural differences in unconscious knowledge

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P2-86: Subjectivity, methodological reduction and self-consciousness

Karen Yan

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P2-87: Can we control evaluative responses? Evaluative conditioning with subliminal stimuli and the question of intentional control

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P2-88: Correlation between the activity of deep brain regions and the change of arousal level

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P2-89: The Tell-Tale Heart: Cardio-visual convergence alters tactile perception and self-consciousness

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SUMMARIES

Presidential Address : Ralph Adolphs (California Institute of Technology, Pasadena, California, USA)

17:00-17:45 Thursday June 9

Title: Consciousness and emotion

Summary: Feelings of emotions are a highly salient and ubiquitous aspect of our conscious experience. While much research has focused on visual perception as a model system for studying consciousness, the experience of emotions offers some valuable contrasts. Emotions immediately motivate us to act; emotions immediately come imbued with valence (whether something is good or bad); emotional behaviors show substantial phylogenetic continuity and play important roles in social communication; emotions involve specific subcortical structures such as the amygdala and the hypothalamus. All of these features of emotions may make it more transparent to develop accounts for why conscious experience of them evolved, what functional role it plays, and what its neural correlates are. I will draw on work in humans, monkeys, and rats to discuss emotion experience, and in particular the experience of fear. Our recent studies in a rare patient with bilateral amygdala lesions points to the amygdala as a necessary structure for orchestrating the neural correlates of feeling fear. They also raise questions about why such a “fear module” might have evolved, and how one’s own experience of fear may be related to its detection and recognition in other people.



Keynote Lecture 1: Edmund T Rolls (Oxford Centre for Computational Neuroscience, Oxford, UK)

9:30-10:15 Fri June 10

Title: Pleasure, emotion, decision-making, oscillations, higher order syntactic thoughts, and consciousness

Summary: In Rolls' theory of emotion (2005) it is argued that emotions are states elicited by reinforcers which are the goals for action, the rewards and punishers. It is argued that emotions solve a fundamental problem in Darwinian evolution, for it is much more efficient for genes to specify goals for actions, rewards and punishers, rather than actions or responses. It is shown that the orbitofrontal cortex is important in emotion for it represents primary, unlearned, gene-specified, reinforcers including the taste and texture of food and face expression; performs rapid learning, and reversal, of stimulus-reward associations; and with the pregenual cingulate cortex has activations that are directly correlated with pleasure, the conscious reports of the subjective state associated with rewards. These reward systems in our brains provide inputs to our value based decision-making mechanisms in the ventromedial prefrontal cortex which can correct decisions based on confidence estimates before the outcome is known.

It is shown using integrate-and-fire neuronal networks that decision-making is inherently probabilistic because of noise caused by the random firing times of neurons in the brain (for a given mean rate). It is argued that this mechanism for decision-making applies to decisions involving a choice between the emotional, implicit, evolutionarily old, brain systems, and the rational (reasoning) explicit conscious system that enables gene-specified goals to be deferred, in a decision between the phenotype and the selfish genotype ('phenes' vs genes). This has implications for free will, and determinism. It is argued that consciousness is the state associated with the operation of a system that has evolved for the correction of multistep syntactic reasoning, in a higher order syntactic thought (HOST) theory of consciousness. It is argued that oscillations can facilitate communication between neurons and the speed of neuronal processing, but does not per se provide a computational mechanism for the mental operations involved in consciousness.

Grabenhorst,F. and Rolls,E.T. (2011) Value, pleasure, and choice in the ventral prefrontal cortex. *Trends in Cognitive Sciences* 15: 57-67.

Rolls,E.T. (2005) *Emotion Explained*. Oxford University Press: Oxford.

Rolls,E.T. (2008) *Memory, Attention, and Decision-Making: A Unifying Computational Neuroscience Approach*. Oxford University Press: Oxford.

Rolls,E.T. and Deco,G. (2010) *The Noisy Brain: Stochastic Dynamics as a Principle of Brain Function*. Oxford University Press: Oxford.

Rolls, E. T. (2011) Consciousness, decision-making, and neural computation. Chapter 9, pp. 287-333 in *Perception-Action Cycle: Models, architectures, and hardware*. Eds. V.Cutsuridis, A.Hussain and J.G.Taylor. Springer: New York.

Rolls,E.T. (2012) *Neuroculture*. Oxford University Press: Oxford.



Keynote Lecture 2: Takamitsu Yamamoto (Department of Advanced Medical Science and Neurological Surgery, Nihon University School of Medicine, Japan)**17:45-18:30 Fri June 10****Title: Cerebrospinal stimulation therapy for the treatment of vegetative state and minimally conscious state**

Summary: One hundred and seven patients in vegetative state (VS) were evaluated neurologically and electrophysiologically over three months (90 days) after the onset of brain injury. Among these patients, 21 were treated by deep brain stimulation (DBS). The stimulation sites were the mesencephalic reticular formation (2 patients) and centromedian/parafascicularis nucleus complex (19 cases). Eight of the patients recovered from VS, and these 8 patients showed desynchronization on continuous EEG frequency analysis. The Vth wave of the auditory brainstem response (ABR) and N20 of the somatosensory evoked potential (SEP) could be recorded even with a prolonged latency, and the pain-related P250 was recorded with an amplitude of over 7 μ V. Sixteen (14.9%) of the 107 VS patients satisfied these criteria in our electrophysiological evaluation. The definition of the minimally conscious state (MCS) is characterized by inconsistent but clearly discernible behavioral evidence of consciousness. Spinal cord stimulation achieved consistent discernible behavioral evidence of consciousness, and emergence from the bedridden state in 6 of 10 MCS patients. These 6 MCS patients corresponded to our electrophysiological criteria. Cerebrospinal stimulation therapy can be a useful method for the treatment of prolonged coma patients, if candidates are correctly selected with electrophysiological evaluation.

- 1.Yamamoto T, Katayama Y, Tsubokawa T et al.: Deep brain stimulation for the treatment of vegetative state. EJN 32: 1145-1151, 2010
- 2.Tsubokawa T, Yamamoto T, Katayama Y et al.: Deep brain stimulation in a persistent vegetative state: follow-up results and criteria for selection of candidates. Brain Injury 4: 315-327, 1990



Keynote Lecture 3: Fiona Macpherson (Department of Philosophy, University of Glasgow, UK)

9:30-10:15 Sat June 11

Title: Cognitive penetration of colour experience

Summary: Can the phenomenal character of perceptual experience be altered by the states of one's cognitive system, for example, one's thoughts or beliefs? If one thinks that this can happen (at least in certain ways that are identified in the paper) then one thinks that there can be cognitive penetration of perceptual experience; otherwise, one thinks that perceptual experience is cognitively impenetrable. I claim that there is one alleged case of cognitive penetration that cannot be explained away by the standard strategies one can typically use to explain away alleged cases. The case is one in which it seems subjects' beliefs about the typical colour of objects affects their colour experience. I propose a two-step mechanism of indirect cognitive penetration that explains how cognitive penetration may occur. I show that there is independent evidence that each step in this process can occur. I suspect that people who are opposed to the idea that perceptual experience is cognitively penetrable will be less opposed to the idea when they come to consider this indirect mechanism and that those who are generally sympathetic to the idea of cognitive penetrability will welcome the elucidation of this plausible mechanism.



Keynote Lecture 4: Nicholas Humphrey (Emeritus Professor, London School of Economics, UK)

17:30-18:15 Sat June 11

Title: Soul dust: The magic of consciousness

Summary: How is consciousness possible? What biological purpose does it serve? In my new book *Soul Dust*, I propose a radically new theory. Consciousness, I argue, is nothing less than a magical mystery-show that we stage for ourselves inside our own heads. This self-made show lights up the world for us and makes us feel special and transcendent. Thus consciousness paves the way for spirituality, and allows us, as human beings, to reap the rewards, and anxieties, of living in what I call the Soul niche. In this Lecture I shall concentrate on the first part of this story: the evolution of sensations as a kind of pantomime performance, staged in an inner theatre. And I shall discuss how this performance has been designed by natural selection to give us, the privileged spectators, the illusory impression that we are experiencing something it is like, like something it actually cannot be!



Keynote Lecture 5: David Eagleman (Department of Neuroscience, Baylor College of Medicine, USA)

9:30-10:15 Sun June 12

Title: Kaleidoscopic varieties of conscious experience

Summary: Imagine a world of magenta Tuesdays, tastes that have shapes, and wavy green symphonies. More than 1 in 100 people experience the world this way in a condition called synesthesia, in which normal sensory stimulation triggers anomalous sensory experience. Synesthesia comes in many varieties: experiencing the days of the week in color is the most common manifestation, followed by colored letters and numbers; other common varieties include tasted words, colored hearing, numberlines perceived in three dimensions, and the personification of letters and numerals. Synesthetic perceptions are involuntary, automatic, and consistent over time. This condition has fascinated laypersons and scientists with its array of sensory amalgamations, but only recently has it been appreciated how the brains of such individuals yield surprising insights into normal brain function and different forms of consciousness. We here present new data from behavioral experiments with thousands of synesthetes in conjunction with neuroimaging and genetics. In this talk we outline the emerging picture of crosstalk in the synesthetic brain and highlight the remaining questions



SYMPOSIUM 1

(Jun 10, 10:30am-12:30pm)

“Metacognition and consciousness”

Chair: Ryota Kanai (UCL College London, UK)

Summary of the symposium

The goal of this symposium is to open a discussion on the relationship between consciousness and metacognition from a diverse perspective. Metacognition refers to the ability to comment on one's own mental state and is often taken as the touchstone of the presence of consciousness in animals and humans. One important area of progress over the last decade has been the development of operational measures of metacognitive ability both in animals and humans. This exciting progress has now opened the possibility to study the neural basis of metacognition, and to gain insight into the presence or absence of consciousness in animals. Examining both theoretical and methodological progress and issues for metacognition research in the context of consciousness studies is thus crucial for understanding which animals have consciousness or what kind of neural structures support consciousness. In our proposed symposium, we invite researchers from a broad range of fields to discuss these issues. The topic includes neuroimaging of metacognition in humans, metacognition in animals and philosophical approach to metacognition. We expect that both the relevance of metacognition to consciousness and the breadth of the speakers' background make our symposium particularly exciting for the broad audience of the ASSC.

Introduction: Ryota Kanai (University College London, UK)

Talk 1: Decisions about decisions: neural construction of metacognitive confidence

Speaker: Stephen Fleming (University College London, UK)

Abstract: Recent practical and analytic developments in psychophysics have isolated a metacognitive component of behaviour during perceptual decision making. I will present behavioural evidence that this second-order component of decision-making (confidence-in-accuracy) is partially independent of first-order performance, and consider how metacognitive confidence might be constructed from components of the decision process. In these data, confidence, task performance and metacognitive capacity (defined as the ability to discriminate correct from incorrect decisions) can be dissociated across tasks and individuals. The relationship between signal detection theoretic models of decision confidence and different constructs of consciousness will be discussed. Finally, I will present data from structural and functional neuroimaging experiments in humans that aim to provide a window on the neural basis of metacognitive capabilities. I suggest that acquisition of neural data can inform and constrain links between metacognitive behaviour and theoretical constructs of consciousness.

Talk 2: Metacognition and memory systems in primates: Successes and limitations

Speaker: Robert Hampton (Emory University, USA)

Abstract: Metacognition is the monitoring and control of cognitive processing. Because metacognition can involve introspection in humans, it can be indicative of explicit, or declarative, cognition and memory. While metacognition is normally inferred from the ability of humans to verbally comment on mental processes, tests of metacognition appropriate for nonhumans have been successfully developed. I will describe the logic of these paradigms and some potential limitations of them. Studies of metacognition may provide a tool that allows us to discriminate between explicit and implicit cognition in nonhumans.

Talk 3: Metacognitive processes in nonhuman animals?

Title: Peter Carruthers (University of Maryland, USA)

Abstract: I shall examine illustrative data from two experimental paradigms (opt-out and information seeking), each of which is said to demonstrate metacognitive awareness in monkeys and apes. In both cases the data admit of nonmetarepresentational explanations, I shall argue. One of these is that it is the negative valence embedded within the animals' feelings of uncertainty that drives the behaviors in question. But the feelings themselves are not, as some have claimed, nonconceptual metarepresentations of the underlying cognitive state of uncertainty; nor does an animal's awareness and use of such feelings require metarepresentation. These considerations will be placed in a theoretical framework according to which metacognition depends upon equivalent forms of mindreading. Hence we might expect apes to exhibit metacognition

SYMPOSIUM 2

(Jun 11, 3:45pm-5:45pm)

"Consciousness: Powerful or useless?"

Chair: Simon van Gaal (University of Amsterdam, The Netherlands)

Summary of symposium

Does consciousness have any causal power in generating behavior or orchestrating cognitive functions? This question has exercised the imagination of philosophers for centuries, and so far no consensus has been reached. Recently, neuroscientists and psychologists have joined the debates, providing new materials for the debate. In this symposium we review these new results from different disciplines, point out apparent contradictions, and attempt to resolve them within a coherent philosophical framework. Inspired by the seminal Libet experiments, many researchers now believe that consciousness lacks any causal power. Indeed brain imaging data (van Gaal) show that unconscious computations can be extremely powerful and that unconscious information can affect the highest levels of the cognitive and cortical hierarchy, influencing complex cognitive (control) functions of the prefrontal cortex. Does that mean conscious decisions never play a role in the production of overt actions? The answer turns out to be quite complex. For instance, experiments, in which subjects are equally good at detecting a stimulus, but report different subjective levels of awareness, suggest that awareness has some functional advantage at some tasks, but not at others (Lau). In line with this, insights from social psychology (Baumeister) on subjects such as mental practice, anticipation, perspective taking, and overriding automatic processes suggests that consciousness does cause behavior, though its effects are generally indirect and operated in concert with unconscious processes. Some of the contradictions in the literature might emanate from a lack of clarity about what "conscious decisions" mean, which can result in faulty interpretations of data. Philosopher Mele will present a model of conscious deciding, which might help us determine whether the data offered to support claims about the presence/absence of a function of consciousness actually support them. Overall, the presented results and theories (all speakers) point to new directions for future research about the potential functional properties of consciousness.

Talk1: Answering Libet: How conscious thoughts cause behavior

Speaker: Roy F. Baumeister (Florida State University, USA)

Abstract: Do human conscious processes cause behavior, or are they merely a "steam whistle" that results from unconscious activity but lacks any causal power? Many have interpreted research findings by Libet and others to show that conscious thoughts lack causal power. We searched the research literature for experiments in which the independent variable was a conscious thought or state and the dependent variable was behavior. By the logic of research design, such studies demonstrate causal effects of consciousness. Our review, forthcoming in *Annual Review of Psychology*, surveyed research on mental practice and mental simulation, anticipation, planning, reflection and rehearsal, logical reasoning, perspective taking, framing, communication, self-affirmation, and overriding automatic processes. We found abundant evidence that consciousness causes behavior, though its effects were generally indirect and operated in concert with unconscious processes. Consciousness seems especially useful for integrating behavior across time, for linking abstract concepts to specific behaviors, for allowing behavior to be shaped by nonpresent factors, for dealing with multiple competing options or impulses, and for enabling behavior to be shaped by social and cultural factors. A human being whose behavior was not partly caused by conscious events would be far less than a fully functioning human being.

Talk2: Performance capacity matching as a new approach to studying the functions of sensory awareness

Speaker: Hakwan Lau (Columbia University, USA)

Abstract: Recent studies have shown that "unconscious" processing can be surprisingly powerful (cf work in the labs of Lamme, Dijksterhuis, Mattler, Haynes, Dehaene, Bargh, myself, etc). I had taken these results to be a challenge to the notion that sensory awareness has special functional power. Here I criticize my previous arguments. A useful analogy: People without legs can move around (albeit poorly), but we all agree that legs are for locomotion. Likewise, although certain higher cognitive functions can be performed without awareness (just barely better than chance), it does not mean that awareness has no functional advantage. A different approach is to create conditions where subjects are equally good at detecting and discriminating the stimulus, but they report different subjective levels of awareness. Under these performance capacity-matched cases, we observed functional advantage for awareness only in some specific tasks. These results give powerful

constraints for theorizing about sensory awareness in general.

Talk3: A model of conscious deciding

Speaker: Alfred Mele (Florida State University, USA)

Abstract: Some scientists and philosophers have claimed that conscious decisions never play a role in the production of corresponding overt actions and that this spells serious trouble for free will. Sometimes it is claimed that conscious decisions to do things at once (conscious proximal decisions) occur only after the actions have been performed - or, alternatively, before the actions but too late to play a part in causing them. Because a lack of clarity about what "conscious decision" means can result in faulty interpretations of data, a relatively precise model of conscious deciding would help us determine whether the data offered to support these claims actually support them. This paper presents such a model and applies it to some recent data. The model distinguishes conscious decisions from, among other things, causes of such decisions.

Talk4: Nonconscious highlevel information processing and the implications for the functional relevance of consciousness

Speaker: Simon van Gaal (University of Amsterdam, the Netherlands)

Abstract: The evidence for unconscious influences on our actions and decision-making is rapidly accumulating; however, much controversy surrounds the actual complexity and depth of unconscious information processing. Overall, it seems that unconscious information can influence several highly automatic, "low-level" cognitive processes, but that there are some more complex, "high-level" cognitive processes (associated with the prefrontal cortex) that are intuitively so strongly associated with conscious awareness that it seems impossible that these could be triggered unconsciously. In this respect, perhaps the most hotly debated case is the existence of unconscious cognitive control. I will present experiments that show that unconscious information has profound influences on prefrontal cognitive control functions (e.g. response inhibition). To what extent "unconscious cognitive control" is triggered depends on several top-down cognitive factors such as the instructed task-set and attention. These results show that unconscious cognition is actually rather "intelligent" and relatively flexible and impact the current debate about the functional relevance of consciousness.

SYMPOSIUM 3

(Jun 12, 1:30pm-3:30pm)

"Robotics & Consciousness"

Chair: Naotsugu Tsuchiya (PRESTO, JST, Japan, Riken, Japan, California Institute of Technology, USA)

Summary of symposium

What can consciousness research learn from robotics research, and vice versa? Can robotics reveal the essential functions of consciousness by substantiating intelligent robots that interact with humans in a real world? Even if we create intelligent robots in the future, how do we know if they are conscious? Will we have a Turing test for consciousness? Here, we aim to establish a dialogue between robotics and consciousness researches by inviting the robotics researchers to present two novel and complementary approaches to the problem of consciousness. The first approach aims to develop conscious creatures in a bottom-up manner. Creating very complex robots with huge degrees of freedom, they let the robots to interact with a real-world-like environment so that functions of consciousness “emerge developmentally”. The second, a more top-down, approach creates a human-like robot, android, that can interact and merge with the human society. Recent androids, with identical look with the real human mimicking human non-conscious behavior, are mistaken by human observers to be “conscious”. The android research cast a doubt on our intuitive sense of which animals are conscious and even cast a doubt on whether other human beings are conscious. Through the symposium, we keep in mind the two core questions. How can we tell if any computational entity is conscious or not from a third-person perspective? What are the functions of consciousness, without which no robots can compete with humans in a real social world? After the talks by the state-of-art robotics researchers, we invite commentaries from the philosophers and neuroscientists. At the end, we will invite the audience to join the discussion towards the future interaction between robotics and consciousness researches.

Talk1: Emergence of Consciousness from Embodied Interaction Dynamics: A Constructivist Approach with A Simulated Human Fetus

Speaker: Yasuo Kuniyoshi (University of Tokyo, Japan)

Abstract: Consciousness is an emergent global dynamical structure over a collection of strongly coupled cognitive/sensory-motor dynamics. A principled understanding of strongly coupled systems can be obtained only via the constructivist approach. We created robotic models that exhibit purely emergent behavior as a result of having many chaotic sensory-motor dynamics coupled together via physical embodiment. The emergent whole-body movement affects every constituent sensory-motor dynamics, resulting in self-sustained and spontaneous behavioral patterns. This principle is extended to a full-blown human fetus model that autonomously develop through sensory-motor experiences. It consists of a detailed musculo-skeletal model, uterus model, and cortico-spinal nervous system model. Several meaningful behavior patterns emerge, including hand-face contact actions for example, that can be viewed to have some primitive intentional characteristics. In addition to the above principle, we hypothesize that a drastic change of the nature of interaction dynamics after birth, namely, encountering non-self-generated stimuli such as touch by a caregiver and discontent of physiological needs is another important factor of emergence of consciousness.

Talk2: Consciousness appears on robots and androids

Speaker: Hiroshi Ishiguro (Osaka University and ATR, Japan)

Abstract: Consciousness is an emergent global dynamical structure over a collection of strongly coupled cognitive/sensory-motor dynamics. A principled understanding of strongly coupled systems can be obtained only via the constructivist approach. We created robotic models that exhibit purely emergent behavior as a result of having many chaotic sensory-motor dynamics coupled together via physical embodiment. The emergent whole-body movement affects every constituent sensory-motor dynamics, resulting in self-sustained and spontaneous behavioral patterns. This principle is extended to a full-blown human fetus model that autonomously develop through sensory-motor experiences. It consists of a detailed musculo-skeletal model, uterus model, and cortico-spinal nervous system model. Several meaningful behavior patterns emerge, including hand-face contact actions for example, that can be viewed to have some primitive intentional

characteristics. In addition to the above principle, we hypothesize that a drastic change of the nature of interaction dynamics after birth, namely, encountering non-self-generated stimuli such as touch by a caregiver and discontent of physiological needs is another important factor of emergence of consciousness.

Talk3: Artificial Consciousness: Necessary Conditions and the Applied Ethics for Synthetic Phenomenology

Speaker: Thomas Metzinger (the Johannes Gutenberg-Universität Mainz, Germany)

Abstract: Consciousness is an emergent global dynamical structure over a collection of strongly coupled cognitive/sensory-motor dynamics. A principled understanding of strongly coupled systems can be obtained only via the constructivist approach. We created robotic models that exhibit purely emergent behavior as a result of having many chaotic sensory-motor dynamics coupled together via physical embodiment. The emergent whole-body movement affects every constituent sensory-motor dynamics, resulting in self-sustained and spontaneous behavioral patterns. This principle is extended to a full-blown human fetus model that autonomously develop through sensory-motor experiences. It consists of a detailed musculo-skeletal model, uterus model, and cortico-spinal nervous system model. Several meaningful behavior patterns emerge, including hand-face contact actions for example, that can be viewed to have some primitive intentional characteristics. In addition to the above principle, we hypothesize that a drastic change of the nature of interaction dynamics after birth, namely, encountering non-self-generated stimuli such as touch by a caregiver and discontent of physiological needs is another important factor of emergence of consciousness.

CONCURRENT SESSION 1 (June 10, 1:30pm – 3:30pm)

CS1a: Decoding consciousness (June 10, 1:30pm – 3:30pm)

Chair: Anil Seth (University of Sussex, UK)

Venue: 1F

1:30pm- CS1a-1: Correlation within Default Mode Network Can Be Manipulated by Unconscious Operant Conditioning with Real-time fMRI Neurofeedback

Megumi Fukuda [1,2], Mitsuo Kawato [1, 2], Hiroshi Imamizu [2, 3]

[1] Nara Institute of Science and Technology [2] Advanced Telecommunications Research Institute International [3] National Institute of Information and Communications Technology megumi-f@atr.jp

Neurofeedback training is one of the promising tools to cure mental disorders, facilitate rehabilitations, and explore the mechanism of human brain. In real-time fMRI neurofeedback training, subjects are required to modulate their neural activity by monitoring it. However, how subjects learn to modulate their neural activity is not clear, and it is under question whether neural activity can be modulated unconsciously or not. One problem in previous studies is that subjects are given proper conscious strategy to control their neural activity (e.g. motor imagery to modulate activity in the motor cortex). To conclude the debate, we conducted neurofeedback training experiment that requires unconscious operant conditioning of neural activity: subjects participated in a 4 days neurofeedback experiment where they were instructed to increase a feedback score computed from correlation of activity in the lateral parietal region (LP) and the left motor cortex (LM1), which show negative correlation in the resting state and no conscious strategy is known to modulate the correlation. Subjects successfully modulated their neural activity to increase correlation of activity between LP and LM1. Also resting state activity recorded after the neurofeedback training showed increased correlation of activity between task-positive network and task-negative network (default mode network), as the change reflected that in neurofeedback training. This study suggests that changes of neural activity induced by neurofeedback training is unlikely to be explained by changes in subjects' conscious strategy, but likely to be explained by unconscious operant conditioning of neural activity.

1:50pm- CS1a-2: Predicting the conscious experience of other people

Kristian Sandberg [1,2], Bahador Bahrami [2,3], Ryota Kanai [2], Gareth Robert Barnes [4], Morten Overgaard [1], Geraint Rees [2,4]

[1] Cognitive Neuroscience Research Unit, Hammel Neurorehabilitation and Research Center, MindLab, Aarhus University, Denmark, [2] UCL Institute of Cognitive Neuroscience, London, United Kingdom, [3] Interacting Minds Project, Institute of Anthropology, Archaeology, Linguistics, Aarhus University, & Centre of Functionally Integrative Neuroscience, Aarhus University Hospital, Aarhus, Denmark, [4] Wellcome Trust Centre for Neuroimaging, Institute of Neurology, London, United Kingdom. krissand@rm.dk

There has been considerable interest in using multivariate decoding techniques applied to fMRI signals in order to decode the contents of consciousness. The use of such signals has inherent disadvantages due to the delay of the hemodynamic response. Moreover to date it has not been shown possible to generalize the decoding of brain signals from one individual to another. This limits the potential utility of such approaches. Here we used a different approach that circumvented these difficulties by using magnetoencephalographic (MEG) signals to decode the contents of consciousness, and to test whether such correlates generalized reliably across individuals. We recorded the MEG of 8 healthy participants while they viewed an intermittently presented binocular rivalry stimulus consisting of a face and a grating. Using a leave-one-out cross-validation procedure, we trained support vector machines on the MEG signals to decode the rivalry percept. Decoding was significantly better than chance in all participants. We then tested whether a support vector machine trained on MEG signals from one participant could successfully decode the rivalry percept of another. Again, decoding accuracy was significantly better than chance. These findings demonstrate that it is possible to decode perception independently of physical stimulation using MEG signals in near real time in a way that generalizes across individuals. Our findings indicate that certain neural mechanisms universally covary with the contents of visual consciousness, and mark a potentially important step in the design of devices for decoding the contents of consciousness in individuals unable to report their experience behaviorally.

2:10pm- CS1a-3: Detecting conscious and unconscious processing at the single trial level

Jean-Rémi KING [1], Alexandre Gramfort [2], Aaron Schurger [1], Frédéric Faugeras [3], Tristan Bekinschtein [4], Etienne Labyt [1], Catherine Wacongne [1], Lionel Naccache [3], Stanislas Dehaene [1,5].

[1] INSERM-CEA Cognitive Neuroimaging unit, CEA, Neurospin center, Gif-sur-Yvette, FRANCE [2] Martinos Center for Biomedical Imaging, Harvard - Massachusetts General Hospital, Boston, USA [3] CRICM - UPMC, Inserm UMR S975, CNRS UMR7225, Hôpital Pitié-Salpêtrière, Paris cedex, FRANCE [4] MRC Cognition and Brain Sciences Unit, Cambridge, UK [5] Collège de France, Paris FRANCE jeanremi.king@gmail.com

The last twenty years of cognitive neuro-imaging studies have been marked by the exciting discovery of numerous neural events systematically associated with conscious processing. However, these so-called "signatures of consciousness" have mainly been revealed in the average over many experimental trials. In the present set of experiments, we developed several decoding techniques so as to identify and detect these signatures within individual trials. Capitalizing on previous work, participants performed a two-level odd-ball auditory task (Local-Global paradigm, Bekinschtein et al 2009), while their brain activity was being recorded with magneto-, electro-encephalography (M/EEG) or intracranial EEG. Previous results had demonstrated that, whereas 'local' odd-balls are processed independently of awareness of the auditory sounds, specific electrophysiological activities - like the P300b component - are systematically associated with conscious detection of 'global' deviancies. Our original analyses precised these results by revealing several previously unidentified effects. Importantly we demonstrate that decoding techniques accurately classified 72%, 81% and 85% of the EEG, MEG and Intracranial EEG trials respectively. Taken together, not only do these results confirm the existence of some of the previously identified signatures of consciousness at the single-trial level, demonstrate the high-sensitivity of our multivariate technique, but, importantly, this novel approach hold promise for clinical applications involving on-line monitoring of patients' level of conscious processing.

2:30pm- CS1a-4: Identifying multisensory representations within high-level convergence regions

Kingson Man, Jonas Kaplan, Antonio Damasio, Kaspar Meyer

Brain and Creativity Institute, University of Southern California, Los Angeles, CA USA kman@usc.edu

Do the experiences of hearing the ding-dong of a bell and seeing a bell swing back and forth activate the same neural representation of a "bell" concept? Forming holistic concepts of objects implies the convergence of signals from different sensory maps into higher-level representations. In this study, we investigated whether activity patterns in convergence regions can be faithfully evoked by different sensory modalities. Using multivariate pattern analysis of human fMRI data, we were able to show shared patterns of activity for an object presented either visually or aurally. A classifier trained on data recorded during the presentation of silent video clips of six different objects was asked to classify the data from six corresponding audio clips. Our preliminary results show that the sounds were correctly matched to the videos at levels well above chance for each subject. These cross-modal classifications were performed in a region of interest defined by the overlap of activity evoked by video and audio clips (assessed in separate functional localizer scans), which encompassed an area around the temporo-parietal junction, a region well known for multisensory processing. We also performed an exploratory searchlight analysis over the whole brain, which confirmed above-chance performance around the temporo-parietal junction. We suggest that these convergence regions containing cross-modally stable patterns of activity are well-situated to integrate and rebroadcast multisensory information and thus contribute to the neural representations of concepts.

2:50pm- CS1a-5: Extracting spatiotemporal pattern of neural network during awake and anesthetic conditions in monkeys

Toru Yanagawa [1], Kazuhito Takenaka [2], Naomi Hasegawa [1], Naotaka Fujii [1]

[1] RIKEN Brain Science Institute, [2] Grad. School of Information Science and Technology, Univ. of Tokyo toru-yanagawa@brain.riken.jp

Brain is a complex and dynamic network system. Clustering spatiotemporal pattern of neural connectivity and describing the dynamic mechanism as a transitional change of network state will be an ideal way of untangling the complexity. Here we developed computational method for classifying spatiotemporal pattern calculated from electrocorticographic (ECoG) data; it revealed consistent pattern of state dynamics during transition between awake and anesthetic conditions. We recorded neural activity in two Japanese macaques by using 128 channels ECoG array that covered almost all of lateral cortical surface as well as medial part of prefrontal cortex. ECoG data were converted to time series data separated by 1s bins. Correlation coefficient (CC) in theta, beta, and gamma frequency bands, and granger causality (GC) were calculated between all combinations of electrode pairs for all bins. Dirichlet process mixture model was applied to the dataset of each feature and temporal network patterns of each bin were automatically classified into finite network states. We found that CC in gamma and theta frequency bands, and GC captured a consistent transition pattern of network states during course of awake, anesthetic, and recovery period, but CC in beta frequency band did not. The network states under anesthesia were

characterized by decreased CC between medial prefrontal and temporal cortex in gamma frequency band, and increased GC within visual cortex. The findings suggest that our method is useful for extracting unique network states and can reveal function of network structure from high-dimensional time series data without knowledge of external events.

3:10pm- CS1a-6: Neural and behavioral indices of perceptual awareness in infants

Sid Kouider

CNRS & Ecole Normale Supérieure, Paris, France sid.kouider@ens.fr

While the last decade has shown increased interest for the cognitive and neural mechanisms associated with consciousness, research has remained limited to adult populations. In fact, the enigma of when and how consciousness arises in human development has been largely unexplored. Here we explored how perceptual awareness develops during the two first years of life, by relying on both psychophysical and electrophysiological measurements. For psychophysical measurements, we took advantage of the fact that infants are heavily attracted to faces and presented masked/brief faces (≥ 300 milliseconds) to estimate the temporal thresholds of infants at different stages of development. This first step allowed us to determine how human infants and adults differ in their temporal visibility thresholds, and importantly whether the development of visibility increases linearly or rather discontinuously towards maturity. We observed a sudden, stage-like rise in visibility during the period surrounding infants' first birthday, with 15 months infants even showing adult-like visibility thresholds and memory-based strategies leading to the maintenance of post-stimulation face representations. These behavioral results reveal a developmental discontinuity in the perceptual abilities of preverbal infants and nicely coincide with the documented dramatic increase in maturation of the prefrontal cortex after the first year of life (Gelskov & Kouider, 2010, Cognition). Having estimated the respective threshold of infants at different stages of development, we used high-density EEG to characterize the neural correlates of visibility. Our results show that visibility reflects different neural correlates of perceptual consciousness in younger, 5 month-old infants and older 12 and 15 month-olds infants, with an important reliance on prefrontal regions only in the latter group.

CS1b: Implicit perception (June 10, 1:30pm – 3:30pm)

Chair: Katsumi Watanabe (University of Tokyo, Japan)

Venue: 2F Hall I

1:30pm- CS1b-1: Behavioural and neural evidences for nonconscious processing during crowding

Nathan Faivre, Sid Kouider

Laboratoire de Sciences Cognitives et Psycholinguistique, CNRS/EHESS/DEC-ENS, Paris, France. nathan.faivre@ens.fr

The conscious representation we build from our visual environment appears jumbled in the periphery, reflecting a phenomenon known as crowding. Here, we show that crowded visual objects are encoded accurately even if they are not consciously discriminable. We validated this hypothesis at the behavioural and neural level using a novel approach termed Gaze-Contingent Crowding (GCC), ensuring the constant unawareness of long-lasting peripheral stimulations. With a series of studies, we established that (1) crowded multi-feature objects, such as faces and directional cues, can be processed nonconsciously but in a way that depends on attentional amplification (2) Nonconscious higher-level face representations resist crowding: both static and dynamic emotional contents conveyed by crowded faces bias subsequent preference judgments, with qualitatively distinct neural correlates. These results are informative, on the one side, as concerns the origins of the crowding phenomenon and support a late locus along the visual pathways and, on the other side, by bringing new insights to our understanding of nonconscious influences, emotional processing, and temporal integration.

1:50pm- CS1b-2: Experience-dependent induction of hypnagogic images during daytime naps: a combined behavioral and EEG study

Kussé Caroline, Shaffii-Le Bourdieu Anahita, Schrouff Jessica, Matarazzo Luca, Maquet Pierre

Cyclotron Research Centre, University of Liège, Belgium Caroline.Kusse@doct.ulg.ac.be

This study characterizes hypnagogic hallucinations reported during a polygraphically-recorded 90-minute daytime nap following practice of the computer game Tetris. In the experimental group (n=16), participants played Tetris in the morning, for two hours during three consecutive days, while in the control group (n=13), participants were examined on a single day and did not play any game. During post-practice naps, participants were repetitively awakened 15, 45, 75, 120 or 180 seconds after the onset of sleep stage 1 and were asked to report their mental content. Reports content was scored by three blind judges (inter-rater reliability 84%). In the experimental group, 45 out of 423 (11%) sleep-onset reports were Tetris-related. They mostly consisted of images and sounds with

very little emotional content. They exactly reproduced Tetris elements or mixed them with older mnemonic components. By contrast, in the control group, only 1 report out of 108 (1%) was scored as Tetris-related (between-groups comparison; $p = 0.003$). The experience-related hypnagogic hallucinations were predominantly observed during the transition of wakefulness to sleep, namely sleep stage 1. The observed attributes of experience-related hypnagogic hallucinations are consistent with the particular organization of regional brain activity at sleep onset, characterized by high activity in sensory cortices and in the default mode network.

2:10pm- CS1b-3: A novel procedure for identifying unconscious structural knowledge in artificial grammar learning

Elisabeth Norman [1], Mark C. Price [1], Ryan B. Scott [2], Emma Jones [1], Zoltan Dienes [2]

[1] University of Bergen, Norway, [2] University of Sussex, UK Elisabeth.Norman@psysp.uib.no

We present a novel procedure for assessing whether structural knowledge acquired in artificial grammar learning is conscious or unconscious, and show that unconscious structural knowledge of two learned grammars can be applied flexibly. All participants ($N=72$) were trained on two different artificial grammars. The nature of each grammar was disguised by random variation in irrelevant properties of individual string elements. In a test phase, instructions as to which grammar to apply varied randomly between trials. Whether classification responses involved conscious or unconscious structural knowledge was assessed by a novel two-step procedure that followed each classification response: First, participants reported whether their response was based on an implicit or explicit decision strategy. Second, they reported which stimulus property their decision was related to. A conservative criterion for unconscious structural knowledge is that the response is based on an implicit strategy related to irrelevant stimulus properties, e.g. attributing a judgment to an intuition related to colours when in fact colours were irrelevant to the grammar. Participants showed flexible application of grammar knowledge on implicit classifications. Importantly, this was the case even for implicit classifications attributed to irrelevant stimulus properties, i.e., where structural knowledge was unconscious according to the novel criterion. However, for explicit classifications, flexibility was limited to trials that were correctly attributed to the relevant stimulus property. Findings are interpreted within the framework of "fringe consciousness" (Norman et al., 2007), and as exemplifying the dissociation between consciousness of judgement knowledge versus consciousness of structural knowledge (Dienes & Scott, 2005).

2:30pm- CS1b-4: The flexible nature of unconscious cognition

Martijn E. Wokke [1], Simon van Gaal [1,4], H. Steven Scholte [1], K. Richard Ridderinkhof [2,3], Victor A. F. Lamme [1,3]

[1] Cognitive Neuroscience Group, Department of Psychology, University of Amsterdam, Roetersstraat 15, 1018 WB, Amsterdam, the Netherlands [2] Amsterdam center for the study of adaptive control in brain and behavior (Acacia), Department of Psychology, University of Amsterdam, Roetersstraat 15, 1018 WB, Amsterdam, the Netherlands [3] Cognitive Science Center, University of Amsterdam, Sarphatistraat 104, 1018 GV, Amsterdam, the Netherlands [4] INSERM-CEA Cognitive Neuroimaging unit, France martijnwokke@gmail.com

The cognitive signature of unconscious processes is hotly debated recently. Generally, consciousness is thought to mediate flexible, adaptive and goal-directed behavior, whereas unconscious processes are reflex-like, rigid and automatic. Here we demonstrate otherwise. Participants performed a Go/No-Go experiment in which an unconscious (masked) stimulus preceding a conscious target could be associated with either a Go or No-Go response. Importantly, the mapping of stimuli onto these actions varied on a trial-by-trial basis, preventing the formation of stable associations and hence the possibility that unconscious stimulus automatically activate these control actions. The results show that the same unconscious stimulus can have a substantially different effect on behavior and (prefrontal) brain activity depending on the rapidly changing task context in which it is presented. This suggests that unconscious information processing is not as reflex-like and "dumb" as previously assumed, but shares many "smart" characteristics (including flexibility and context-specificity) with its conscious counterpart.

2:50pm- CS1b-5: Fast unconscious fear acquisition

David Carmel [1,2], Candace Raio [1], Elizabeth A. Phelps [1,2], Marisa Carrasco [1,2]

[1] Department of Psychology, New York University, [2] Center for Neural Science, New York University davecarmel@nyu.edu

How do conscious and unconscious visual processing differ? Suppressing stimuli from awareness has revealed quantitative differences, reducing or eradicating processing. Finding qualitative differences, however, would benefit the understanding of systems mediating conscious versus unconscious perception. Here, we show such a difference in the timing of conscious and unconscious fear acquisition, an essential function for adaptive behavior. Threatening stimuli can elicit physiological responses without conscious detection. But whether new fear can be learned for visual stimuli that are never consciously seen is unknown. We used classical fear conditioning, suppressing conditioned stimuli (CSs) from awareness with continuous flash suppression (CFS), in which stimuli presented to one eye are rendered invisible by salient dynamic stimulation of the other eye. One

suppressed stimulus (CS+) was occasionally paired with a shock, whereas the other (CS-) was not. We measured participants' skin conductance responses (SCRs) during acquisition, tracking the development of learning over time. Participants were conditioned either with CFS (unaware group) or without it (aware group). We found significantly greater SCRs to the CS+ in both groups, but the temporal pattern of learning differed. Robust learning was observed only during early acquisition (1st half of the 36-trial session) for unaware participants, and only during late acquisition (2nd half) for aware participants. Conditioning magnitude was negatively correlated with state anxiety in both groups. Unconscious fear acquisition – rapid, but swiftly-habituating – may therefore involve automatic threat orienting, mediated by amygdala activity (known to habituate quickly); conscious conditioning may employ cortically-mediated mechanisms, allowing associations to form over time.

3:10pm- CS1b-6: Lessons from studies of unreported perceptual stimuli: A possible functional role for phenomenal content?

Guven Guzeldere

Department of Philosophy and Center for Cognitive Neuroscience, Duke University; Departments of Philosophy and Psychology, Harvard University (visiting) guven.guzeldere@duke.edu

My presentation is centered around the question: can we rightly attribute phenomenal content to perceptual mental states produced by unreported or unreportable stimuli? This is a controversial issue, especially among philosophers of perception and vision scientists. Assume subject S is given a brief presentation of visual stimulus x. If S's inability to report having seen the x does not warrant the claim that S has no phenomenal awareness of x, then there is not much we can infer about the role phenomenal content may have vis-à-vis the ensuing behavior of the subject. That is, if S can have phenomenal awareness of stimuli that she is unable to report or even denies having perceived, then phenomenal content has little explanatory value concerning the difference between the differential behaviors of the subject directed towards reportable versus unreportable stimuli. I argue for the opposite conclusion: that the epistemic basis for phenomenal content attribution to perceptual states varies along a spectrum that goes from simply unreported to principally unreportable stimuli, based on the reasons and conditions involved in the perceptual situation, and for a certain class of unreportable stimuli, there is no warrant for the conclusion that we can be phenomenally aware of what we cannot report. I then conclude with the consequent claim that a detailed examination of what can be accomplished by perceptual states lacking phenomenal content may guide us in understanding the proper functional role of phenomenally conscious perception, e.g. in the self-initiation, sustenance, and epistemic justification of perceptually-driven voluntary behavior.

CS1c: Embodied cognition (June 10, 1:30pm – 3:30pm)

Chair: Yukihiro Nobuhara (University of Tokyo, Japan)

Venue: 2F Hall II

1:30pm- CS1c-1: A volitional account of agentic awareness

Myrto I. Mylopoulos

Graduate Center, City University of New York (CUNY) myrto.mylopoulos@gmail.com

In this paper, I take steps towards defending a volitional account of agentic awareness, i.e., the awareness one has of oneself as performing an action. According to this view, the states in virtue of which we have such awareness are types of intention, as opposed to types of judgment, or perception, as is most commonly argued. In the first section, I motivate and sketch the account. Next, I argue that a volitional account should be preferred over the more popular perceptual accounts, on which agentic awareness is implemented by way of perceptions, sensations, or sensory imagery. The leading versions of such accounts are grounded within a specific neurocomputational model of action control: the comparator model. As such, they commit themselves to the claim that agentic awareness arises when there is a match between intention and sensory feedback from bodily movement. I argue that there is good reason to reject this picture. Finally, I consider three objections to the volitional account, namely (i) that it cannot do justice to the phenomenology of agency, (ii) that volitional states do not have the right “direction of fit” to provide us with agentic awareness, and (iii) that there is evidence from cases of disownership of agency that a match between intention and sensory feedback is indeed required for agentic awareness. I argue that each of these objections rests on unfounded assumptions; the first two about the nature of intentions, and the third about the relationship between agentic awareness and the disownership of agency.

1:50pm- CS1c-2: The transtemporal identity argument for subject-body dualism**Kirk Ludwig**Philosophy Department Indiana University Bloomington, IN 47405-7005 USA ludwig@indiana.edu

Martine Nida-Rümelin (MNR) has recently argued for what she calls Subject-Body Dualism (2010). Unlike substance dualism it does not maintain subjects of conscious experience can exist without bodies, but still distinguishes between the subject of experience and its body. The argument involves reflection on the possibility of identity of subjects of experience over time in fission thought experiments. In a case of symmetrical duplication of A into B and C (perhaps an operation in which the left and right hemispheres, conceived as duplicating function, are each transferred into identical new bodies), we can make sense of A (as a subject of experience) being identical to B or identical to C. No relevant empirical difference (material or psychological) could ground the claim that A is identical with B as opposed to C. MNR holds that the possibility is underwritten by deep conceptual structures in any thinker capable of I-thoughts, and that the assumption that this does not involve an illusion requires us to deny that the subject of experience is identical with any material thing. It would immediately follow that reductionist accounts of consciousness are mistaken. I show in this paper that, as intriguing as the argument is, it rests on a modal error: to complete the argument, one needs to establish in addition that as a matter of fact, in such cases, A would be identical with B or C, as opposed to neither. This leaves us with some puzzles, but not the ones that MNR identifies. Reference Nida-Rümelin, M. (2010). An Argument from Transtemporal Identity for Subject-Body Dualism. *The Waning of Materialism*. G. Bealer and R. Koons. Oxford, Oxford University Press: 191-214.

2:10pm- CS1c-3: Two types of proprioceptive content**Hao Pang [1], Allen Y. Hough [2]**[1] National Taiwan University, College of Life Science, [2] National Yang-Ming University, Institute of Philosophy of Mind and Cognition howpan@gmail.com

Bermudez (2000) argues that forming a point of view needs the participation of proprioception and distinguishes two distinct aspects of proprioceptive content: the descriptive and the spatial. But the case of “The Disembodied Lady”, who loses both aspects of proprioceptive content and still has a point of view, seems to be a counterexample to his argument. In this paper, in order to account for the case of “The Disembodied Lady,” I will argue that there are two types of proprioceptive content: the subjective one and the qualitative one. The subjective proprioceptive content is necessary for constructing a point of view, while the qualitative one is not. According to my account, the proprioceptive content which contains the descriptive and the spatial aspect is the qualitative one. If the qualitative proprioceptive content was necessary for constructing a point of view, then, under Bermudez’s theory, “The Disembodied Lady” would not have a point of view. However, “The Disembodied Lady” does have a point of view. It means that the two aspects of proprioceptive content made by Bermudez must be insufficient. Therefore, I will argue that “The Disembodied Lady” has another kind of proprioceptive content, that is, the subjective proprioceptive content. Only this one, which “The Disembodied Lady” still remains, is necessary for constituting a point of view.

2:30pm- CS1c-4: Stressing the flesh: In defense of the strongly embodied nature of cognition and experience**Itay Shani [1], Liam P. Dempsey [2]**[1] Department of Philosophy Kyung Hee University 1 Hoegi-dong Dongdaemun-gu Seoul 130-701 Korea, [2] Department Of Philosophy Lady Eaton College Trent University Peterborough Ontario Canada. ishani479@hotmail.com

In a recent paper, Andy Clark (2008) has argued that the literature on embodied cognition reveals a tension between two prominent strands within this movement. On the one hand, there are those who endorse what Clark refers to as body-centrism, a view which emphasizes the special contribution made by the body to a creature’s mental life. Among other things, body centrism implies that significant differences in embodiment translate into significant differences in cognition and consciousness. On the other hand, there are those who endorse what Clark calls extended functionalism, a view which sees the mind as the joint product of the computational resources presented by (i) intracranial processing, (ii) bodily input, and (iii) environmental scaffolding. As such, extended functionalism allows for the possibility that any contribution of the body to cognition and consciousness can be compensated for by the other two contributing factors. While Clark’s sympathies lie with the latter approach, we argue in favour of the former. Focusing on phenomenal consciousness, and in particular on the affective underpinnings of experience, we show how the nature of a creature’s embodiment shapes the qualities of its lived experience. We conclude that the unique contribution the body makes to a creature’s manifold of phenomenal experience cannot be compensated for, in the manner, and on the scale, that Clark envisages.

2:50pm- CS1c-5: The social dimension of perceptual experience

Axel Seemann

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Do differences in embodiment make a difference to the content and quality of conscious perceptual experiences? There are two main positions. A body-determinist view bets on the importance of implementational details and claims that differences in embodiment do make a difference in perceptual experiences. On the contrary, a body-insensitive position states that differences in embodiment do not necessarily make a difference in perceptual experiences, since the latter depend on computational processes that are independent (in the relevant way) of the details of implementation. Both of these positions approach this question as an empirical question. My aim is to show that this allegedly empirical question, under close scrutiny, turns out not to be (exclusively) empirical. This question is biased in a way that prevents an empirical resolution. There is no possible fact, no possible experimentum crucis that could decide it. By the hand of an empirical illustration (i.e. cases of sensory substitution systems) I will show that no empirical evidence could possibly refute the body-insensitive reading. The reason is that it is already assumed that experience is multiply realizable, and therefore, that details of (bodily) implementation do not matter for perceptual consciousness. I will try to do the conceptual analysis that is needed in order for this question to be a real (open) empirical question.

3:10pm- CS1c-6: Do schizophrenic patients actually misidentify the owner of their thought? An approach from brain's default network

Yao-Wen Hsieh, Allen Y. Houng

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Thought insertion is an astonishing symptom found in schizophrenic patients. Patients report that they feel the thoughts which occur in their heads are actually not their own but inserted in them. In other words, the patients misidentify the source of their thought. This seems to violate Sydney Shoemaker's claims that someone cannot make mistake when she uses the first-person pronoun 'as subject' to refer herself. In this paper, I will suggest that combining the finding of hyperactivity of default network in schizophrenic patient's brain and Antonio Damasio's multiple-stage self theory, we can well explain and defend the immunity to error through misidentification when we referring ourselves. Functional image studies have found the correlation between schizophrenic symptoms and increased default network activity. The default network also activates when someone recruiting autobiographic memory, making self-referential judgement, and simulating another person's perspective. These data may suggest that the symptom of thought insertion is generated when the boundary between simulated imagination and reality is disrupted and causes the patient to wrongly re-label the owner of his own thought. However, those processes only happen in the level of autobiographical self. In the more basic level of core self, our direct feeling and attention to a particular thought secure our sense of ownership in a nonverbal way. Therefore, a schizophrenic patient may misinterpret, and make a wrong story, about the source of her thought but she indeed has the sense of owning that thought.

CS1d: Perception & decision(June 10, 1:30pm – 3:30pm)

Chair: Satoshi Shioiri (Tohoku University, Japan)

Venue: 2F Hall III

1:30pm- CS1d-1: Perceptual load broadens orientation tuning

Moritz Stolte [1], Bahador Bahrami [1,2,3], Nilli Lavie [1]

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Much previous research has demonstrated that the level of perceptual load in a task determines perception of task-relevant, as well as irrelevant stimuli and reduces neural activity and cortical excitability in task irrelevant areas. However, it remains unclear whether these effects are the result of a general reduction in neural response or reduced precision in the coding of stimulus features. Here we addressed this question in the case of orientation perception. We varied the level of perceptual load in a letter search task and assessed its effect on the detection of an oriented grating. We used a noise masking procedure where participants judged whether a small, vertically oriented grating appeared in one of two possible locations. By varying the mean orientation of the noise surrounding the grating we were able to measure contrast thresholds at each noise orientation and construct behavioral orientation tuning curves. Our results show that high perceptual load not only reduces the perceived orientation signal but also broadens orientation tuning considerably. This indicates that high perceptual load degrades perception by compromising the precision of low level feature representations, in addition to an overall

reduction in signal strength. These results suggest that the effects of load on perception are mediated by reducing both the strength and precision of neural representations.

1:50pm- CS1d-2: Predictive context biases perceptual selection during binocular rivalry

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Prediction may be a fundamental principle of sensory processing: it has been proposed that the brain continuously generates predictions about forthcoming sensory information. However, little is known about how prediction contributes to the selection of a conscious percept from among competing alternatives. Here, we used binocular rivalry to investigate the effects of prediction on perceptual selection. In binocular rivalry, incompatible images presented to the two eyes result in a perceptual alternation between the images, even though the visual stimuli remain constant. If predictive signals influence the competition between neural representations of rivalrous images, this influence should generate a bias in perceptual selection that depends on predictive context. To manipulate predictive context, we developed a novel binocular rivalry paradigm in which rivalrous test images were immediately preceded by a sequence of context images presented identically to the two eyes. One of the test images was consistent with the preceding image sequence (it was the expected next image in the series), and the other was inconsistent (non-predicted). We found that human observers were more likely to perceive the consistent image at the onset of rivalry, suggesting that predictive context biased selection in favor of the predicted percept. These results suggest that predictive signals related to visual stimulus history exist at neural sites that can bias conscious perception during binocular rivalry. In the future, this paradigm could be used to test whether visual percepts are generated from the combination of prior information and incoming sensory information according to Bayesian principles.

2:10pm- CS1d-3: The key to finding a target object rapidly: preparatory biases in lateral occipital area

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The human visual system needs only remarkably brief exposure to a complex natural scene to detect the existence of a target object category (Li et al., 2002). This is partly because object-selective attention operates in parallel across the visual field, including unattended regions, and objects from the target category are preferentially processed (Peelen et al., 2009). Using novel surface-based spatiotemporal pattern classification methods, we showed that such category-specific biases could already be established in high-level visual areas even before the appearance of any object from the target category – or other categories. Such pre-stimulus preparatory biases may facilitate rapid target detection, as participants with stronger selectivity in the lateral occipital area (LO) – an important object processing region – required shorter stimulus exposure times to accurately detect the target category (Pearson's correlation, $r=-0.90$). Crucially, given that the BOLD signal in LO did not increase during the preparatory period, and the target objects were never shown to participants before each trial, our results were probably not due to conscious mental imagery (Stokes et al., 2009), but sub-threshold biases that enabled rapid processing of objects matching the target category.

2:30pm- CS1d-4: Subliminally presented reward cues bias incidental economic decisions and the encoding of subjective values in the brain

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Human decision-making is driven by subjective values assigned to more or less rewarding choice alternatives (McClure et al., 2004; Kabel & Glimcher, 2007), and these subjective values are based on reward cues. It is unknown, however, whether unrelated reward cues may bias decisions, particularly if presented outside of conscious awareness, and whether they can change the encoding of subjective values in the brain. In this functional magnetic resonance imaging (fMRI) study, we subliminally presented brand logos as unrelated reward cues preceding intertemporal choices. Priming biased participants' preferences towards more immediate rewards in the subsequent temporal discounting task. The shift in preferences was associated with modulations of the neural encoding of subjective values for choice options in a network of reward- and decision-related brain regions, predominantly in anterior medial prefrontal cortex (mPFC). Using multivariate decoding (Haynes & Rees, 2006), regions in anterior mPFC and medial orbito-frontal cortex (mOFC) were also found to directly encode decision outcomes and decision difficulty. Our findings demonstrate the susceptibility of the human decision making system to apparently incidental contextual information. We conclude that the brain incorporates seemingly

unrelated value information that modifies decision-making outside the decision-maker's awareness. References: Haynes JD, Rees G (2006). Decoding mental states from brain activity in humans. *Nat Rev Neurosci* 7, 523-34. Kable JW, Glimcher PW (2007). The neural correlates of subjective value during intertemporal choice. *Nat Neurosci* 10, 1625-33. McClure SM, Laibson DI, Loewenstein G, Cohen JD (2004). Separate neural systems value immediate and delayed monetary rewards. *Science* 306, 503-7.

2:50pm- CS1d-5: Unconscious influences on morality: manipulating moral decisions using the gaze cascade effect

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In our everyday experience making an explicit moral decision seems to be a function of our moral intuitions accessible by conscious introspection. Recent research has shown how moral decisions can be affected by semantic (Cushman et al. 2006), cognitive load (Green et al. 2008) and emotional (Wheatley & Haidt, 2005) manipulation, thus questioning the common sense view. However, possible interactions with gaze and the perceptual system in general have been left unstudied. We studied participants responding to complex moral dilemmas, modelled after the Trolley problem (Thompson, 1985), and constructed so as to yield a two-alternative forced choice task using a novel pictorial paradigm. Participants' gaze and pupil dilation was monitored using eye tracking equipment. A gaze bias was exhibited towards the to-be-chosen alternative (known as the gaze cascade effect Shimojo et al. 2003). A novel correlation with pupil dilation was also discovered. Moreover, in ongoing studies using the same methodology as described by Shimojo et al., gaze duration toward the alternatives was manipulated. Early results indicate an overall shift in participants' responses to the moral dilemmas, such that they to a greater extent come to prefer the alternative with greater gaze duration, while remaining unaware of the effect. This points to a hitherto undiscovered causally efficacious role for the perceptual system in moral decision-making, indicating a need for changes in how moral decisions are modelled. At ASSC we will further discuss the implications of our findings for how limits to the consciously accessible parts of our moral lives should be drawn, and the wider role of conscious and unconscious processes in everyday morality.

3:10pm- CS1d-6: Investigating dose-dependent effects of placebo analgesia: A psychophysiological approach

Yoshio Nakamura [1,2,3], Gary W. Donaldson [2,3], C. Richard Chapman [2,3]

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Investigating dose-dependent effects of placebo analgesia (PA) in laboratory subjects undergoing pain testing, we evaluated two hypotheses: 1) greater expectancy for relief produces greater PA, and 2) active expectancy for relief triggered by a predictive cue leads to more enhanced analgesia than does passive expectancy (no predictive cue). We used a conditioning procedure in which 84 subjects experienced reduced stimulation intensity following the application of purported analgesic creams to the two experimental fingers, while the control finger received the same levels of stimulation as in the baseline block. The dose of placebos was manipulated by creating two levels of expectations for relief. The nature of expectation (active vs. passive) was also manipulated by a predictive cue specifying the next finger to be stimulated. Subjective reports and psychophysiological responses served as critical indicators for evaluating impacts of the placebo manipulation on subsequent pain processing. The dose-dependent PA was unambiguously demonstrated by the predicted ordering of the three fingers in terms both of response sensitivity and average response magnitude, in mixed effects analysis of three outcome indicators (EP, SCR, Pain Report). Greater expectation for relief led to both 1) greater reductions in the average dependent variable slope (response sensitivity) as a function of stimulus intensity, and 2) greater reductions in average response magnitude. Unexpectedly, passive expectation led to a slightly larger PA than did active expectation. The study provided clear evidence that PA can occur in a "dose"-dependent manner, mediated by the levels of expectancy for pain relief.

CONCURRENT SESSION 2 (June 10, 3:45pm – 5:45pm)

CS2a: Attention & consciousness (June 10, 3:45pm – 5:45pm)

Chair: Melanie Wilke

Venue: 1F

3:45pm- CS2a-1: Cognition is nice, but consciousness is better

Victor A.F. Lamme

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Traditionally, consciousness and cognition are closely knit together. Take the case of seeing: we see what we attend to; when we consciously perceive, we know what we are seeing; as a final consequence, we can report what we have seen. That's what we think consciousness is. Well, that's wrong. Such introspective and behavioral notions are poor guides to the true nature of consciousness. They are the prime reason why consciousness has remained a mystery, despite vigorous attempts to understand it during millennia of philosophy and ages of psychology. If we want to make progress, we need to move away from this. Will neuroscience succeed where previous disciplines have failed? Not if we only allow neuroscience to find 'neural correlates' of our flawed notions of consciousness. But if we take neural evidence seriously, an entirely new, yet clear picture emerges of what consciousness is. We then understand that consciousness is in fact very different from cognition. I will discuss how such a neural stance on consciousness gives surprising insights into the true nature of phenomena like neglect, attentional blink, and change blindness, which are in fact not failures of consciousness but of cognition. This will reveal that we are conscious of much more than we think we are. We see without knowing it. I will provide an overview of recent evidence we have obtained to empirically verify this intuitively strange consequence of adopting the neural stance on consciousness.

4:05pm- CS2a-2: Consciousness is not necessary for feature binding

André W Keizer [1], Bernhard Hommel [2], Victor Lamme [1]

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When visual information enters the brain, it is relayed to different specialized regions. For example, there are brain regions that are tuned to process either shapes, colors or motion. However, when we have a conscious experience of a colored, moving shape, all the different features are integrated into one unified percept. Therefore, it has been hypothesized that consciousness and feature binding share an intimate relationship. To study this relationship, we used a paradigm in which the behavioral effects of feature binding can be measured. In this task, subjects were instructed to respond to the second presentation of a stimulus (S2) in each trial. Previous research using this paradigm has shown that partially repeating the features of S1 on S2 results in performance costs compared to complete repetition or alternation of features (i.e. Hommel, 1998). Brain imaging research has shown that these performance costs can be attributed to automatic reactivation of the previously bound features (Keizer et al., 2008). Using metacontrast masks, we were able to investigate the difference in binding between consciously and unconsciously processed stimuli. The results of our study show that different features of a visually presented object (its location and orientation) are automatically integrated, even when subjects are unable to report whether an object was presented or not. We conclude that binding and consciousness share a less intimate relationship than previously hypothesized, since binding is not a sufficient condition for the generation of conscious percepts and consciousness is not a necessary condition for binding.

4:25pm- CS2a-3: Attention is necessary for awareness

Michael A. Cohen, Ken Nakayama

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Numerous theorists claim that attention and awareness are entirely dissociable: that stimuli can be attended to without reaching conscious awareness, and can be consciously perceived in the absence of attention. While the first point is irrefutable, the second point needs to be reconsidered. In general, four pieces of evidence are cited to support the notion of awareness without attention: gist perception's immunity to inattention blindness, animal/vehicle perception being unaffected by dual-task conditions, pop-out in visual search, and iconic memory. We claim that none of these results actually support the argument separating attention and awareness and that there is currently no evidence that awareness can occur without attention. Recently, we showed that the gist of a scene can be rendered inattentionally blind by a sufficiently difficult primary task (Cohen et al., 2010). In addition, we showed that the classification of scenes containing an animal or vehicle is impaired by a secondary task. Furthermore, it has been shown that singletons are detected more slowly, or even missed, as a function of

attention (Joseph et al., 1997, Theeuwes et al., 1999). Finally, iconic memory results can be easily accounted for without relying on the notion of awareness without attention. In conclusion, we propose that while attention can operate on an object or event without elevating those items to consciousness, a stimulus can only reach awareness by virtue of attention.

4:45pm- CS2a-4: Unconscious pop-out: attentional capture by unseen feature singletons only when top-down attention is available

Po-Jang Hsieh, Jaron Colas, Nancy Kanwisher

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In visual "pop-out", a unique visual target (e.g. a feature singleton) can be rapidly detected among a set of homogeneous distractors. However, the role of visual awareness in this process remain unclear. Here we show that, even though subjects were not aware of a suppressed pop-out display, their subsequent performance on an orientation discrimination task was significantly better at the pop-out location than at a control location. These results indicate that visual awareness of a feature singleton is not necessary for it to attract attention. Furthermore, our results show that the unconscious pop-out effect disappeared when subjects diverted their attention toward an RSVP task while viewing the same unconscious pop-out display, suggesting that the availability of top-down attention is necessary for the unconscious pop-out effect.

5:05pm- CS2a-5: Unconscious cognition isn't that dumb: Subliminal primes exert top-down modulations

Filip Van Opstal [1], Wim Gevers [2], Cristian Buc Calderon [2], Tom Verguts [1]

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Unconscious processing is generally thought to be fundamentally limited. In particular, top-down control would require conscious thinking. According to the influential global workspace theory of consciousness (Baars, 1997; Dehaene & Naccache, 2001), top-down modulation from the global workspace is identified with consciousness. Unconscious stimuli are thought to operate in a bottom-up fashion and are unable to establish a context for later processing (e.g., Heinemann et al., 2009). In contrast, influential cognitive control theories do predict its possibility. In conflict monitoring theory (Botvinick et al., 2001) any stimulus, conscious or not, can trigger the cognitive control module and lead to top-down modulation on later trials. In the present study, we designed an experiment to distinguish these possibilities. We therefore adapted the design of a previous study in which participants had to decide if two target numbers were the same or different (Van Opstal et al., 2010). The results of this study revealed that an unconscious prime consisting of the same letter in mixed-cases (e.g. 'a A') evoked a 'same' response in a context of low similarity primes (e.g., 'a D'). In the current study we changed the context to high similarity primes (e.g., 'a a'). Our results showed that in this high similarity context, mixed-cases prime evoked a 'different' rather than a 'same' response. The same unconscious prime thus evoked opposite responses depending on the unconscious context in which it is presented. Hence, unconscious primes can establish a cognitive context to modulate cognitive processing, thereby providing evidence for unconscious top-down manipulations.

5:25pm- CS2a-6: Spatial awareness after pulvinar inactivation

Igor Kagan [1], Melanie Wilke [1,2], Richard A. Andersen [1]

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The phenomenon of spatial neglect - not perceiving and not responding to one side of visual space - occurs frequently in patients after cortical and subcortical lesions. Similar deficits can be elicited in monkeys by inactivating parietal cortex and the thalamic pulvinar. Although the exact function of the pulvinar is still elusive, converging evidence suggests that it plays an integrative role in conscious perception and decision-making. Here we used reversible inactivation of the pulvinar in combination with functional MRI to study mechanisms underlying spatial awareness during free-choice paradigms. First, we asked how pulvinar lesions influence the visibility and eye movement choice behavior under different reward and visual saliency conditions. Second, we investigated how pulvinar lesions affect cortical activity. When monkeys were asked to choose between two simultaneously presented stimuli, pulvinar inactivation resulted in a pronounced choice bias away from the affected side of space. This deficit could be alleviated by placing a high reward stimulus in the affected space. In contrast, a high visual saliency had a significantly weaker effect. Thus, monkeys were still aware of the stimuli in the affected space, but preferred not to select them unless they carried more value. These behavioral effects were accompanied by reduced parietotemporal cortical activity in the lesioned hemisphere. The modulation by expected reward for the stimuli in the affected space diminished in some parietal areas and the caudate, but was preserved in other nodes of the spatial network. These results suggest that the pulvinar modulates the cortical processing of behavioral saliency.

CS2b: Body & mind (June 10, 3:45pm – 5:45pm)

Chair: Zoltan Dienes (University of Sussex, UK)

Venue: 2F Hall I**3:45pm- CS2b-1: Superior haptic shape recognition in adults with autism****Tamami Nakano [1], Nobumasa Kato [2], Shigeru Kitazawa [1]**[1] Department of Neurophysiology, Juntendo University School of Medicine [2] Department of Psychiatry, Showa University School of Medicine
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Autism spectrum disorders (ASD) are characterized by impairments in social interaction and communication, and by restricted and repetitive behavior. It is hypothesized that these impairments derive from general lack in long-range connections as compared to an overgrowth of localized cortical connections. The hypothesis agrees with a recent finding that motor learning do not generalize from intrinsic proprioceptive coordinates to extrinsic visual coordinates in children with ASD (Haswell et al., 2009). This led us to hypothesize that haptic shape recognition, involving both intrinsic and extrinsic coordinates, would be impaired in ASD. We, therefore, examined the abilities of haptic shape recognition and orientation discrimination through active touch in adults with ASD. Contrary to our expectation, the accuracy in the haptic orientation discrimination did not differ between the two groups. Moreover, the adults with ASD showed superior performance in the haptic shape recognition through active touch compared to adults without ASD, especially for complicated objects. We further found that the performance of haptic shape recognition was significantly correlated with the performance of visual mental rotation. These results suggest that projections from somatosensory and motor areas to those representing shapes in extrinsic coordinates are functionally normal in individuals with ASD, and that their spatial representations of shape are more accurate than those without ASD.

4:05pm- CS2b-2: Reality substitution platform and its application to research on déjà vu experience**Sohei Wakisaka [1], Keisuke Suzuki [2], Naotaka Fujii [2]**[1] Laboratory for Dynamics of Emergent Intelligence, RIKEN Brain Science Institute [2] Laboratory for Adaptive Intelligence, RIKEN Brain Science Institute
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Normal healthy individuals subjectively experience continuous reality, synthesizing fragmented and discontinuous stimuli and inaccurate memories into coherent, continuous sequence (or, they ‘make up a story’ about reality). “Choice Blindness” successfully shows that the arbitrariness of the synthesis can be investigated by editing participants’ ongoing ‘live’ reality. However, such arbitrariness gets concealed/fades once they noticed the editing. For further investigations of the synthetic mechanism, here we introduce a new psychological experiment platform with virtual reality technique, that enables more drastic reality editing than ever, without participants noticing; Wearing a head-mount display (HMD) with a front camera, participants alternatively experience two kinds of realities. One is live, with real-time visual stimulus captured with the camera, and the other consists of previously recorded and edited. The key ‘trick’ is that the sensory-motor coupling between vision and head movement is also maintained in the latter: a panoramic video camera is used for recording and stimuli are determined with a head direction tracker in the HMD. After live reality is covertly substituted by recorded one, participants still subjectively experience live reality, because this coupling makes them hardly notice the substitution, as long as they stay at the position where the recording has done. As a striking application of the platform, we report a implementation and psychological measurements of a déjà vu experience in laboratory (which we believe the consequence of an anomalous synthesis) by forcing participants to re-experience a recorded reality as live one (for instance, the breaking up of an identical vase happens repeatedly).

4:25pm- CS2b-3: Upside Down: Visual-vestibular conflict induces illusory changes in the experienced direction of the first-person perspective**Christian Pfeiffer [1], Roberto Martuzzi [1], Julio Duenas [1], Roger Gassert [2], Olaf Blanke [1,3]**[1] Laboratory of Cognitive Neuroscience Ecole Polytechnique Fédérale de Lausanne Switzerland, [2] Rehabilitation Engineering Laboratory Eidgenössische Technische Hochschule Zürich Switzerland, [3] Department of Neurology University Hospital Geneva Switzerland
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Bodily self-consciousness has been hypothesized to rely on self-identification, self-location and the first-person perspective (Blanke, Metzinger, 2009). This has been demonstrated by manipulating self-identification and self-location with visual-tactile conflicts in different full-body illusions (Lenggenhager, 2007; 2009; Ehrsson, 2007). Multisensory mechanism of the first-person perspective (1pp) are less well understood (Blanke, 2008). Here we employed visuo-tactile and additional visual-vestibular conflicts to investigate 1pp by extending a real-time robotic setup. Visuo-tactile stimulation was presented on a virtual body (i.e. back view image of a body at extracorporeal location) and participant’s own body in synchronous or asynchronous fashion (stroking, within-subject factor). Virtual body orientation in space differed from participant’s orientation in order to induce strong or weak visual-vestibular conflict (VVC, within-subject factor). Questionnaire ratings for 1pp-direction and

self-identification with the virtual body were acquired as well as response times (RTs) for self-location (Lenggenhager, 2009). As expected based on pilot data, questionnaire analysis revealed two participant groups that differed for ratings of 1pp-direction (Down-Looker (N=9), Up-Looker (N=14)) (Group, between-subjects factor). Both groups showed higher scores for self-identification during synchronous as compared to asynchronous stroking. RT analysis revealed synchrony-related changes of experienced self-location that were modulated by 1pp-direction, RTs decreased with synchrony for Down-Lookers, but increased for Up-Lookers. Furthermore, only Down-Lookers modulated RTs with VVC. Together these results demonstrate inter-individual differences concerning visual-vestibular mechanisms in the 1pp and demonstrate that 1pp shares functional mechanisms with self-location, but not with self-identification.

4:45pm- CS2b-4: Distal perception via use of distal-to-tactile sensory substitution interface does not lead to extension of body image

Tom Froese [1,2], Marek McGann [3], Anil Seth [1]

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It is well known that bodily transformations are entailed by practical tool-use, such as changes in body schema and body image after pointing with sticks or manipulating with rakes (see Maravita and Iriki 2004). What remains unclear is which aspects of tool-use cause the transformations. Since no effects are found in control tasks with laser pointers, the changes appear to be related to reachability (Longo and Lourenco 2006). But is reachability important because elongated tools enable subjects to perceive at a distance, like a blind person using a cane? Or because such tools enable subjects to act at a distance, like a subject using a rake to retrieve an object? Comparisons between elongated tools and laser pointers cannot resolve this question (elongated tools enable both factors simultaneously, while laser pointers enable neither of them). We used a custom-built hand-held sensory substitution device, the Enactive Torch (Froese and Spiers 2007), to investigate this issue. Subjects trained in using this device, which converts distance measurements into tactile vibrations in the hand, readily report the perceptual experience of things 'out there'. However, in contrast to the case of using elongated tools, this novel perception at a distance is not accompanied by a change in the possibility for directly acting at a distance. We tested 20 participants but found no evidence of a transformation in their perceived arm length. This suggests that it is the change in the potential for action, not perception, which is the decisive factor for transformations of the body image.

5:05pm- CS2b-5: Sensitivity on discrepancy between aimed action and its visual feedback in chimpanzees and humans

Takaaki Kaneko[1,2], Masaki Tomonaga[1]

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For smooth operation of voluntary action, it is important to monitor congruency of aimed action and its visual feedback and correct kinematic action according to the discrepancy between intention and feedback. We show the discontinuity between chimpanzees and humans on the use of peripheral/foveal vision for such correction movements. The participants were required to hit the cursor to the targets shown on the display using the trackball as an input device. Perturbations were occasionally introduced between manipulations of the trackball and cursor actions on the display. Visual feedback was altered to dissociate its action trajectory but not final goal of action. The perturbation was zero at both ends of the movement and reached a maximum at the midpoint of the movement. As maximum amplitude of distortion increased, both species increased correction movements to decrease curvature actions. Humans tended to look longer at cursor actions in fovea as distortion increased, while chimpanzees did not show such a tendency. In the other type of perturbation which altered both kinematics and final goals, however, both species increased correction movements and also looked longer at cursor actions in fovea. These results suggest that humans and chimpanzees have different criteria to switch "peripheral correction" to "foveal correction". Chimpanzees kept "peripheral correction" as long as there was less dissociation in terms of "goal" although they (consciously/unconsciously) detected dissociations in action kinematics. Kinematics are redundant information, thus chimpanzee's strategy may be more parsimonious to save the cognitive resource correlated with foveal vision such as the attention.

5:25pm- CS2b-6: Can young infants extend their own sense of agency outside the body?

Michiko Miyazaki, Hideyuki Takahashi, Hiroyuki Okada, Takashi Omori

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The sense of agency (SA) is the subjective awareness of one's own actions. When manipulating a computer mouse, we become aware that a moving cursor on a PC display is under one's own control and "feel" the SA toward the cursor even though it does not part of our own body. Such expanded feeling of agency toward an external object is important while considering the beginning of tool use. However, the developmental process of the SA has not

been clarified yet. There are few useful experimental paradigms for evaluating the developmental process of the SA in young infants because they cannot verbally describe their internal feelings and because their limbs are not fully developed to control objects smoothly. To overcome such problems, we developed a new experimental paradigm to evaluate the SA, which we named the "Eye Scratch Task," in infants younger than 9 months of age using their eye movement interactively. In this study, we clarified the difference in eye trajectories between adult participants with the SA and those without the SA on the basis of their verbal report. Subsequently, we examined whether these characteristics of eye movement in adult participants appeared in the eye trajectories of 8-month-old infants. The results suggested that 8-month-olds could feel the SA toward an external object. We believe that the Eye Scratch Task will become a powerful tool in the exploration of proto-consciousness in young infants.

CS2c: Representation & introspection (June 10, 3:45pm – 5:45pm)

Chair: Dan Lloyd (Trinity College, USA)

Venue: 2F Hall II

3:45pm- CS2c-1: Inner Speech and Introspective Self-Knowledge

Kengo Miyazono[1,2]

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In this presentation, I argue for "Inner Speech Account of Introspection", according to which the awareness of inner speech is the source of introspective self-knowledge of our conscious thought. The view claims that we come to know that we are thinking that *p* by being aware of the sentence of inner speech "*p*" in our head. In general, there is an intimate connection between our conscious thought and inner speech. When I consciously think that *p*, I usually utter the sentence of inner speech "*p*" in my head. Again, when I utter the sentence of inner speech "*p*", I usually think that *p*. Given this intimate connection, it is possible for me to know what I am thinking by being aware of what I am saying in my head. Inner Speech Account of Introspection is the view that this is not just a possibility, but also is actually what is going on when we introspectively know our own thought. The possible link between introspection and inner speech was previously mentioned by some philosophers including G. Ryle, P. Carruthers and A. Byrne. In this presentation, I go further and give an argument for Inner Speech Account by showing that the view explains six explananda imposed for the theory of introspective self-knowledge; peculiar access, privileged access, detection condition, the lack of phenomenology, occurrent/dispositional asymmetry, and content/attitude asymmetry.

4:05pm- CS2c-2: Is Naive Introspection Really Unreliable?

Kranti Saran

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Take introspection to be a kind of attention to current conscious experience. Is introspection reliable? Not according to Schwitzgebel (2008). He argues that naive introspection is unreliable in two ways: it often yields the wrong result or it yields no result at all. Schwitzgebel provides a wealth of putative evidence for what I'll call "pessimism" or the claim that, "The introspection of current conscious experience, far from being secure, nearly infallible, is faulty, untrustworthy, and misleading, not just possibly mistaken, but massively and pervasively," (p. 259). That is, whether it be emotional, visual or cognitive phenomenology, Schwitzgebel thinks that we are prone to gross errors even under the best conditions. Pessimism has serious revisionary repercussions for psychology. If pessimism is true, then any psychological study that relies on introspecting emotional, visual or cognitive phenomenology, relies on the evidence of a grossly unreliable faculty. For example, sorting faces on the basis of their attractiveness involves introspecting one's emotional phenomenology. But if introspection is grossly unreliable, as pessimism insists, then the ranking does not in fact reflect felt attractiveness, since we are so unreliable at introspecting it. Is pessimism warranted? This paper critically assesses the evidence presented by Schwitzgebel, to argue that most of his evidence is either self-defeating or inconclusive. I steer a middle path between pessimism and its other extreme, "optimism", or the claim that introspection is nearly infallible. Like Churchland (1988), I argue that introspection is roughly on par with perception; I argue that we can avoid the revisionary repercussions of pessimism without lapsing into optimism.

4:25pm- CS2c-3: When to trust first-person reports—and when not to. A new approach towards first-person methods in consciousness research

Jennifer M. Windt

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What is the epistemological status of first-person reports relative to conscious experience? Both philosophers of mind and researchers from the cognitive and neurosciences are increasingly recognizing the need for integrating first-person reports into consciousness research, but disagree as to their reliability. For instance, neurophenomenology takes first-person reports to be generally reliable and suggests that the reports of trained subjects reveal structural features of conscious experience that are inaccessible to casual introspection. By contrast, Dennett's heterophenomenology principally distrusts first-person reports, recommending that they should be treated as fictions and that the researcher should remain neutral regarding their epistemological status. I propose an intermediate position between the two extremes of naïve trust and principled skepticism. Pragmatic realism claims that first-person reports, at least when gathered under certain conditions, should be taken to be epistemically transparent regarding conscious experience. Assuming that first-person reports reveal the occurrence and phenomenal character of conscious experience as a default position is a necessary condition for making progress in interdisciplinary consciousness research. I then propose methodological skepticism as a means of formulating empirically informed and informative doubts about the reliability of first-person reports. Unlike principled skeptical approaches, such doubts have to be grounded in empirical evidence in order to be constructive and drive research towards ever-more rigid methods and elaborated theories. I argue that pragmatic realism about conscious experience, when complemented by methodological skepticism, is an important and fruitful theoretical tool for consciousness research and that it is not only normative, but also descriptive of existing approaches.

4:45pm- CS2c-4: What metarepresentation is for

Tillmann Vierkant

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In the theory of mind debate, metarepresentation has been understood as the key ability for understanding minds in order to predict behaviour. In this paper I want to argue that the real function of the ability to understand the nature of representations is more about manipulating one's own mind, rather than predicting the behaviour of others. I draw on the agential theory of self knowledge as developed by Pettit/McGeer. According to their proposal, human minds are self-regulating, because language allows humans to "think about thinking" This phrase sounds very similar to what thinkers like Perner or Carruthers mean by metarepresentation, but it is quite different. Pettit/McGeer do not think that language automatically enables humans to understand the nature of representations, but that it does enable them to take a much more active role in shaping the content of their mental states. While I will agree with the gist of the Pettit/McGeer proposal, I will also argue that language is nevertheless neither a necessary condition for self-regulation nor sufficient to explain certain distinctly human forms of self-regulation. In order to make this point, I will examine Smith's and Beran's work on animals and what Hieronymi, has called 'manipulative control'. In manipulative control an agent brings about the acquisition of a desired mental state by manipulating their psychology rather than by deliberating. The final step of the paper is then to argue that manipulative control does require metarepresentation and that it is the most essential distinctly human form of self-regulation.

5:05pm- CS2c-5: Two Levels of Metacognition

Santiago Arango-Munoz

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Two main theories about metacognition are reviewed. One claims that metacognition is a metarepresentational capacity to self-ascribe mental states (Carruthers 2009), whereas the other claims that it is mainly a capacity to evaluate and control our cognitive processes via a mental simulation of them (Proust 2007). Each of these theories claims to provide a better explanation of this phenomenon, while discrediting the other theory as inappropriate. The talk/poster claims that in order to do justice to the complex phenomenon of metacognition, we must distinguish two levels of this capacity—each having a different structure, a different content and a different function within the cognitive architecture. It will be shown that each of the reviewed theories has been trying to explain only one of the two levels and that, consequently, the conflict between them can be dissolved. The talk/poster characterizes the high-level as a rationalizing level where the subject uses concepts and theories to interpret her own cognitive behavior and the low-level as a controlling level where the subject exploits epistemic feelings (a particular kind of conscious experience) to adjust her cognitive activities. Finally, the paper explores three kinds of interaction between the levels: 1) bottom-up causation from the low-level to the high-level, 2) top-down causation, and 3) top-down effect causing an inhibition of the low-level by the high-level.

5:25pm- CS2c-6: Perception versus Memory: An Argument against Representationalism**Joseph N. Gottlieb**University of Illinois: Chicago, Department of Philosophy joseph.gottlieb@gmail.com

This paper presents an argument against both strong and weak varieties of Representationalism; the thesis (broadly construed) that the phenomenal content of a conscious mental state is either exhausted by, or supervenes on, that state's representational content. In short, I argue that the initial perception of an experience and the memory of that very same experience can—under certain conditions—be identical in their r-content while differing in their p-content. Because Strong Representationalism entails the supervenience commitment of its weaker cousin, a counterexample to the supervenience claim will serve to topple both versions of the representationalist thesis. Both a priori and empirical support is provided for the conclusion.

CS2d: Clinical insights (June 10, 3:45pm – 5:45pm)

Chair: Noam Sagiv (Brunel University, UK)

Venue: 2F Hall III**3:45pm- CS2d-1: Is the cortex the seat of conscious unity?****Yair Pinto**University of Amsterdam yair.pinto@gmail.com

It is undisputed that conscious experiences correlate (almost) exclusively with activity in cortical areas. However, this does not necessarily imply that conscious unity depends on the cortex. Perhaps, conscious unity finds its origin subcortically. The way to test this is by investigating split-brain patients. In split-brain patients subcortical areas are unaffected. However, their corpus callosum is severed, effectively isolating the cortical hemispheres from one another. If conscious unity depends on cortical unity, then in split-brain patients conscious unity should be lost. Specifically, each hemisphere should have its own consciousness. Indeed, classic split-brain studies claim this to be the case. These studies report that, when a stimulus is flashed to the left visual field, the patient verbally reports to see nothing. However, with his left hand he draws the stimulus. This suggests a split-consciousness. His speaking left hemisphere never consciously saw the picture, but his mute right hemisphere (which controls his left hand) did. However, I recently revisited this classic experiment with two split-brain patients (with a full callosotomy), but found very different results. Both patients verbally reported (and reacted with their right hand) on the presence and orientation of objects throughout the entire visual field. My recent findings are not isolated incidents. The last thirty years have produced an enormous amount of 'anomalous' data. In this presentation I will discuss these findings, and I will argue that we should consider the notion that not the cortex, but subcortical areas are the seat of conscious unity.

4:05pm- CS2d-2: Do chimpanzees have better working memory of numerals than humans?**Ting-An Lin [1], Allen Y. Houg [2]**[1] College of Life Science, National Taiwan University, [2] Institute of Philosophy of Mind and Cognition, National Yang-Ming University isly17@gmail.com

Whether chimpanzees have better working memory of numerals than humans is still a controversial issue. According to the results of 'limited-hold memory task', Sana Inoue and Tetsuro Matsuzawa (2007) held that chimpanzees have an extraordinary photographic memory capacity for numerical recollection and also proposed a trade-off hypothesis to explain that humans have developed symbolic representation while losing photographic memory (Matsuzawa, 2009). Nonetheless, Peter Cook and Margaret Wilson (2010) refuted the above conclusion by showing two human subjects outperformed chimpanzees after adequate practice, claiming that there is no evidence for superior working memory in chimpanzees. However, the results of limited-hold memory task, I argue, are not due to superiority or inferiority of working memory but the different working memory systems used by humans and chimpanzees. I argue that chimpanzees favor to use photographic memory to memorize the digits as a picture while humans favor to memorize them by symbolic representation. On the practice procedure of Inoue and Matsuzawa's experiment, the human subjects used symbolic representation to memorize the numerals, looking at the display much longer than chimpanzee did and then performed poorly in limited-hold memory task. Nevertheless, in Cook and Wilson's experiment, humans used photographic memory after training at much shorter stimulus duration and thus outperformed chimpanzees in the following task. The result of Cook and Wilson's experiment only proved that the photographic memory of humans can be enhanced after adequate training but didn't refute the argument of two working memory systems of numerals in chimpanzees and humans proposed by Matsuzawa.

4:25pm- CS2d-3: Mirror-touch Synaesthesia in the phantom limbs of amputees

Jamie Ward, Aviva Idit Goller, Kerrie Richards

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In mirror-touch synaesthesia merely observing another person being touched will cause the observer to experience a touch sensation on their own body. The current study investigates whether this, normally a developmental condition, might be acquired in amputees as a consequence of the changes that occur after amputation. Almost a third of amputees report a tactile sensation on their amputated phantom limb when watching someone else being touched. In this particular group the sensations tend to be localised on the phantom limb or stump, but are rarely reported elsewhere on the body, irrespective of the body part seen. Twenty-eight amputees observed 67 videos of touch events and indicated a) whether the video elicited tactile sensations, b) where on the body this was located, c) the intensity of the sensation, and d) whether it was painful. The synaesthetic sensations were more intense when real bodies were observed relative to dummies or objects, and when the observed touch is mildly painful relative to non-painful. Although frequency, intensity and cause of phantom limb pain do not appear to determine whether an amputee will report mirror-touch sensations, those who do report it show greater empathic emotional reactivity. These results suggest that acquired synaesthesia may be linked with sensory loss, arising after amputation, and that that highly empathic individuals could be predisposed to strengthening existing pathways between observed touch and felt touch.

4:45pm- CS2d-4: Measuring cortical effective connectivity in non-communicating patients with severe brain injury

Mario Rosanova [1], Olivia Gosseries [2], Silvia Casarotto [1], Mélanie Boly [2], Adenauer G. Casali [1], Marie-Aurélié Bruno [2], Maurizio Mariotti [1], Pierre Boveroux [2], Giulio Tononi [3], Steven Laureys [2], Marcello Massimini [1]

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Objectives Transcranial Magnetic Stimulation combined with Electroencephalography (TMS/EEG) was employed to assess cortical effective connectivity at the bedside of severely brain-injured patients with disorders of consciousness. Methods TMS-evoked potentials were recorded in 17 brain-injured patients. A first group of 12 patients (Group I) underwent a single session. Five of these patients were diagnosed as vegetative state (VS), five were minimally conscious (MCS) and two were in a locked-in syndrome (LIS). A second group of five patients (Group II) underwent longitudinal measurements. Three of them recovered consciousness evolving from VS through MCS to emergence from MCS. Results In Group I, in VS patients, TMS triggered a stereotypic and local response indicating a breakdown of effective connectivity. On the contrary, in MCS patients, TMS triggered rapidly changing, widespread responses similar to the ones recorded in LIS and healthy awake subjects. In Group II, a simple response to TMS was also recorded in all VS patients. In the three patients who recovered consciousness and functional communication, intracortical effective connectivity resurged soon after they switched from VS to MCS as well as they emerged from MCS. Conclusion TMS/EEG measurements performed in Group I suggest that clear-cut differences in intracortical effective connectivity underlie the subtle clinical discrimination between VS and MCS patients. TMS/EEG measurements performed in Group II showed that cortical effective connectivity resurged in VS patients who recovered consciousness as soon as they recover to MCS. Thus, this change in the brain's capacity for internal communication occurred at an early stage before the subject could reliably communicate with the environment.

5:05pm- CS2d-5: Functional MRI studies of aberrant self-experience: depersonalization disorder before and after treatment

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Depersonalization disorder (DPD) is characterized by a persistent and pervasive alteration in the quality of subjective experience, such that experience of both oneself and the outer world seems oddly unreal, flat, and lacking in vitality. Patients with DPD almost invariably describe a specific deficit in emotional experience, such that emotional responses to external events are experienced as dampened or absent. In this study, 14 patients with DPD viewed alternating blocks of aversive and neutral images during fMRI scanning. In comparison to healthy controls, patients showed a significant absence of activation in the left anterior insula (LAI) in response to aversive images. 10 patients repeated the paradigm after 4-8 months of pharmacotherapy. In patients reporting significant clinical improvement, there was activation of LAI present at time 2, and this area was significantly more active in responders than non-responders at time 2. An area of right ventrolateral prefrontal cortex, identified

in previous work as being involved in the suppression of emotional responses, was active in DPD patients at time 1, but in non-responders only at time 2, suggesting that overactivity of this region plays a key role in the disturbance of emotional experience that characterizes DPD. The findings provide an unusual perspective on the role of the anterior insula in self-awareness, and have relevance to the wider study of affective neuroscience, psychopathology, and self-related processes.

5:25pm- CS2d-6: Automatic attributions of human qualities to graphemes and linguistic sequences in synaesthesia: an fMRI study

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The attribution of mental states such as feelings, intentions, and beliefs to agents is fundamental to predicting and understanding others' behaviour. In a variety of situations, mental capacities are ascribed not only to humans but also to inanimate objects and other non-human entities. A particularly interesting instance of this - ordinal linguistic personification (OLP) - is a variant of synaesthesia in which mental states and other human qualities are attributed to letters, numbers, or time units. In the light of these phenomena, brain research into synaesthetic personifications of graphemes, ordinal sequences and objects may provide a promising means to test theories concerning the neural bases of social cognition, particularly mentalising. This work used functional magnetic resonance imaging to investigate the brain areas mediating the implementation of synaesthetic personification. The results of our fMRI study will be examined in the context of the brain mechanisms engaged in understanding other people's intentions and feelings.

CONCURRENT SESSION 3 (June 12, 10:30am – 12:30am)

CS3a: Blindsight & perceptual blindness (June 12, 10:30am – 12:30am)

Chair: Hakwan Lau (Columbia University, USA)

Venue: 1F

10:30am- CS3a-1: Event-related potential (ERP) evidence for a common neural pathway of a GABA-a agonist and backward masking in disrupting visual awareness

Anouk M. van Loon[1], **H Steven Scholte**[1], **Simon van Gaal**[1,2,3], **Bjorn J. J. van der Hoort** [1], **Victor A. F. Lamme** [1,4]

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Consciousness can be manipulated in many ways. Here, we seek to understand whether two ways, visual masking and pharmacological intervention, share a common pathway in manipulating visual consciousness. We recorded EEG from human subjects who performed a backward masking task in which they had to detect a masked figure from its background (masking strength was varied across trials). In a within-subject design, subjects received Lorazepam (GABA-a receptor agonist) or placebo. The behavioral results show that detection rate decreased with increasing masking strength and that Lorazepam induced a further decrease in detection rate. Figure-related ERP signals showed three neural events of interest: (1) an early posterior occipital and temporal generator (94-121 ms) that was not influenced by the pharmacological manipulation nor by masking. (2) A later bilateral peri-occipital generator (156-211 ms), which was reduced by masking as well as Lorazepam. (3) A late bilateral occipital temporal generator (293-387 ms) that was mainly affected by masking. Crucially, only the intermediate neural event correlated with detection performance. In combination with previous findings, these results suggest that Lorazepam and masking both reduce visual awareness by means of modulating recurrent activity in the visual cortex, but leave early feedforward intact. These findings provide the first evidence for a common mechanism for these two distinct ways of manipulating consciousness.

10:50am- CS3a-2: Moving without knowing: Discrepancy between action and perception during eye movements

Martina Poletti, Michele Rucci

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It is remarkable that we perceive a stable visual world. Unlike our percept, the image on the retina is never stationary. Microscopic eye movements, which include microsaccades and drifts, continually relocate the direction of gaze even when we attempt to maintain fixation. How does the visual system identify and discard the motion of the retinal image caused by these involuntary eye movements while? To answer this question, we have decoupled eye movements from the changes in visual input that they normally cause. By using a real-time system for gaze contingent display, we precisely controlled the motion of the retinal stimulus during eye movements. Our results show that even though ocular drift is under the control of the motor system, humans are not aware of its occurrence. This gives rise to discrepancy between motion and perception. We show that ocular drift is influenced by the visual stimulus; a slowly moving target is accurately tracked, whereas a stationary one is accurately fixated. Yet subjects are unaware of their motor activity and rely, instead, on the retinal image to infer motion of the stimulus. As a consequence, under the right circumstances, subjects report a moving stimulus as stationary even though they track it with their eyes and a stationary one as moving even though they maintain accurate fixation. Fixational eye movements provide an ideal arena to study interactions between behavior and visual awareness. (Supported by NIH EY18363 and by NSF BCS-0719849).

11:10am- CS3a-3: Neural correlates of visual awareness studied with adaptation induced blindness

Kaoru Amano [1,2], **Toshimasa Takahashi** [3], **Tsunehiro Takeda** [1], **Isamu Motoyoshi** [4]

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Neural activities related to visual awareness have been studied using displays such as binocular rivalry and motion-induced blindness, in which the perception of a target is replaced by that of a competing stimulus. Here, we introduced a novel display in which the post-adaptation target becomes totally invisible without any competing stimuli (adaptation-induced blindness), and recorded magnetoencephalography (MEG) responses to isolate the neural activities correlated with awareness of a single visual target. Following the presentation of a drifting grating of 10 Hz, a static grating was gradually presented either at the adapted location (adapted condition) or at

the non-adapted location (non-adapted condition), or did not appear at all (no image condition). The observers were instructed to judge whether they perceived the test grating or not. The MEG responses to the test grating were recorded using 440 ch whole-head MEG system (PQ2440R: Yokogawa, Japan). The cortical loci and the functional connectivity were studied with beamformer in combination with granger-causality analysis. We found that while the observers perceived nothing on a uniform background in the adapted condition, the invisible test grating produced a significant decrease in alpha and an increase in gamma response around hMT+. The connectivity analysis further indicated that the feedback from hMT+ to V1 might be essential for visual awareness. The results demonstrate the existence of extra-striate cortical activities that do not prompt awareness of a visual stimulus even without any competing inputs.

11:30am- CS3a-4: Neural correlate of blindsight generated in the superior colliculus

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Macaque monkeys with a unilateral lesion in V1 have been used as an animal model of blindsight, a form of unconscious vision in human. Previously we reported that macaque monkeys with a unilateral V1 lesion were able to discriminate spatial position of visual stimuli in the visual field contralateral to the V1 lesion while they failed to report presence or absence (i.e., detection) of the physically identical stimuli, demonstrating blindsight in monkeys. Here we sought for the neural mechanisms of blindsight. We recorded activity of the visual neurons in the superior colliculus (SC), putatively from the superficial layer that received direct input from retina. We found that their visual response was stronger when the monkeys succeeded in detection ('hit') than when they failed ('miss'). Such modulation was found only on the side of the V1 lesion, thus indicating the neural correlate of blindsight in the SC. The visual response latency was less than 60 ms and the difference between hit and miss emerged less than 100 ms after stimulus onset. We also found similar modulation in the deeper layer of the SC, which is involved in saccade initiation. However, their temporal dynamics were similar to those of the superficial layer neurons, suggesting that the modulation evolved in bottom-up visual processing. Together with the finding in the accompanying paper (Kato et.al.) that discrimination of visual stimuli by the same monkey was abolished by pharmacological inactivation of the SC, we conclude that the neural correlate of blindsight is generated in the SC.

11:50am- CS3a-5: Blindsight in normals: Binding features without awareness

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Blindsight refers to the paradoxical phenomenon observed in occipital cortex injured patients: They report having no visual awareness and nevertheless demonstrate higher than chance level response to visual stimuli. In this study, we observe a blindsight effect on feature binding in normal observers. In the continuous flash suppression procedure, a color bar, conjoined by one color (red or green) and one orientation (horizontal or vertical), was presented to one eye. Visual awareness of the color bar was suppressed by dynamic changing colorful Mondrian patterns that were presented to the other eye. Participants were asked to detect the color bar and forced to guess its identity from one of the four possibilities if they could not see the bar at all. Results showed that while participants reported being unable to detect the bar, their guessing response (~30-40%) was significantly more accurate than chance (i.e., 25%), and this was not due to a guessing bias based on the detection of either features (color or orientation). To further examine whether attention is needed for this blindsight effect on feature binding, we presented a spatial cue with 75% validity and asked participants to pay attention to the cued location. While there was no difference in the bar detection at the attended or unattended location, the blindsight effect on feature binding was still observed when the bar was presented at the attended location, but not at the unattended location. In sum, these results suggest that feature binding can occur without awareness, but attention is required. This research is supported by National Science Council of Taiwan (NSC 96-2413-H-002-009-MY3, 98-2410-H-002-023-MY3, 098-2811-H-002-034, and 099-2811-H-002-038).

12:10am- CS3a-6: Orienting or intention? Unconscious processing of human gaze

Yi-Chia Chen, Su-Ling Yeh

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Human gaze indicates the direction of next action, which is so important that even a chimpanzee can detect it (Tomonaga & Imura, 2010). We examine whether human gaze can be processed unconsciously when the face presented to one eye is made completely invisible for some time due to dynamic masks that was presented to the other eye (The continuous flash suppression paradigm). In Experiment 1, gaze and head orientation were the same, and we presented a schematic face in one of the six versions of facial expression (happy, fearful, neutral expression) x head orientation (direct, averted). Participants were asked to detect the face and the time to release

from suppression was used as an index of processing time. Faster detection time was found for faces with direct orientation than with averted one regardless of expressions. Experiment 2 kept the head orientation constant (in front) but manipulated gaze direction to eliminate the low-level feature effect such as symmetrical vs. asymmetrical configuration in direct vs. averted head orientation respectively. The same results were found. Experiment 3 tested two hypotheses. First, the averted gaze induces attentional orienting, which causes one's attention to shift away from the target and thus impairs its detection. Second, direct gaze carries "intention to you" information and facilitates processing because it is self-relevant. Upright, inverted, and eye-only conditions were manipulated. Results showed no difference between these conditions, supporting the attentional orienting account. In sum, gaze direction can be processed unconsciously through attentional orienting induced by averted gaze. This research is supported by National Science Council of Taiwan (NSC 99-2815-C-002-108-H, NSC 96-2413-H-002-009-MY3, and NSC 98-2410-H-002-023-MY3).

CS3b: Measures of consciousness (June 12, 10:30am – 12:30am)

Chair: Naotsugu Tsuchiya (RIKEN, BSI, Japan)

Venue: 2F Hall I

10:30am- CS3b-1: Querying the octopus visual system: Complex vision and a possible model for invertebrate consciousness studies

David B. Edelman

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Among all invertebrates, the coleoid cephalopods (octopus, squid, and cuttlefish) have camera-like eyes that are most structurally convergent with those of vertebrates, albeit with some notable differences. Moreover, octopuses appear to be capable of both seeing moving objects (e.g., predators or prey) at reasonably large distances and acting quickly on what they see. The foregoing observations strongly suggest: 1) the presence of relatively sophisticated visual processing, i.e., neural substrates that can support dense visual input; 2) the possible specialization of sub-modal visual areas in the central brain, perhaps analogous in some ways to the vertebrate case; and 3) spatiotemporal properties of memory that would necessarily involve rapid integration of visual information into a dynamic 'scene.' Endowed with a nervous system containing roughly 500 million neurons, as well as camera eyes, the common octopus (*O. vulgaris*) may be an excellent model for investigating consciousness in an invertebrate. However, in order to justify such an investigation and establish its attendant methodology, and because the visual channel will be crucial to this kind of study, it will be necessary to first characterize some previously unknown functional properties of octopus vision. Here, I discuss the latest results from an ongoing study of the perception of biological motion in *O. vulgaris* and offer a 'roadmap' of additional experiments that, it is hoped, will lead to a robust methodology for the explicit investigation of sensory consciousness in these, and perhaps other (e.g., the jumping spider *Portia*), invertebrates. Supported by the Neurosciences Research Foundation.

10:50am- CS3b-2: Signal detection theory is not a good model or measure of consciousness

Anil K Seth [1,2], Adam B. Barrett [1,2], Ryan C. Scott [1,3], Zoltan Dienes [1,3], Daniel Bor [1,2]

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Signal Detection Theory (SDT) is widely used to measure objective (type I) and subjective (type II) behavioural responses relevant to distinguishing conscious from unconscious processing. SDT also suggests a 'higher order' model of neural mechanisms according to which, roughly speaking, consciousness arises as the brain 'does signal detection on itself' (Lau, 2008). In a typical study, subjects make forced choice (objective) responses (e.g., present vs absent) to a stimulus, and then provide (subjective) confidence ratings commenting on their first-order decisions. Type I dprime compares hits and false alarms with respect to objective responses and measures discrimination accuracy. Type II dprime compares hits and false alarms with respect to subjective responses and is usually taken to reflect metacognitive insight, indicating the extent to which type I decisions are based on conscious as opposed to unconscious signals. Here, we describe analytical models and computational simulations indicating that SDT is neither a good measure, nor a good model, of consciousness. Among our results we show (i) type II dprime is unstable and depends on decision criteria used for both objective and subjective responses; (ii) type II dprime can be negative and in some cases exceeds type I dprime; contrary to experimental results (Scott et al., this meeting) zero type I dprime implies zero type II dprime. Meta-dprime, a new measure designed to overcome the limitations of type II SDT (Rounis et al. 2010), also suffers from instabilities. We explore alternatives based on information theory and Bayesian predictive coding.

11:10am- CS3b-3: Granger causality analysis of steady-state EEG during propofol-induced anaesthesia

Adam B Barrett [1], Mike Murphy [2], Mélanie Boly [3], Steven Laureys [3], Pierre Boveroux [3], Quentin Noirhomme [3], Marie-Aurélié Bruno [3], Anil K Seth [1]

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An important challenge in the neuroscience of consciousness is to discern neurophysiological correlates of changes in conscious level. Various theories suggest a key role for directed information flow between brain regions in modulating conscious level. However, measuring information flow is technically challenging, even given relevant data. A promising measure in this context is Granger causality (G-causality), which quantifies the extent to which past observations from one region help to predict future observations from another. We developed a new method for applying G-causality to high-density, steady-state EEG data, and applied it to data from subjects undergoing propofol-induced anaesthesia. These data were source localized, furnishing low-artefact time-series from anterior and posterior cingulate cortices, these being areas showing large gamma-based power changes between waking and loss-of-consciousness (LOC). For each subject, we computed G-causalities for multiple short data segments taken from both the waking state and LOC. We used permutation analysis to eliminate statistical bias in individual observations, while allowing that G-causalities could vary during both waking and LOC. Inferences on changes in mean G-causality showed high inter-subject consistency, marked by a significant increase in bidirectional Granger causality during LOC in most subjects, especially in the gamma and beta bands. In contrast, changes in synchrony showed substantially lower consistency among subjects, though across subjects we confirmed a general increase in gamma synchrony during LOC. Our results illustrate a methodological pipeline for rigorous G-causality analysis of steady-state EEG data, and underline the utility of G-causality in exposing functional neural interactions underlying different conscious levels.

11:30am- CS3b-4: Know thyself: Metacognitive networks and measures of consciousness

Antoine Pasquali [1,3*], Bert Timmermans [2*], Axel Cleeremans [1*]

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Subjective measures of awareness rest on the assumption that conscious knowledge is knowledge that participants know they possess. Post-Decision Wagering (PDW), recently proposed as a new measure of awareness, requires participants to place a high or a low wager on their decisions. Whereas advantageous wagering indicates awareness of the knowledge on which the decisions are based, cases in which participants fail to optimize their wagers suggest performance without awareness. Here, we hypothesize that wagering and other subjective measures of awareness reflect metacognitive capacities subtended by self-developed metarepresentations that inform an agent about its own internal states. To support this idea, we present three simulations in which neural networks learn to wager on their own responses. The simulations illustrate essential properties that are required for such metarepresentations to influence PDW as a measure of awareness. Results demonstrate a good fit to human data. We discuss the implications of this modeling work for our understanding of consciousness and its measures.

11:50am- CS3b-5: Converging on consciousness?

Liz Irvine

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Seth et al.'s (2008) review of behavioural and neurophysiological measures of consciousness suggests that by using studies that make use of both types of measure, a process of mutual refinement will result in uncovering the best theories, taxonomies and measures of consciousness. This proposal of using integrative techniques to find convergence over multiple levels of analysis is echoed in recent work in philosophy of neuroscience, including in reductive (Bickle, 2006) and multi-level (Bechtel, 2007, Craver 2007) accounts of explanation in neuroscience. However, Sullivan (2009) has argued that this kind of multi-level integration and convergence cannot currently be found in neuroscience. This is because variations in experimental protocols for operationalising a single phenomenon mean that different research groups are in fact operationalising different phenomena altogether. Using Sullivan's framework, the differences in experimental protocols in consciousness science will be explored. Based on these differences, it will be argued that instead of operationalising different aspects or types of consciousness, researchers are simply operationalising very different phenomena. Although this is sometimes made explicit, for example through debates about the potentially confounding effects of attention and working memory on consciousness, the problem goes much deeper than usually recognized. This means that convergence across different levels of analysis (behavioural, neurophysiological) towards well-supported measures and theories of consciousness is, in methodological terms, very problematic. Implications of this claim to the science of consciousness will be briefly discussed.

12:10am- CS3b-6: Higher-order awareness without first-order accuracy: Implications for models of consciousness

Ryan Scott [1,3], Zoltan Dienes [1,3], Anil Seth [2,3]

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Models of higher-order awareness adopting a signal detection framework (e.g. Scott & Dienes, 2008) assume that metacognitive insight is derived directly from the output of the network making first-order discriminations (see accompanying abstract by Seth et al.). The more clearly the first-order network supports one option over another the higher one's confidence in that judgement. A consequence of this assumption is that one cannot have metacognitive insight – confidence predictive of accuracy – in the absence of above chance discrimination. Here, we present evidence to the contrary. Response accuracy and confidence ratings were examined for 320 participants classifying artificial grammar strings. First-order accuracy was captured by type-I d-prime (dI') calculated on grammaticality judgments. Higher-order awareness was captured by type-II d-prime (dII') relating confidence and accuracy. 50 participants exhibited chance discrimination performance ($dI' \leq 0$). These participants nonetheless revealed significant metacognitive insight ($dII' = 0.18$, $SE = .05$, $t(49) = 3.24$, $p = .002$) that was not significantly different from participants discriminating above chance ($dII' = 0.24$, $SE = .03$, $t(318) = .913$, $p = .362$). These participants exhibited higher-order awareness without first-order accuracy. Furthermore, participants encouraged to believe their discrimination performance was better than reflected by their confidence ratings displayed significantly greater metacognitive insight ($dII' = 0.29$, $SE = .06$) than those not encouraged ($dII' = 0.16$, $SE = .04$, $t(158) = 2.02$, $p = .046$) despite their discrimination performance ($dI' = 0.53$, $SE = .06$) remaining equivalent ($dI' = 0.55$, $SE = .06$, $t(158) = 0.27$, $p = .785$). These data have important implications for models of consciousness and metacognition. Specifically, they imply that metacognitive judgments either derive from different inputs to first-order judgments or the same inputs processed differently, in a way inconsistent with signal detection theory implementations

CS3c: Theories & models of consciousness (June 12, 10:30am – 12:30am)

Chair: Timothy Lane (National Chengchi University, Taiwan)

Venue: 2F Hall II

10:30am- CS3c-1: Dolphin consciousness and higher-order thought theories

Ryoji Sato

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Higher-order thought theories of consciousness (HOT theories) are one of the most promising physicalistic theories of consciousness. However, at the same time, it is also known by its coldness for consciousness in nonhuman animals. Since HOT theories in general require creatures to possess cognitively sophisticated capacity of having HOT to enjoy a conscious mental state, it is said unlikely that nonhuman animals are subjects of conscious mental states. In this presentation, on the contrary, I argue there is an actual case for consciousness in nonhuman animal based on recent evidence in comparative psychology. I mainly consider about an experiment of bottlenosed dolphin by Smith et al. (1997), which is said to prove existence of metacognitive capacity of dolphin: monitoring capacity of uncertainty. Gennaro (2009) thinks it is a case for HOTs and conscious mental states in nonhuman animals, but Browne (2004) disagrees. His refusal is based on the famous Morgan's canon: if there are explanations without higher order capacity, we should take one of them. I like to strengthen Brown's conclusion by appealing to an argument proposed by Jose Bermudez (2003) to the effect that nonlinguistic creatures cannot enjoy HOTs about other thoughts. Instead, I propose an alternative explanation that the dolphin has a HOT about its feeling of uncertainty. A HOT about a mental state with feeling is still a HOT in a weaker sense of the term. If this is the case, the dolphin does have a HOT and therefore has a conscious mental state.

10:50am- CS3c-2: Attention and the structure of consciousness

Adrienne Prettyman

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The relationship between consciousness and attention has recently attracted much philosophical interest. I give a new argument for the view that attention is necessary for consciousness. Previous attempts to argue for the view that attention is necessary for consciousness have relied on empirical evidence for the role of selective attention in perceptual processing (de Brigard & Prinz 2010). These arguments are vulnerable to objections that criticize the interpretation of the empirical findings, or point to studies which seem to show evidence for consciousness in the absence of selective attention (Koch & Tsuchiya 2006; Lamme 2003). In contrast, my view is motivated by

phenomenological insight into the structure of lived experience. I broaden the concept of attention beyond visual selective attention, and argue that attention plays two roles in structuring conscious experience. (1) Synchronically, attention gives conscious experience its foreground/background structure. (2) Diachronically, attention structures the stream of consciousness by determining shifts in the content of present perception, retention, and protention, which jointly comprise what William James calls the “specious present.” I argue that these synchronic and diachronic roles of attention are necessary conditions for conscious experience. If I am correct, then attention is necessary for consciousness. I briefly compare my view with other attempts to provide a person-level characterization of attention (Mole 2011; Wu 2010), and show that in focusing on the role of attention in rational action, these theories have neglected the fundamental role of attention in structuring consciousness. **TBA**

11:10am- CS3c-3: The sensorimotor approach and higher-order representationalism

Oliver Kauffmann [1] , John Michael [2]

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The so-called 'dynamic sensorimotor approach' to perception is a constitutive theory about perception as embodied. Perceptual experiences are explained as the subject's implicit knowledge of how sensory stimulations vary as a result of change of the subject's bodily action. Perceptual experiences supervene on neural states of the brain plus this kind of implicit knowledge. We argue that on the most charitable interpretations of 'implicit knowledge' (O'Regan & Noë, 2001; Hurley & Noë, 2003; O'Regan, 2011), this approach slides back into a higher-order representationalism and gives rise to the problem of misrepresentation inherent to this position. A higher-order personal-level control of the tracking activity of the sensorimotor contingencies is accomplished by the organism's knowledge of the embodied knowledge of sensorimotor contingencies. But to claim that this second-order knowledge of the embodied 'knowing how' itself can be understood as a type of 'knowing how' is ill-founded. Assuming that instantiations of 'knowing how' are essentially tied to embodied skills, it is not clear that any embodied skills whatsoever are exercised by the higher-order control of (first-order) embodied skills. A conception of higher-order cognitive access to skills in terms of representational mental states is a more reasonable claim. But on such a two-tiered account of perceptual experience, a misrepresentation of a first-order embodied skill by a higher-order state is possible, just as much as it is in standard higher-order theories. By accepting this consequence, the explanatory role of embodied skill - an essential part of the constitutive version of the sensorimotor approach - is lost.

11:30am- CS3c-4: Consciousness, intentionality, and naturalization

Amir Horowitz

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Theses that relate consciousness and intentionality differ with respect to which of these phenomena, if any, has priority over the other. Relatedly, such theses may differ in their implications concerning the naturalization of consciousness and of the mental at large, the hard problem, and the explanatory gap. In this talk I argue for the priority of intentionality. My discussion starts from the claims (made by Horgan and Tienson) that "there is a kind of intentionality [...] that is constitutively determined by phenomenology alone", and that this adds a dimension to the problem of explanatory gap: why should a mental state that is grounded in some physical state be by its intrinsic phenomenal nature directed toward whatever it is directed toward? H&T correctly point out an intentional aspect that is (wholly or partly) determined by phenomenal character, but, I argue, they err about the nature of this determination – it is logical rather than metaphysical, and, more importantly, about its source and its implications. Since such "a kind" of intentionality cannot but be rooted in the fact that the phenomenal itself has a relational aspect (that which characterizes intentionality, as will be shown), the explanatory gap problem is anything but doubled, because such relations can plausibly be naturalized. Furthermore, we shall see that intentionality is prior to consciousness: due to that same relational character of intentionality, intentionality can only be essential to consciousness if consciousness is metaphysically determined (at least partly) by intentionality.

11:50am- CS3c-5: Inner clock model and conscious judgments of duration

Michal Klincewicz

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The dominant model of temporal perception posits an internal oscillator clock (Wearden 2001). On this view, each oscillation counts for a unit of time, which is added to a value stored in a buffer. The contents of the buffer at the offset of a stimulus determine the content of a subjective duration judgment. But it isn't obvious that such a connection exists, even if the internal oscillator model is otherwise correct. In this paper, I argue that the contents of subjective duration judgments are determined largely independently of perception, and thereby also independently of the operation of an internal oscillator. On my view, the oscillator drives motor control, while subjective judgments are determined by top-down input from other purely cognitive processes. I present two

arguments supporting this view. First, temporal judgments vary depending on the conception of time dominant in a linguistic community (Boroditsky and Gaby 2010). This shows that temporal judgments are influenced by factors independent of perception. Secondly, there is evidence that humans have at least two distinct duration mechanisms, one of which is tied to motor control and processes subsecond durations (Koch et al. 2007). The other mechanism processes longer durations, and involves areas of the brain that are tied to higher-cognitive functions. Nonetheless, even though the subsecond mechanism doesn't involve higher-cognitive areas, we are still able to make subjective judgments about subsecond durations (Pöppel 1997). This suggests that the contents of these duration judgments are determined largely by cognition, and independently of the subsecond timing mechanism.

12:10am- CS3c-6: Self-oscillator model of bistable perception explains percept stabilization and reversal rate characteristics with interrupted ambiguous stimulus

Norbert Fürstenau

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Experiments with periodically interrupted ambiguous stimulus (e.g. the Necker cube) with off-times $t_{off} < 1$ s exhibit a maximum of the percept reversal rate of $R_{max} \gg 36 \text{ min}^{-1}$ at $t_{off} \gg 200$ ms (with $t_{on} = 300$ ms) [Orbach et.al., *Percept. and Motor Skills* 22 (1966)]. For $t_{off} > 200$ ms the percept is stabilized with increasing t_{off} due to recovery from fatigue. These results can be explained by a simple nonlinear dynamics attention fatigue model with delayed perceptual feedback which was recently used for explaining long range correlations of the reversal time series [Fürstenau, *Biol. Cybern.* 103 (2010)]. A recursive phase oscillator equation describes the dynamics of the perception state with feedback through the attention control parameter (adaptive gain) which in turn is modulated through a slowly varying bias (memory). The present computer experiments reproduce the stimulus-off induced percept stabilization and reversal rate maximum of interrupted stimulus experiments. The t_{off} value at R_{max} is determined by the time constants (fatigue, recovery, feedback delay) and attention noise as parameters of the three coupled perception-attention-memory (PAM-) equations. The quasiperiodic percept alternations can be suppressed by a suitable choice of the perception bias (memory parameter), thus allowing also for the transition into a stable response when the stimulus becomes unambiguous. A mapping of the PAM equations to basic Thalamo-Cortical reentrant loops is suggested.

CS3d: Self & other (June 12, 10:30am – 12:30am)

Chair: Kenji Matsumoto (Tamagawa University, Japan)

Venue: 2F Hall III

10:30am- CS3d-1: Social cognition - A 360° panorama

Marisa Przyrembel, Dipl.-Psych., M.A.

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Current research in social cognition is characterized by two biases. The first consists of the tendency to assume that social cognition requires or is exhausted by Theory of Mind. I will argue for a wider conception and illustrate that certain prereflective precursors need to be taken into account – in particular, subpersonal interactions in a 2nd personal mode early in ontogenesis (Zahavi, 2008; Reddy, 2008). The second bias in current research, especially in primatological research or comparative psychology, is the tendency to think of social cognition against the background of prosocial, empathical, and altruistical capabilities. Slogans like "minds made for sharing" (Schilbach et al., in press) or "human unique path of hypercooperativeness" (Warneken & Tomasello, 2006) spell this out. However, an adequate theory of social cognition needs to pay equal attention to anti-social capabilities as manifested in competition, manipulation, and strategic deception. I will discuss three possible explanations for this "prosocial bias": a) the overlap of the normative and the descriptive level, b) the social desirability, and c) the enthrallment with the earliness of prosocial behavior. In my talk, I shall analyze the shortcomings of research suffering from these two biases and encourage to overcome them in order to make a 360° panorama of social cognition available.

10:50am- CS3d-2: A cognitive model of the imagination and emotions**Jordan C.V. Taylor**Macquarie Centre for Cognitive Science (MACCS), Macquarie University, Sydney, Australia jordan.taylor@gmail.com

Nichols & Stich (2003) offer a comprehensive account of imagination and pretence which synthesises aspects of both theory theory (the idea that we develop and utilise a theory of mind when predicting behaviour or attributing mental states to other agents) and simulation theory (the idea that we simulate the behaviour and mental states of others based on models of our own minds). While it promises to account for a much wider range of phenomena than either of the previous theories, their theory falls short of accounting for the functions of emotions—genuine or make-believe—on our beliefs and desires during episodes of pretence. If one accepts their view that a comprehensive account of imagination must combine aspects of previous theories, then one should be able to build on or their theory in order to account for the effects of emotions on imaginations and predictions. This paper draws on ideas such as Gendler's (2008) account of 'aliefs' as arational, cognitive mechanisms which underly emotions and beliefs, as well as Lambie's (2006, 2009) psychological work on emotions, rationality, and 'Reflective Revision'. Synthesising components of each theory, this paper arrives at an account of imagination which maintains many of the mechanisms of Nichols & Stich's work while accounting for the effects of emotions on the production of behaviour and mental states. In short, Nichols & Stich need not leave emotions out of their cognitive architecture; I demonstrate that emotion mechanisms are crucial components of a wide-reaching model of the imagination

11:10am- CS3d-3: Monkey medial prefrontal cortical involvement in social-based decision-making**Mariana F. P. de Araujo [1], Etsuro Hori [1], Rafael Souto Maior [1,2], Carlos Tomaz [2], Taketoshi Ono [1], Hisao Nishijo [1]**[1] System Emotional Science, Graduate School of Medicine and Pharmaceutical Science, University of Toyama, Sugitani 2630, Toyama 930-0194. [2] Laboratory of Neuroscience and Behavior, Department of Physiological Sciences, Institute of Biology, University of Brasília, Brasília-DF, Brazil. mfparaujo@gmail.com

The medial prefrontal cortex (mPFC) including the anterior cingulate sulcus is involved in both decision-making and social cognition, suggesting that this area may play a central role in decision-making based on social contexts. In the present study, neural activity from the monkey mPFC was recorded while they performed an observation-based decision-making task. The monkeys observed a robot arm touching one of two figures displayed in the left or right side of a touch screen. At each trial, one side was randomly assigned as correct. Every time the robot chose a correct option, the same pair appeared on another touch screen for the monkey. Then, the monkey had to touch the figure in the same side to obtain reward. Neuronal responses were compared by one-way ANOVA among 17 intervals distributed in 4 phases: baseline (1 s before each trial), observation phase (robot arm choices and feedback signals), inter-phase interval (between observation and following execution phases), and execution phase (monkeys choices and associated outcomes). Of 264 neurons recorded, 164 (62.12%) responded in one or more intervals of the task. Of these, 16 responded during the observation-phase, 5 during the inter-phase interval, 98 during the execution-phase and 18 on both phases. Furthermore, neuronal activity of 69 (26.14%) neurons during action observation was positively or negatively correlated with that during real action (execution). This type of neurons might correspond to mirror neurons. The results indicated that the mPFC processes information about self and others actions and outcomes, which may support social-based decision-making.

11:30am- CS3d-4: Depersonalization is due to damage to right fronto-parietal cortex: relevance for bodily aspects of self-consciousness**Guillaume Marillier [1], Lukas Heydrich* [1,2], Margitta Seeck [2], Nathan Evans [1], Olaf Blanke [1,2]**[1] Laboratory of Cognitive Neuroscience, Brain Mind Institute, Ecole Polytechnique Federale Lausanne, Switzerland [2] Presurgical Epilepsy Unit, University Hospital Geneva, Switzerland * presenting author Lukas Heydrich lukas.heydrich@epfl.ch

Ever since John Hughlings Jackson first described the so-called "dreamy state" during temporal lobe epilepsy – consisting of experiential hallucinations, the sense of having previously lived through the same situation (*déjà vu*) and/or the sensation of strangeness – these phenomena have been studied and repeatedly linked to mesial temporal lobe structures. However, most of these studies have focused on illusions of familiarity referring to the extrapersonal space (i.e. *déjà vu*, experiential hallucinations), whereas only little is known about such illusions that affect personal space (i.e. body and self; i.e. depersonalization). Here we analyzed a sample of 40 patients with intractable focal epilepsy suffering from either *déjà-vu*, experiential hallucinations, and/or depersonalization by means of lesion overlap analysis using the freely available software MRICron. All the patients underwent thorough pre-surgical examination at the University Hospital of Geneva, including MRI, PET, SPECT, EEG and neuropsychological examination. Confirming previous data, we found that *déjà-vu* was primarily due to right or left mesial temporal lobe epilepsy, and that experiential hallucinations were due to left temporal lobe epilepsy. Patients reporting depersonalization and related illusory own body perceptions were significantly more often suffering from extratemporal lobe epilepsy, affecting the frontal and parietal lobe. Our data reveal the

implication of extratemporal structures in fronto-parietal cortex, in depersonalization during the dreamy state. We discuss the relevance for scientific models of self-consciousness.

11:50am- CS3d-5: The other in me: Interpersonal multisensory stimulation changes the mental representation of the self

Ana Tajadura-Jiménez [1], Stephanie Grehl [2], Manos Tsakiris [3]

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Mirror self-recognition is a key feature of self-awareness. Do we recognize ourselves in the mirror because we remember how we look like, or because the available multisensory stimuli (e.g. felt touch and vision of touch) suggest that the mirror reflection is me? Participants saw an unfamiliar face being touched synchronously or asynchronously with their own face, as if they were looking in the mirror. Following synchronous, but not asynchronous, stimulation, and when asked to judge the identity of morphed pictures of the two faces, participants assimilated features of the other's face in the mental representation of their own face. Importantly, the participants' autonomic system responded to a threatening object approaching the other's face, as one would anticipate a person to respond to her own face being threatened. Shared multisensory experiences between self and other can change representations of one's identity and the perceived similarity of others relative to one's self.

12:10am- CS3d-6: Implicit influence of other's intention in prisoner's dilemma game

Haruaki Fukuda [1], Hiroaki Suzuki [1,2], Ayumi Yamada [1]

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It is known that we can perceive others' intentions and goals automatically. Moreover we interpret simple geometrical shapes as animated agent based upon their movements and perceive their intentions and goals. On the other hand, recent researches have demonstrated that people spontaneously adopt and pursue the goals perceived in others' behavior. This phenomena is called goal contagion and goal contagion can occur even when the goal is not consciously understood. In this study, we examined whether animated agents' intentions displayed implicitly could influence our social behavior. In the experiment, participants were seated in front of two PC monitors and first performed an irrelevant memory task in one monitor. Then, they performed prisoner's dilemma game in another monitor while the short animation in which a ball helps or hinders another ball played repeatedly in the monitor that participants had used in the memory task and did not attend to at that time. We found that participants exposed to an animation that implied helping behavior was more cooperative in prisoner's dilemma game than participants exposed to an animation that implied hindering behavior. In addition, participants could not answer what was displayed in the monitor in which the animation was displayed. This result suggests that others' intentions can influence our social behavior without consciousness and our cognitive system has unconscious process connecting perception of others' social intentions with our social behavior.

Poster Session Summary

Saturday, June 11th

Venue: 2F Hall I-III

POSTER SESSION 1 (10:30am-12:30pm)

P1-1: Far elements guide attention before near elements do

Ryuji Takeya[1], Akimi Ogihara[2], Tetsuko Kasai[3]

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Our conscious perception of grouping may be associated with involuntary attention spreading over the entire spatial region within a group, which is defined by Gestalt principles. This study examined attention-spreading processes by using event-related potentials (ERPs) that have high temporal resolutions of brain activities. Stimuli consisted of eight elements (E/Q for standards; F/O for targets). There were three stimulus conditions based on distance of elements similar in shape: adjacent pairs of elements were the same in the NEAR condition (e.g., EEEEEQQQ), both ends of elements were the same in the FAR condition (e.g., EEQQQEE), and all elements were the same in the BOTH condition. ERPs were recorded from 11 participants who were covertly attending to one hemifield and ignoring the other during rapid stimulus presentations. The task was to press a button for infrequent targets at the end of the attended hemifield. The typical ERP attention effects (i.e., amplitude enhancement at posterior electrode sites contra-lateral to the attended visual fields) were assessed. An early parietal ERP attention effect (95-125 ms post-stimulus onset) decreased for the FAR condition compared to NEAR condition. Later temporal ERP attention effects (225-270 and 275-400 ms) decreased for the BOTH condition compare to the other conditions (NEAR and FAR). These results indicate that attention was guided to far elements based on the global pattern or element saliency in the dorsal stream, which was followed by gradual attentional spreading in the ventral stream.

P1-2: On the role of physics and subjective space-Time in an understanding of perceptual experience.

Gert J. van Tonder

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One reasonable viewpoint in the science of the mind is that consciousness infuses with rich subjective qualities the otherwise featureless frame of external reality. In such an approach, space-time is an a priori aspect of the objective physics of the environment in which the body exists; the task for a science of mind is, foremost, to work out how the brain subjectively recalibrates the external physical space and time for itself to obtain synergies requisite for behavioral autonomy (O'Regan & Noë, 2001) and second, to find out which perceptual primitives are attached to the physical space-time frame in order for the conscious mind to experience subjective reality (von Uexküll, 1940; Albertazzi, 2010). This view gives rise to the conundrum of qualia. In the presentation here, I would like to depart from the assumption that physics is objective, and instead - via presentation of a meta-cognitive exercise - consider space and time as truly qualitative mental constructs. I will show that within this framework, physics can be fully redrawn as a study of how the ubiquitous mind structures reality, with deep implications for a scientific underpinning of physical reality. The framework presented does not necessitate a collapse into idealism, relativism, or dualist qualia. Instead, it naturally suggests a network of qualitatively different systems of meaningful primitives that could potentially populate perception, and hints at how the ultimate reality - independent of the mind - can be approached.

P1-3: Phenomenal stability vs. Neural dynamics

Alexandra Elbakyan

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An interesting, but rarely discussed feature inherent to most phenomenal states is their stability. Once percepts are formed, they are able to persist unchanged within consciousness for several seconds and longer. This stability, however, is at odds with neural activity that is proposed to provide a basis for consciousness by most recent theories. Neural activity by itself is inherently dynamic, with constant changes occurring at the order of milliseconds and faster. How do these dynamic processes result in a stable phenomenal experience? I argue that the paradox can be solved only by developing new descriptive model for neural activity that will be compatible with actual properties of phenomenal experience. In particular, higher-level descriptions, or macroproperties, of neural activity - such as synchrony and network patterns - should be employed instead of lower-level descriptions such as

individual spikes. Macroproperties can exhibit stable behavior regardless of dynamic activity occurring at the lower level at the same time. Thus, understanding phenomenal stability will provide an important insights for reunifying phenomenal states with their neural underpinnings.

P1-4: Eye movement differences between implicit and explicit contextual cuing effects

Satoshi Shioiri [1,2], Takuro Mano [2], Kazumichi Matsumiya [1,2], Ichiro Kuriki [1,2]

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When some of the layouts are repeated in a visual search task, participants learn the display layout implicitly. Time to detect the target (response time, RT) is shortened by repeated observations of layouts (contextual cuing effect). In a previous study (ASSC, 2008), we found differences in contextual cuing effects between implicit and explicit learning. Although RT and the number of fixations decreased after both implicit and explicit learning, fixation duration became long after explicit learning, but not after implicit learning. In order to investigate this fixation duration lengthening in detail, we asked whether this fixation duration effect depends on ability to recognize layouts. Using a typical visual search task for contextual cuing effect, we compared conditions with different number of repeated layouts. When there was one layout among several new layouts within a block, participants usually noticed the repetition of the layout even no information of layout repetition was given. When there were eight repeated layouts instead, participants noticed only a few repeated layouts. We used one, two, four and eight layouts for repetitions and measured the RT and eye movements. Reduction in reaction time was found for all repeated layouts but the layouts that were recognized later (ones assumed to be learned explicitly) showed larger reductions. In contrast, fixation duration was longer for layouts explicitly learned than for layouts implicitly learned. The longer fixation duration in the explicit condition may be explained by the time required to access in the memory in the explicit condition.

P1-5: What can developmental amnesic patients memorize about their personal past? In-depth investigation of episodic memory and the self in one new case

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Developmental amnesia (DA) refers to a selective episodic memory disorder, induced by bi-hippocampal damage sustained early in life (Vargha-Khadem et al., 1997). These patients fail dramatically to remember the events of their daily life. Very few studies have investigated their autobiographical memory (AM) dysfunction. Sense of identity is yet closely associated with personal past memory. In the light of neuropsychological studies and of theoretical frameworks, two complementary selves seem necessary to construct and maintain subjective continuity in time and personal identity: one phenomenological self allowing to travel in subjective time and one conceptual self that underlies knowledge about one's past (Duval et al., 2007). One might thus question about the possibility for developmental amnesic patients, which lack the episodic component of AM, to construct a normal sense of identity. We report here one new case of DA patient, Valentine, now adult, exploring: 1/ her abilities to remember personal past, and 2/ her sense of identity. Both AM components (episodic and semantic) were assessed thanks to an adaptation of the TEMPau task (Piolino et al., 2009). The multidimensionality and coherence of the self was assessed thanks to The Tennessee Self Concept Scale (TSCS, validated in French by Duval et al.). This questionnaire consisted in descriptive assertions that have to be self-rated on a 5-point true-false scale according to the adequacy with participant personality. Valentine's performance was compared to those of a control group matched for age. Concerning AM, we showed that she displayed a dense episodic AM amnesia, characterized by a complete inability to remember with a sense of reliving specific past events in a detailed fashion (i.e. no phenomenological self). She evoked in fact predominantly general events and failed to recall any strictly episodic AM. Moreover, she reported a sense of remembering personal past events (RKG paradigm) but, contrarily to the controls, she was unable to justify her judgements by providing phenomenological details. Note that she had completely preserved semantic AM. Regarding her conceptual self, the TSCS revealed that she had self knowledge, but she reported higher self-esteem and satisfaction and lower self-criticism. Across different domains of self (personal, family, social, moral, physics and academics), Valentine's scores were almost always higher than the control group, but only two of them were statistically different: the familial and the personal selves. We showed thus that she displayed a dense episodic AM amnesia and had no phenomenological self. Her sense of identity was also somewhat different: she seems to have conceptual knowledge about herself in the same way she should know things about the world but ignores specific instances which illustrate why and how she knows who she is, breeding to a personal identity devoid of intimacy (Piolino et al., 2009). In line with Conway's theoretical

framework, she experiences a subjective sense of well-being which is grounded on an idealistic self but ungrounded in a remembered realistic past.

P1-6: Large-billed crows (*Corvus macrorhynchos*) have retrospective but not prospective metamemory

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Evidence for metamemory, the ability to monitor ones' own memory, has been obtained in some primates, but it is weaker in other species. We examined whether crows flexibly modulate behaviors by monitoring their own memory in a delayed matching-to-sample task using two paradigms. First, crows performing a memory test were given an escape option to decline taking the test (prospective metamemory). Second, crows were given the escape option as a "not confident" report after completing the test (retrospective metamemory). Accurate memory performance yielded a reward with a higher probability, whereas inaccurate memory performance resulted in no such recompense. The escape option yielded it with a lower probability. In the prospective metamemory test, crows escaped the memory test more frequently with longer than shorter delay intervals but no more frequent in the sample-omission than sample-present trials, suggesting that the crows decided to take a test or not by using delay interval as a cue. In contrast, in the retrospective metamemory test, the crows escaped more frequently when their memory test response was incorrect than correct and in the sample-omission than sample present trials. These results suggest that crows at least retrospectively monitor their level of confidence in the memory test and utilize it for maximizing reward probability.

P1-7: Implicit association between sound frequency and visual motion

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We have recently shown that strong association between sound sequence and visual motion is easily formed within a short period and that, after forming the association, the sounds are able to trigger visual motion perception for a static visual object (Teramoto et al., 2010). Our current study demonstrates that the same effect can be observed with indiscriminable sounds. Two circles placed side by side were presented in alternation producing apparent motion perception and each onset was accompanied by a complex tone burst of 8 spectral components. Each tone was created by removing one (820 Hz or 1219 Hz) of the 9 frequency components, which were equally spaced from 672 Hz to 1485 Hz on a logarithmic scale. These tones were far above threshold but virtually indiscriminable by participants. After prolonged exposure to this visual apparent motion with the complex tones, the tones became drivers for illusory motion perception. When the flash onset was synchronized to tones of alternating components, a circle blinking at a fixed location was perceived as lateral motion in the same direction as the previously exposed apparent motion. Furthermore, the two deleted pure tones, that were present in the other complex tones but unperceived among other components, acquired the same effect after the exposure. These results demonstrate that activation of the human auditory system without reaching consciousness can drive illusory visual motion, indicating unconscious neural activation for auditory inputs would affect and modulate conscious visual perception.

P1-8: The Web as a new framework for understanding the mind

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The Web started as a mere cluster with four nodes has now become a vast, evolving, complex system that perceives, memorizes and develops its own structure. Recently, Graham and Rockmore have proposed to use Internet as a new metaphor for the brain. In line with their study, we propose to use the Web as a new framework for understanding the mind. The Web has begun a new phase consisting of two structures; search engines such as Google making an enormous amount of public data easily accessible and Social Network Services (SNS) such as Twitter helping people exchange private information. By referring to the former as semantic memory and the latter as episodic memory, we argue for the states of the Web and discuss how this can be used to understand the mind. More specifically, we propose that a quantitative analysis of the dynamics of Web crawlers will contribute to our understanding of the mind. This is studied by analyzing the following topics; 1) defining and measuring the autonomy of the Web through crawler behavior, 2) analyzing how often the Web is updated and how this relates to the mind; and 3) analyzing what factors determine the diffusion speed of information on the Web - this should reveal the Web's long and short term memories. Finally, we argue that a relationship between accessible public memory offered by a search engine and private memory offered by a SNS should contribute to understanding how the mind is formed.

P1-9: Self-Specificity and Mineness

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Legrand and Ruby (2009) argue that neural investigations of self mislead. “Self-relatedness” studies (e.g. Northoff et al. 2006), for example, fail to distinguish self from nonself. Neural substrates identified by that paradigm are not “specific” to self. Proclaiming a paradigm shift aimed at capturing that which is “constitutive” of self, they argue that inquiry should focus on “subjective perspective”—the relation between perceiving-subject and perceived-object. This new paradigm’s target is the experiential level, self-as-subject, and the minimal capacity to distinguish self from nonself. Perspective is seen as pivotal to understanding specificity, or “mineness” (see also Legrand 2007 and Christoff et al. In Press). But their operational definition of self-specificity—exclusivity and noncontingency—fails to account for mineness, as is shown by various empirical examples (e.g. Gott et al. 1984 and Zahn et al. 2008), wherein both conditions are satisfied but for perceiving-subject perceived-object is not “mine”. Previously I (Lane and Liang Forthcoming) have argued that mode-of-access is inadequate to account for mineness; subjective perspective also seems lacking. These failures, the lack of a conspicuous positive phenomenology of mineness, the fact that its loss can correlate with either attenuation or enhancement of sensory experience, and other factors suggest that search for a unique constituent is misguided. Specific, enabling processes might be found (e.g. Northoff et al. In Press). But mineness likely results from several parameters that interact dynamically, creating distinct regions within a multi-dimensional space. Among other things, this implies that mineness is multiply realizable and that it comes by degree.

P1-10: Measuring implicit and explicit anxiety: Using implicit association test

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In recent years, the development of implicit measurements has enabled psychologists to reliably tap implicit consciousness, personalities, and self-concepts. The previous research demonstrated implicit anxiety uniquely predicted to changes participants’ experimenter-rated anxiety and performance decrements after failure (Egloff & Schmukle, 2002). The purpose of this research was to examine how to measure implicit anxiety for Japanese samples. The author developed Japanese version of Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) to tap unconsciousness anxiety, and examined its predictive validity. Forty-four Japanese graduate and undergraduate students (study 1) and 129 of their friends (study 2) participated in this study. In study 1, participants completed Japanese version of IAT-Anxiety and explicit Trait form of the State-Trait Anxiety Inventory (STAI: Spielberger, Gorsuch, & Lushene, 1970; for the Japanese version, see Shimizu & Imae, 1981) and social desirability scales (SDS: Paulhus, 1991; for the Japanese version, see Tani, 2008; consisted of self-deception and impression management). The results revealed that IAT-Anxiety didn’t correlate with explicit STAI and SDS. In study 2, a total of 129 friends that study 1’s participants rated their trait and state anxiety (others rated). Multiple regression analyses revealed that IAT-Anxiety uniquely predicted participants of study 1’s state anxiety that others rated. On the other hand, self-reported anxiety uniquely predicted their trait anxiety that others rated. These results similar to previous research (Egloff & Schmukle, 2002) did. Thus, the predictive validity of Japanese version of IAT-Anxiety was revealed. Finally, the future problems and prospects were discussed.

P1-11: Ten design rules for a conscious system

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Control systems theory and architecture can provide valuable insights into the architecture of consciousness and cognition. The quest for the universal controller technology -a technology for building machine minds for any purpose- has advanced by small, both practical and theoretical steps but without a clear convergence into a unified view. However, recent developments in search of improvements in open-environment robustness for autonomous systems -fundamentally in robotics but also in other domains of automatic control- have produced a reactivation of the quest for the very essence of the mental -from a systemic/cybernetic perspective. This talk will present an architecture-centric proposal for a fundamental, model-based control structure that fulfils a basic set of requirements for being an explanation of a functional mind from an access-consciousness and self-consciousness perspective (including associated concepts such as perception, knowledge, thinking, action, etc.). This structure is grounded on systemic, embodied control systems concepts beyond computationalism so as to be realizable in machines and serve as explanation of natural consciousness. This proposal goes from the elementary aspects of sensing and perception to the higher aspects of knowledge, meaning and consciousness. This general approach is captured in the form of general design rules for cognitive architectures. The proposed ten design rules will provide a basic stance for understanding access consciousness and self-consciousness and a catalogue of design features

needed both for the engineering of a conscious system of technological and economical value and for the explanation of natural consciousness.

P1-12: Pathological gamblers exhibit metacognitive biases during decision making under uncertainty

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Several studies have reported that decision making under ambiguity is impaired in pathological gamblers (PG) during the Iowa Gambling Task (IGT). However, little is known about the specific cognitive and motivational processes that may be responsible for poor performance on the IGT amongst PG. Here, we explored the association between metacognitive biases and poor performance on the IGT in a group of PG (n = 30) and in a normal control group (CONT, n = 35). Metacognitive processes were assessed during the IGT with the post-decision wagering procedure. In addition, we also aimed at investigating the relationship between reward and loss sensitivity (BIS/BAS self-report scale), as well as post-decision wagering performance in gamblers. Results indicate (1) that initial performance enhancement of the control group on IGT occurred without explicit knowledge of the task, thus confirming its implicit character, (2) that compared to controls, performance of PG on the IGT failed to increase during the task; (3) that the PG group tended to exhibit a bias in evaluating their own performance on the IGT by maximizing their wagers independently of selecting advantageous decks; (4) that compared to controls, PG had higher scores on self-report measures of tolerance to punishment and fun seeking behaviors; and (5) that PG scores of tolerance to punishment and fun seeking were associated with their metacognitive biases during the IGT. Our results suggest that biased metacognition may affect pathological gamblers, leading to disadvantageous post-decision wagering, which is in turn linked to impaired decision making under ambiguity.

P1-13: Neural synchrony, causation and consciousness

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It has been suggested that neural synchronization is related to consciousness in various ways, such as facilitating binding. Recently, a role for synchronization has been proposed in opening up communication channels between neuron groups. Although this communication through coherence hypothesis is independent of the study of consciousness, it has the potential to explain the flexible routing of traffic in a global neuronal workspace. A significant problem is that transmission delays between brain areas could lead neuron groups synchronized in absolute time to exchange spikes out of phase. Whilst absolute time synchronization between primary sensory areas might be linked to sensory onset, occurrence of this within higher cortical areas could indicate that they are actually out of phase and not exerting a causal influence on each other. These observations can be reconciled if the response characteristics of neurons compensate for out of phase signals from other groups. Alternatively, delay-compensated synchrony might be important for binding and consciousness, rather than synchrony in absolute time. To understand these issues we have constructed a series of spiking neural models, ranging from pairs of 1000 neuron groups, up to a network based on the human brain with 66,000 neurons and 66,000,000 connections. Using these models we have explored the conditions under which synchrony arises, tested different methods for defining synchrony and compared our models with experimental work on synchrony using oscillators. One long term aim of this work is the development of measures for making predictions about consciousness in the brain.

P1-14: Passivity experience in schizophrenic elusions of alien control

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Delusions of alien control arise as a response to loss of the “sense of agency” as it is sometimes called. The sense of agency is a subtle form of awareness of being in control of one’s actions. A question remains as to why this loss is reported as being controlled by another (externality) rather than simply not being the controller (passivity). Cognitive neuroscience has produced a large body of evidence about neural correlates of the sense of agency and its loss in normal and pathological conditions but no consensus about its representational content. There is at present no definitive answer to the question “is the experience of passivity or externality?” In this paper I suggest that Bayesian theories of neural representation, together with the most plausible neurocognitive architecture of motor control provide an interpretation of the imaging and deficit studies, which resolves the question. The experience is of passivity not externality. The basis for alternative interpretations of the data is re-examined. The externality interpretation arises when passivity experience is induced in subjects who are asked to report, “did you or someone/something else make that movement?” This provides a default externality attribution whose content is then treated as intrinsic to the experience itself.

P1-15: Modified measure for integrated information theory and its application to 128-channel electrocorticogram data recorded in macaque monkeys

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Tononi's integrated information theory (2004) proposed a measure called 'phi' that quantifies the capacity of a system to integrate information, which according to the theory corresponds to the level of consciousness. While an attractive proposal, the original measure has several major problems that limit its applicability to the real neuronal data. Recently, Barrett and Seth (ASSC, 2010; PLoS Comput Biol, 2011) suggested two alternative measures, which approximated the original 'phi' so that they can be realistically computed on the real neural data. However, these alternative 'phi' also have some problems, one of which manifests when the neural activities are strongly correlated. To overcome such a problem, we propose a yet another alternative measure, while keeping its applicability to the real neural data. With this new measure, we analyzed the electrocorticogram (ECoG) data recorded from the cortical surface in various areas of the monkey's brain. The data were simultaneously recorded with 128 electrodes while the monkey underwent a transition from an awake state, through under anaesthesia, then to an awake recovery. One of the biggest practical problems in computing 'phi' in any form of approximation is to find the best way to partition the system. Here, we applied a recently proposed novel clustering technique, called infinite relational model (Kemp et al, 2006), to obtain minimally correlated clusters. Preliminary results suggest that 'phi' computed from high frequency components of ECoG signals behave as we expected (e.g., low under anaesthesia and high during awake), while that from low frequency components do not.

P1-16: Retinotopic activities in extrastriate visual areas predict individual variations in binocular rivalry dynamics

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Binocular rivalry (BR) occurs, when dissimilar images are presented to each eye. Perception alternates between the two images at a rate, varied widely between individuals. Although recent human TMS studies have revealed a causal role of parietal regions on the BR dynamics, there are few neuroimaging studies focusing on the role of visual cortex, which is implicated by many psychophysical studies. Here, we devised a paradigm to measure responses to a suppressed or dominant stimulus separately during BR, by combining a phase encoded rotating wedge and a variant of BR called continuous flash suppression (CFS). In CFS, a monocular stimulus can be suppressed for up to several minutes by a presence of highly dynamic flashing patterns in the other eye. We measured brain activity using fMRI, while subjects viewed the rotating wedge rendered invisible (or visible) with CFS. Simultaneously, we recorded behavioral responses indicating whether the wedge was visible or completely invisible. We found that the suppression durations were negatively correlated with the amplitude of the responses to the invisible wedge in extrastriate visual areas (V2, V3, V3A, hV4), indicating that the weaker the response, the longer the suppression lasted. In contrast, no such correlation was found in V1 and no significant correlations for the responses to the visible wedge in all the areas. The results demonstrate that the extrastriate visual areas, at least in part, are involved in generating the binocular rivalry dynamics.

P1-17: Hint seeking in pigeons

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We examined whether pigeons could monitor their own knowledge states and seek new information in need. The task required the pigeons to learn novel sequences of responses for various trios of illustrations. On half of the trials, subjects were given the opportunity to ask for "hints" as to the next correct response in a sequence. We analyzed when the pigeons sought hints. If the pigeon completed a trial correctly without requesting any hints, it was rewarded with food and light. If the subject requested one or more hints during the course of completing a trial correctly, the bird received either food and light or light only as a reward. Incorrect responses resulted in a timeout. If the subjects have the ability to introspectively monitor knowing and not knowing, they should use the hint option more often at earlier stages of learning a novel list than later stages when they are familiar to the list. Two out of four pigeons sought hints in the first session more often than in the last session, and the frequency of hint seeking was inversely related to the accuracy on forced trials in which hints were unavailable. This result may show that pigeons have an ability to differentiate between the cognitive states of knowing and not knowing.

P1-18: A battle over implicit resources – does it affect modus operandi in AGL?

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Since the discovery of the implicit learning phenomenon (Reber, 1967), little have we got to know about its exact mechanisms. In terms of AGL paradigm, there is a well-documented effect of acquiring knowledge necessary for classification above chance level (e.g. Reber, 1993; Vokey & Brooks, 1992), there is some evidence of knowledge transfer into novel material (e.g. Pothos & Bailey, 2000), but the mechanism of learning described by concurrent hypotheses still invites inquiry. To answer the above, we decided to adopt dual task paradigm, developed as a tool designed to test competition over resources. In this procedure, participants are asked to perform two tasks simultaneously; a decrease in performance (as compared to single-task) is interpreted as a result of the competition. As the learning in AGL task is deemed implicit, the second task is implicit as well. In our experiments, participants are exposed to a second tacit rule while performing regular AGL tasks. In three experiments conducted, we have observed: a decrease in classification accuracy when second tacit rule was present (first experiment) and no change in classification accuracy but in strategy used to distinguish regular from irregular strings (second and third experiment). Namely, participants included regular strings into grammatical category more often than excluded irregular strings from this category (classification for regular items was significantly more efficient than for irregular), but only in the group with a second implicit rule. We discuss these results in the light of the role of the resources determining the effectiveness of learning process.

P1-19: Examining the role of vicarious trial-and-error in a robotic experiment

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Vicarious trial-and-error (VTE) (Muenzinger and Fletcher, 1934) is a measure of choosing behavior at decision points. Studies of VTE have shown a correlation between the number of VTEs exhibited by an individual with its learning efficiency. During a learning task, the number of VTEs increases until mastery is reached to progressively decrease afterward. Our work relies on a model developed by Bovet and Pfeifer (2005) where a neural network equipped with Hebbian learning commands a robot evolved to complete a T-maze task using multiple sensory modalities. This setup allows us to compute the number of VTEs during learning of the task. Similarly to animals, the number of VTEs increases until mastery, only to decrease afterward. We also found out that a model with minimal connectivity showing the same performance does not present this phenomenon. This implies that VTE might not be related to performance in learning but would rather be caused by a redundant connectivity pattern. We also noticed that models exhibiting less VTEs were less adaptive to changes in initial conditions. It is not yet clear what is causing the VTEs in our model. VTEs have been reported in T-maze experiments in rats who were shown to be simulating their next decisions internally before acting (Johnson and Redish, 2007). This capacity of internal simulation can be connected to consciousness through Bergson's philosophical idea of mental imagery. Additional studies of this model could shed some lights on the connection between VTE and internal simulation in animals.

P1-20: Priming effect of sense of agency in handwritten traces

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The primary aim of this study is to investigate whether people automatically construct a higher-order representation of letters, especially a representation that conveys information regarding who wrote them, when they perceive a single radical letter, i.e. part of a single Chinese character. Although much work has been done to elucidate the neural substrate of processing of hand-written letters, no research involving behavioural priming has been conducted which focuses on paralinguistic aspects of hand-written texts, namely those aspects of handwriting that convey information as to the meticulousness, rashness, and vigor of the writer. In this study, participants watched prime-target pairs of Chinese radicals that were either matched or unmatched in regard of who (the participant him- or herself or some other person) wrote that radical. In our preliminary study with eight healthy participants, the self/other discrimination of target letters was significantly more accurate when the prime and target letters were written by the same person than when they were written by different persons ($F(1,7)=13.11$, $p<0.01$). As primes and targets never shared the same radical shape, the priming effects could not have been due to the repetition of low-level visual features; they can more plausibly be ascribed to the existence of an invariant representation of personal identities extracted from handwriting.

P1-21: A disappearance of the face inversion effect in unconscious visual processing

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It is well known that an amplitude of ERP component N170 is larger in response to inverted than upright faces (face inversion effect, FIE). Here we report that this robust effect is diminished and even reversed when face images are made invisible by an inter-ocular suppression. Using EEG, we measured brain activities at 19 points over the scalp of subjects when they viewed neutral faces either visible or rendered invisible through a technique of continuous flash suppression (CFS). In the visible condition, the amplitude of N170 components in the electrodes located over the ventral visual pathway were found to be larger to inverted than upright faces, which reflected a normal FIE. When those faces became invisible, however, the upright faces perceived unconsciously induced substantial N170 compared to their control (random-phase) images, whereas unconscious inverted faces did not. Those results highlighted a difference in neural processing of face stimuli between conscious and unconscious states of perception. When images are made invisible, weak neural responses in the ventral regions to upright faces might be sufficient to activate FFA (fusiform-face-area, an extrastriate region specialized for face processing) efficiently, while the unconscious inverted face might fail to induce significant activation at any specialized regions in the ventral pathway.

P1-22: Neural basis for associative face memory in the monkey anterior inferior temporal cortex

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In our previous study, we found that a population of face-responsive neurons in the ventral, anterior inferior temporal cortex (AITv) can represent the identity of faces in a view-invariant manner (Eifuku et al., 2004). On the other hand, it has been reported that neurons in the AITv selectively respond to particular paired associations of non-facial, complex pictorial patterns, acquired by training. In the present study, we recorded neuronal activity from the AITv of macaque monkeys during the performance of an asymmetrical paired-association (APA) task which required associative pairing between an abstract pattern and five different facial views of a single person. In the APA task, after one element of a pair (either an abstract pattern or a face) was presented as a sample cue, the reward-seeking monkey correctly identified the other element of the pair among various repeatedly-presented test stimuli (faces or patterns), which were temporally separated by inter-stimulus delays. The results revealed that a substantial number of AITv neurons responded both to faces and abstract patterns, and the majority of these neurons responded selectively to a particular associative pair. It was demonstrated that in addition to the view-invariant identity of faces used in the APA task, the population of AITv neurons was also able to represent the associative pairing between faces and abstract patterns, which was acquired by training in the APA task. Taken together, these findings indicate that the AITv plays a crucial role in both facial identification and semantic associations with facial identities.

P1-23: A direct interview with a patient who recovered from the persistent vegetative state

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A persistent vegetative state is a state in which the patient looks fully awake, but not conscious or aware of the world around. Here we report an interview study on a patient diagnosed as vegetative state after a traffic accident and became conscious after a treatment by the spinal cord stimulation (SCS) therapy (Tsubokawa et al 1990, Yamamoto et al 2005). The electrode was inserted by the spinal cord and stimulated for 10 to 15 minutes per day. From the third-person perspective (mainly, his mother's point of view), the patient seemed to have gained consciousness one month after starting the SCS therapy, reacting to verbal requests. However, in an interview, the patient told us that he has some memories of the time even before the therapy (e.g., slaps on his cheek by his friends who visited him at the hospital). He also remembers the first moment of awakening due to the therapy; when stimulated, he felt warmth and vibration near his heart, where the power of the equipment was implanted. When asked to describe his experience at the moment he regained consciousness, he recalled that moment as, "all of a sudden, I noticed that I was awake. It was a quite different experience than waking up in the morning". We also report on his remarkable current status; after 2 years of SCS therapy, the equipment is now taken off. With extensive rehabilitation, he can converse with others, walk with support, eat using chopsticks and write diaries on his own.

P1-24: Cognitive rehabilitation using a brain activation measuring instrument patients with disturbance of consciousness (two cases)

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[Purpose] Neither a means for the cognitive rehabilitation of patients with disturbance of consciousness nor a method to check the effect of rehabilitation has been established. The purpose of this study was to develop a cognitive rehabilitation technique using a brain activation measuring instrument for such patients. [Methods] Two patients with disturbances of consciousness participated in the study: a woman who was injured by post resuscitation encephalopathy and hospitalized for four years (eighty two years old), a man who was injured by left thalamic hemorrhage (seventy three years old) and hospitalized for four months. First, to improve the arousal level of the patients, they were put in a sitting position without back support. Then, stimuli were presented that were supposed to activate cognitive functions. The brain activations were measured by 2-channel Near-infrared Spectroscopy (HITACHI HOT 121). The patients' Japan Coma Scale (JCS) score were employed for assessment of the degree of consciousness. [Results] The effective stimuli were individual hobbies and interests of the patients. The brain activations corresponding to the stimuli were measured. The patients' JCS score were improved after six months rehabilitation. [Conclusion] Placing patients in a sitting position without back support and then presenting stimuli is an effective method to induce cognitive rehabilitation for disturbance of consciousness. Using a brain activation measuring instrument during the rehabilitation is a good way to confirm the arousal level and the cognitive activation of the patients. The effective stimuli varied individually between the patients. [Acknowledgement] This work was supported by KAKENHI (21700557).

P1-25: Stimulating the dream body. Transcranial direct current stimulation (tDCS) of the sensorimotor cortex during rapid eye movement (REM) sleep dreaming

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Recent philosophical and neuroscientific theories converge on the assumption that the basic foundations of waking self-consciousness lie in those brain systems that represent the body. Very little is known about how the body is represented in dreams and how this dream body relates to other aspects of the dreaming self. The present study seeks to investigate this relation by, for the first time, applying transcranial direct current stimulation (tDCS) during rapid eye movement (REM) sleep. We stimulated the sensorimotor cortex in order to see how artificially induced neurophysiological changes in this area might alter the phenomenological dream body and the dreaming self. Immediately after stimulation the participants were woken up and a standardized questionnaire and a free dream report were used to assess bodily experiences and other dream content. The data show as predicted a significant decrease in subjective reports of movement during dreams after tDCS as compared to after sham stimulation. The results thus confirm that dream content can be directly and specifically influenced by artificially altering brain activity during REM sleep. These results will be discussed with respect to body representations in dreams but also with regard to more global questions about the relationship between the neurophysiology and phenomenology of dreaming. These findings are also relevant for more abstract questions about of subjectivity and agency in the dream state.

P1-26: Experimental and computational approach to dynamic body boundary problem .

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We propose an experimental and computational model to challenge the “hard problem of consciousness” (Chalmers 1996). Our strategy examines an agent's "attention shift" in terms of extensible body image, e.g. as described by the rubber hands illusion or phantom limbs. A computational model (Iizuka & Ikegami, 2005) was used to explore how a body and sensor can be made inseparable. A model agent must distinguish the number of vanes of a windmill by blind touching with a stick. By adding an additional windmill to the first one we investigated the shift of attention, i.e. the first windmill can be an object to be distinguished, or an agent can distinguish the second windmill by using the first one as a tool. In other words, an agent's body image can shift from its arm tip to the boundary between the first and second windmill. We then introduce an experiment with a real stick-windmill model. Subjects are tasked with distinguishing the number of vanes by blindly touching the windmill with a stick. Analysis revealed subjects begin by randomly rotating the windmill then acquiring efficient

usage of the stick to correctly guess the number of vanes in the later stages. A shift from an irregular to regular movement of a windmill is an indication of how a subject assimilates his behavior to this system. Based on these theoretical and experimental studies, we argue how the mind-body problem is projected onto the regularity of a dynamic attractor with information transfer across the body boundary.

P1-27: Forward displacement of the final position of a non-retinotopically moving bar

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Visual world appears stable even though both our eyes and external objects frequently move. The illusory stabilization of visual world is involved with non-retinotopic visual processing. In the present study, we tested whether non-retinotopic motion could induce the position shift of a moving target. Many studies have shown that the final position of the moving target was displaced forward in the direction of motion. However, it was still unclear as to whether the forward displacement was induced by non-retinotopic motion. Our motion stimuli consisted of two successive frames each consisting of an outlined square within which two bars were presented. In the first frame, each of the bars was placed at the opposite corners of the square. In the second frame, the bars were displaced toward the horizontal center of the square. The square did not move in the retinotopic conditions while it moved downward in the non-retinotopic condition. Thus, in the non-retinotopic condition, the bars moved diagonally downward in the retinotopic sense but moved horizontally (within the square) in the non-retinotopic sense. As a result, the forward displacement was observed in both conditions, though the effect size in the non-retinotopic condition was relatively small. The results suggest that not only retinotopic but also non-retinotopic motion processing contributes to the determination of perceived positions of visual signals.

P1-28: Rubber hand illusion, empathy, and schizotypal experiences in terms of self-other representations

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When participants observed a rubber hand being touched, their sense of touch was activated (rubber hand illusion: RHI). While this illusion might be caused by multi-modal integration, it may also be related to empathic function, which enables us to simulate the observed information. We examined individual differences in the RHI, including empathic and schizotypal personality traits, as previous research had suggested that schizophrenic patients would be more subject to the RHI. The results indicated that people who experience a stronger RHI might have stronger empathic and schizotypal personalities simultaneously. We discussed these relationships in terms of self-other representations.

P1-29: The problem of the Symmetry Thesis

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The problem of self-consciousness is one of the most difficult questions in the research of consciousness. What makes it difficult is that self-consciousness uses to connect with the ability to use the first-person pronoun, and this ability must presuppose the self-consciousness. However, recently research by Bermudez try to get rid of the paradox by using the non-conceptual content which can successfully develop in infant and other animals. This kinds of content do not need to presuppose the conceptual or linguistic ability, thus the non-conceptual content approach can avoid the circulation of presupposing self-consciousness. Nevertheless, Bermudez accept the Symmetry Thesis which face the problem in the first place. The idea of the Symmetry Thesis is that a subject's self-awareness is constitutively linked to his awareness of other minds. The Thesis is based on the thought that if a predicate can freely ascribe to the self, it can also ascribe to others. However, there are some predicates which is important when we consider the question of self don't follow the thought. This kind of predicate like "being exist" or "being a subject" can just ascribe to others but can never ascribe to the subject itself. This kind of predicate indicates the asymmetry of self-awareness and awareness of other mind. Because of the asymmetry, the Symmetry Thesis can't apply to the theory of self-consciousness.

P1-30: Neural processes for pseudo perceptual switching using bistable figure

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There has been much discussion about the ambiguous figures inducing spontaneous switch among rivaling percepts. What kind of mechanism causes spontaneous switching? To investigate the time course of neural processes underlying perceptual rivalry, we measured ERPs associated with subject's perceptions of the ambiguous figures. However, the problem seems to lie in the fact that the timing of perceptual switching is

variable and unpredictable. In previous studies, Kornmeier & Bach(2004) enable the more precise time locking to the stimulus onset by presenting temporally discontinuous stimuli (stimuli-blank-stimuli). However, it was not clear about whether perceptual disambiguation of the subjects was solved until the presentation of the stimulus in this method. To avoid the problem, we employed the experimental paradigm in which the first stimulus was an unambiguous stimulus, and the second stimulus was an ambiguous stimulus of Necker cube. In the control condition, we presented an unambiguous stimulus also as the second stimulus and we compared endogenous Necker cube reversals with exogenously reversals of unambiguous stimuli. Ten healthy subjects participated in the present study. The oscillatory activity showed the different activity between exogenously and endogenous changing. When the ambiguous stimulus was perceived differently from the first stimulus, the right-occipital beta band activity (16-23Hz) was increased between 50-100ms following the onset of the ambiguous stimulus. In contrast, even if the unambiguous stimulus was changed from the first stimulus, beta band activity was not activated. These results indicated that the right-occipital beta band activity reflected spontaneous switching between rivaling percepts.

P1-31: Mind-sightedness: autism and the theory of mind

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The theory of mind is what underlies our everyday psychological understanding of other people. In order to explain why individuals with autism spectrum disorder (autism) have difficulty interacting with other people, some scientists propose that autistic individuals do not have the theory of mind (Baron-Cohen, 1995; 2008; Leslie, 1992). However, in this paper, I will argue against the above proposal of autism by suggesting what the theory of mind really is. I argue that we understand other people through both simulation and reasoning. First, when understanding others' mental states, such as perceptions, emotions, and actions, we simulate or replicate these mental states. On the other hand, when understanding others' cognitive mental states, such as beliefs and planning, we deploy reasoning and scientific theory of human psychology. However, since people do have both kinds of mental states at the same time, we thus use both simulation and reasoning to understand others. Furthermore, according to Damasio's (1999) researches, our reasoning is in fact based on our emotions; we cannot have rationality without emotions. Thus, when we understand others, our emotions play a key role not only in our simulating of others' emotions but also in our reasoning about others. In the case of autism, it is known that the diversity and the strengths of emotions of autistic individuals are different from people without autism (Grandin, 2006). This difference thus explains why autistic individuals have difficulty understanding people without autism while understand other autistics better than people without autism (Grandin, 2006).

P1-32: Body scheme derives body image in a flock, swarm and herd

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Does a swarm, flock or school act as a single organism? We answer 'yes'. Our judgment was previously based on analysis of kinetic experimental data of soldier crab, *Mictyris brevidactylus*, behavior and computational model. Now In computer simulations we demonstrated that the correlation function of individual crabs velocity vectors linearly decays with constant slope against re-scaled distance. Our novel computer model based on reciprocal anticipation (RA) proves that the correlated size of the sub-domain scales with the linear size of a swarm. Our experimental and modeling results suggest that that a swarm has a one body image based on RA. Our model contains both feed-forward by anticipation and feed-back by memory. When we compare our model with the comparator model proposed to explain the motor control features of schizophrenic patients' body image, feed-forward and feed-back mechanism can refer to the sense of agency (SoA) and sense of ownership (SoO). We show how SoA and SoO can contribute to the re-scaled body image.

P1-33: An attempt to analyze cell assembly dynamics by using a dual information task

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When we consider consciousness from neuroscience, we should know how the brain encodes information. The concept of cell assembly is important to reveal the coding mechanism because it is thought to process internal information, for example memory. But, we don't know enough about how such cell assemblies actually encode internal information. Then, by investigating how dynamically the cell assemblies change by types and levels of internal information, we can get a clue to know about neural coding strategy. To investigate this dynamics, we should compare activity of neurons in different cognitive processes. Thus, we developed a behavioral paradigm "dual information task" which imposes subjects on two different internal cognitive processes

with same sensory input and motor output. In the task, a sample cue has two information meanings (time and position). The rats are required to select and use just one information meaning (internal information) to get a reward effectively. We record multi-neuronal activity with tetrodes from hippocampus when the rats are performing this task. Then we analyze the neuronal data to show how cell assemblies change when the internal information change. We report behavioral data and preliminary neuronal data, and suggest this dual information task is a effective behavioral paradigm.

P1-34: Acquisition of innate abilities

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Some of our abilities are the result of learning and we can give a reasoned account of their operation and acquisition; for example swimming and reading. However, other things that we know well, such as the perception of pain or colours are innate, and these we cannot adequately describe or account for: they exist as a fixed background to our lives. I want to propose, by means of an example, a mechanism for the creation of these latter abilities. Consider a girl who learns to swim, and suppose that this ability is accompanied with a change in her neurons, S. Although she can recall the learning process she has no access to the actual neurological changes. It is reasonable to suppose that the changes leading to her ability to swim are gradual. Other individuals in the human population may be born with some of the parts of S as innate properties. If swimming had major evolutionary survival advantages, then gradually the whole population, in successive generations, would be able to swim without instruction as they would gradually acquire the full changes S as innate properties. The ability to swim would then become part of the set of everyone's innate properties and individuals would have no insight about why they could swim as there would be no cognitive access to the neural changes involved. It will be argued that this mechanism can help to understand our great conceptual difficulties in trying to understand qualia.

P1-35: Does Attention Construct Our Experience?

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Change Blindness is an important phenomenon in the discussion of consciousness, and the problem is whether attention is necessary for consciousness. Change Blindness is often described as that subjects with normal vision fail to notice a difference in sequentially observed scenes. The debate is whether the difference, which subjects fail to notice, goes into our consciousness. Some philosophers, such as Dretske, argue that there is a distinction between to notice and to see, so, in the case of change blindness, we see some conscious experiences that we fail to notice with our attention. But, Tye (2010) argues that attention is necessary for consciousness. He argues for the Representation Failure Hypothesis, in contrast to the Comparison Failure Hypothesis, because how we attend to a scene influences the phenomenology of our experience. He thinks attention constructs our experiences. In this paper, I argue that we need to make a distinction between to modify our experience and to construct experience from an evolutionary point of view. Attention is a factor to modify our experiences, not to construct our experiences, thus how we attend to a scene is to modify our experiences. In primitive organism, which has limited consciousness, they need to quickly respond the environment, not to modify their experiences to make sophisticated representations. In addition, I argue the evolution of brain provides the evidence for the analysis. In conclusion, I argue that Comparison Failure hypothesis is better than Representation Failure hypothesis from an evolutionary point of view.

P1-36: On saving the self: Postdictive shifts of sense of agency by monetary gain and loss

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Sense of agency (SoA) refers to the subjective experience that one's voluntary action causes specific outcome in the outside world. The core questions in SoA research are (1) whether it is built on a predictive or postdictive way, and (2) how the valence of the outcome influences SoA. These questions are remained unclear, but behavioral studies of self-serving bias indicate that the valence of the outcome biases action attribution or SoA retrospectively. To investigate the relationship between SoA and the outcome of action, "intentional binding" (IB) will be useful. As Haggard proposed originally, IB is an implicit measure of SoA. Here, we show the results of 15 healthy subjects using a modified version of Libet's clock timing paradigm. In the conditioning block, subject learned the combination of tones and valences (positive, neutral and negative monetary outcome). After conditioning, subjects played slots while watching a clockhand rotation. They were asked to press a key at a time of their own choice. Then, one of 3 beeps was presented randomly after a 250 ms delay, which informed the outcome of the slot. After

a clock hand disappeared, subjects reported the perceived timing of either an action or a beep. These timing estimates were compared with baseline blocks where subjects judged either an action or a beep in a single event trial. In our study, subjects showed considerable binding effects regardless of the valence of outcome. However, the degree of temporal compression was attenuated significantly when negative outcome occurred as compared to positive and neutral outcomes. Our results not only confirm the postdictive account of SoA, but also demonstrate that the valence of the outcome influence SoA.

P1-37: Analysis of playing clusters and cliques of wild chimpanzees: The physical and cognitive structure of social play among wild chimpanzees

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In order to reveal the sociality of play among our closest animal, I have observed and recorded the data of behavior and interaction during social play among wild chimpanzees of M group in Mahale Mountains National Park, Tanzania, for about four months intermittently from Dec 2008 to Nov 2010, and for 90 observation days (662.4 hrs) in total, using digital video camera and field notes. Immature chimpanzees often played socially when they were near many other individuals in various sex-age classes, who were resting, grooming, or playing socially. They synchronized their playing behaviors in the narrow area to form a large-sized playing group. There were no specific individuals who gathered the active playing behaviors from others, thus no clear centrality of the networks of each playing cluster. However, the sizes of each playing clique were around two in any moment during social play. This did not mean that they had no interaction between the dyads, but rather each dyad often exchanged their playing partners. The results suggest that during social play among immature wild chimpanzees, multiple dyad groups occurred simultaneously in narrow area to form a polyadic group. They engaged in physically dyadic interaction, but cognitively polyadic interaction among playing clusters. Each individual paid attention to not only a partner playing physically with but also whole the “field” of play they were forming.

P1-38: The influence of mind learning through writing on the knowledge transformation

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Procedural knowledge can construct the pupils' critical abilities through reading and writing. The objective of this paper explored the pupil's cognitive learning barriers and problem-solving strategies to the nature science curriculum. The ethnographic research methods have been used when author as a participant taught at the school. The author analyzed the data using literature review, pictures, and interviews with colleagues, cross-checking the results by triangulation. The pupils in this case study wrote with left hand, but the illegible handwriting was more difficult to identify. Consequently, the pupils changed to computer typing instead, but the typing speed was slow and couldn't catch the learning progress. The author focused on the writing skills for recording and summarizing the experimental results of natural science. The pupils were required to record and write down neatly. The words which were not familiar to the pupils would be enlarged and the strokes of the words would be given to let the pupils follow. In the end the pupils have gain the success experience. The attitude process of writing can enhance pupils' cognitive learning, produce sensory integration, and construct the pupil's knowledge framework and meaningful learning for the natural science curriculum, and transform knowledge to problem-solving abilities. Based on the study results, the author proposes some strategies for the Procedural knowledge of pupils' self-control, motivation and deliberation.

P1-39: Attenuation of Rubber Hand Illusion coincides with detection of visual feedback delay

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Rubber hand illusion (RHI) is the attribution of a rubber hand to subject's own body and caused by stimulating them synchronously. The previous study (Shimada et al. 2009) showed that RHI was greatly reduced when the visual feedback delay of the stimulation was longer than 300 ms. However, it was not explicitly measured whether the attenuation of RHI was interrelated with the detection of the delay. In order to ascertain these queries, we carried out two experiments: (1) RHI experiment and (2) self body recognition experiment under delayed visual feedback. The subjects were eighteen healthy male undergraduate students. In the RHI experiment, the rubber hand and the subject's hidden right hand were stimulated synchronously for 60 s and the proprioceptive drift before and after stimulation was measured. In the self-body recognition experiment, subjects underwent the tactile stimulation (brush stroke) on their right hand and judged whether visual feedback was consistent with the touch sensation. In each experiment, we adopted visual feedback delay between 133-633 ms at 100ms intervals. The results showed that the proprioceptive and the delay detection probability were significantly differed between the conditions with the visual feedback delay of 133 and 333 ms. The conclusion demonstrated from these two

experimental results was that the attenuation of RHI interrelated of the recognition of visual feedback delay with more than 300ms.

P1-40: Factors determining grapheme-color associations in multilingual synesthetes

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People with color-graphemic synesthesia experience idiosyncratic colors when viewing alphanumeric characters. Despite large individual differences, researchers have attempted to find regularities and determinants of grapheme-color associations. So far, this was done mainly by analyzing large-scale color matching data (Rich et al., 2006; Simner et al., 2005), but investigating synesthetic colors of multilingual synesthetes in different grapheme types could be an alternative (Barnett et al., 2009). Here, we report a novel finding based on three Korean synesthetes who experience colors on characters of multiple languages and digits. A modified version of the synesthesia battery (Eagleman et al., 2007) was used with a color-calibrated monitor for color matching of English, Korean, and Japanese characters. “Colors” for the overlearned sequences - i.e., numbers 1-9 and weekdays - in various forms were also matched. Results showed that graphemes of which first sound is identical tended to induce similar “colors”. Matched synesthetic colors of those graphemes were clustered together on the CIE color space. Graphemes with similar visual shapes also tended to induce similar “colors”, but the tendency was not as strong as in the case of sound. Sound seems important for the synesthetic color induced by the overlearned sequences as well. For example, the Korean words for “one” and for “sunday” are homonyms and all three synesthetes experienced similar “colors” for those words. For the overlearned sequences, however, meaning seems to be the major determinant. The current study provides a clue to the nature of synesthetic association by deploying unusual cases of multilingual synesthetes.

P1-41: Entangled ego: consideration of consciousness of conjoined twins

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Although conjoined twins (also known as Siamese twins) are sometimes featured in mythology and popular culture (e.g., novels and movies), scientific literature describing them has been limited to medical reports on surgical separation and morphogenesis. Here, I suggest that studying consciousness of conjoined twins from the viewpoint of cognitive neuroscience would provide unique opportunities to reconsider the concept of consciousness, as did the research on split brain and blind sight. My main focus includes craniopagus and dicephalus twins, in whom conscious experiences are conceivably shared between twins through unique anatomical connections. Craniopagus twins, with separate bodies but fused skulls, occasionally share parts of their brain tissues (Stone & Goodrich, 2006). Thus, the twins might share their visual experiences or even communicate their intentions via conjoined brain structures. Dicephalic twins, with two independent heads on a single trunk, sometimes share their viscera and cardiovascular systems (Harma et al., 2005). This could enable them to share their bodily sensations, which possibly intermediate their emotional awareness. Standard cognitive tasks and existing neuroimaging techniques can be used to assess whether these twins actually share their conscious experiences. Importantly, I argue that all human beings are “conjoined,” in a metaphorical sense, through the ability of empathy (e.g., perspective taking and emotional contagion). This view challenges our intuitive belief in the bijective correspondence between the brain and consciousness; in other words, the assumption that each individual has their own “insulated” consciousness in the skull. Ethical issues concerning research on conjoined twins will be explicitly discussed.

P1-42: Significance of letter recognition concerning with letter familiarization

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Language reflects various types of human behavior and is one of the key components of human conscious experience (Wittgenstein 1953). Humans have been successfully utilizing sounds, gestures (e.g. hand signs) and letters to express their thoughts and emotions. The close connection between consciousness and human language systems is one of the most important research issues today. When a subject observes and perceives letters, various cognitive processes such as feature detection and memory retrieval take place in the cortical circuits. Some features of letters affect reading proficiency (Pelli et al. 2006). Familiarity is also known to affect the linguistic process. Here we investigate the nature of human cognitive processes related to reading letters. The subjects were shown two types of letters on the computer screen. One of them was clearly shaped with normal brightness, while the other one was blurred, warped or given other visual noise. The subjects were instructed to judge whether those two types of letters were the same one or not. In addition, they were also questioned about the familiarities and

preferences. We tested wide range of phonograms and ideograms existing all over the world. Our results show that the accuracy of the identification correlates with the familiarity to those letters, rather than the visual complexity. We discuss the implications of the result for the linguistic aspects of consciousness.

P1-43: One's own name is connected to consciousness

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It is reported that patients suffering from consciousness disorder show reaction in the level of brain activity when their own names were auditorily presented. The cortical midline structure (CMS) is activated by self-related stimuli like one's own name. However, the activity in the anterior CMS (aCMS) is observed in other cognitive tasks that require concentration. We hypothesized that the aCMS is not necessarily the seat of the Self, and the activation in aCMS could be modulated by attentional states. We performed an fMRI study to separate the effect of attention from self-referential processes. Thirty adults (15 females) volunteered to the study. Stimuli were vocalized names of participant's own (S), specific other's (R), and variable others' (C). During a trial, two names were presented binaurally and simultaneously, C with either S, R, or C. Each of the names was followed by an 880Hz or 440Hz beep sound. In the Top-down session, the participant judged whether the names contained S or R, or only Cs. In the Bottom-up session, the participant judged whether the beep was high or low. Functional images were acquired using 3T MR scanner with GRE-EPI sequence. The images were preprocessed and analyzed with SPM8. Results revealed that the contrasts $S > C$ and $S > R$ found activation in aCMS, but $R > C$ did not in top-down session. Importantly, no activation in aCMS in bottom-up session. In conclusion, aCMS activity to one's own name indicates the attentional and conscious processes to it, not unattended and automatic processes.

P1-44: Does perceptual learning require consciousness or attention?

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It has been proposed that visual attention and consciousness are separate (Koch and Tsuchiya, 2007) and possibly even orthogonal processes (Lamme, 2003). The two converge when conscious visual percepts are attended, and hence become available for conscious report. A lack of reportability can however have two causes: the absence of attention or the absence of a conscious percept. This raises an important question in the field of perceptual learning. It is known that learning can occur in the absence of conscious reportability, but given the recent theoretical developments it is now suddenly unclear which of the two ingredients – consciousness or attention – is not necessary for learning. We present textured figure-ground stimuli, and manipulate reportability either by masking (which only interferes with consciousness) or with an inattention paradigm (which only interferes with attention). During the second session (24 hours later) learning is assessed via differences in figure-ground ERPs and via a detection task. Preliminary findings suggest that early learning effects are found for stimuli presented in the inattention paradigm, and not for masked stimuli. These results suggest that learning requires consciousness, and not attention, and further strengthen the idea that consciousness is separate from attention. Koch C., & Tsuchiya N. (2007). Attention and consciousness: two distinct brain processes. *Trends in Cognitive Sciences*, 11, 16-22. Lamme, V.A.F. (2003). Why visual attention and awareness are different. *Trends in Cognitive Sciences*, 7, 12-18.

P1-45: Effect of facial color on subliminal/supraliminal processing of fearful facial expressions

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Non-conscious processing of fearful facial expressions has been shown by recent ERP studies (Liddell et al., 2004; Kiss and Eimer, 2008; Pegna et al., 2008). In various components of the face, especially “color information” provides important clues for emotion recognition. Previous behavioral study (Suzuki and Koyatsu, 1998) showed that emotion recognition on a face was affected by facial color. However, there have been no electrophysiological evidences for effects of facial color on emotion recognition. This study aimed to investigate the effects of facial color on supraliminal (conscious) and subliminal (unconscious) processing of fearful faces. ERPs were recorded in the task where subjects had to identify the expression of masked target faces with facial expression (fearful or neutral) and facial color (natural or bluish). In the subliminal condition (10ms target duration), identification performance was at chance level, but there was a significant facial expression \times facial color interaction for N170 latency, indicating that the processing of fearful expression was suppressed by the bluish color suggesting that subliminal processing of fearful expression is affected by facial color. On the other hand, in the supraliminal condition (200ms target duration), there was no significant facial expression \times facial color interaction on any ERP components. Therefore, it is suggested that supraliminal processing of fearful faces is not related to the processing

of facial color. The present study has provided a new electrophysiological evidence for the effects of facial color on processing of fearful faces.

P1-46: Metaconsciousness: Information theory meets embedded consciousness

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Recent enquires into the nature of shared experience have led to a revision of the ideas of representationalism and a move towards theories of embedded consciousness where the broader environment of the organism can, in a rudimentary sense, be considered part of its mind. While these theories (as presented by Clark 2008 and Nöe 2009) are conceptually appealing, they lack a formal physical description. There has also been significant work in attempting to define the phenomenal nature of experience in more concrete terms, especially with the use of information theory (Tononi 2008, Friston 2010). The authors present an argument that these two streams of research are convergent and can be used to formulate predictions for how consciousness acts to transform information in the world. The authors call this process “metaconsciousness” and present an information theoretical description based upon Landauer's principle (Landauer 1961, Maroney 2009), which describes the energetic costs of information erasure. Metaconsciousness theory aims to reconcile the boundaries between phenomenology (particularly relating to temporal awareness and the bandwidth limits of perception) and physical formalism. This approach draws evidence from the visual sciences, notably Grimes' (1996) change blindness studies and Sperling's (1960) iconic memory experiments. Testable predictions of how information is utilized and transformed by the acts of awareness and cognition can then be made. In this manner, a formalized theory of embedded consciousness can be derived. Applications of this theory to the understanding of phenomenological time and information exchanges in inter-personal interactions are discussed.

P1-47: What synesthesia tells us about functionalism

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ynesthesia is a condition in which stimulation of one sensory modality reliably causes phenomenal experiences in a second, unstimulated sensory modality. J. A. Gray et al. argue that synesthesia provides a counterexample to functionalism (Gray et al., 1997; 2002; 2006; Gray, 1999; 2003; 2004; 2005). However, others think that synesthesia does not rule out functionalism (R. Gray, 2001; 2004; Macpherson, 2007; Sagiv & Roberson, 2005). In this article, I survey the debates between G. Gray and R. Gray and discuss the nature of the synesthetic experience. I argue that synesthesia do challenge functionalism.

P1-48: Where am I ? On localizing the Self

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The subjective location of the Self in the body is a traditionally problematic question, and it can only be addressed from the first-person perspective. However, this does not preclude an empirical approach to the question. In an interactive internet-based survey, we examined whether a large sample of participants would be willing and able to determine the perceived location of their Self. The main goal was to assess current beliefs about the nature of the Self and its assumed relation to specific bodily organs. Eighty-seven participants indicated the center of their Self by placing crosshairs on human silhouettes and on abstract, non-human silhouettes with varying anatomy. Results show a clearly dominant role of the brain and the heart for Self-location in humans. In abstract creatures, however, Self was located predominantly in the brain. Moreover, the results revealed that people not only believe that the Self can be located inside the human body but that it resides in a singular point. Implications for common notions of the Self will be discussed.

P1-49: Where and how Anscombe and Descartes went wrong

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Anscombe(1974) argues against the view that "I" is an referring expression on the ground that "if 'I' is a referring expression, then Descartes was right about what the referent was". Thus she admits that if 'I' is a referring expression, it would refer to a Cartesian Ego. But according to Kaplan(1989), "I" is an expression for "direct reference"; the proposition expressed by a sentence in which it occurs contains in it its speaker itself as a constituent. If we wish to refer, with Damasio(1994), to the view that "I" refers to a Cartesian Ego as Descartes'

error, and to hold, with Kaplan, the view that "I" is a referring expression, we need to find out where and how Anscombe and Descartes went wrong in the course of their arguments. Even if we admit, for the sake of argument, that "what is guaranteed by 'cogito' " is just "the thinking that thinks this thought" (Anscombe 1974), this doesn't seem to be sufficient for showing that the referent of "this I" is not a body. For all I know according to "cogito", I might be a human being with a body. Assuming that "I" is a referring expression, what are the grounds they think they have for concluding that the referent of "I" lacks a body. We will examine this question in detail in this presentation.

P1-50: Defense of the Innateness Hypothesis of the mental function

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The capacity of self-awareness is one of the mental functions that have been considered as species-specifically evolved and largely innate. The innateness hypothesis alleges that within a given species most, if not all, members either would or would not possess the capacity of self-awareness. The innateness hypothesis is what validates the science of animal minds in which inferences for the species are drawn from the studies of individuals. However, a recent study demonstrates that Rhesus Monkeys (*Macaca mulatta*) only showed self- and mirror-directed behaviors with strong stimuli and after a learning period. The fact that only some of the Rhesus Monkeys exhibit (quasi) mirror-self-recognition (MSR) shows variance of MSR ability within species which challenges the innateness hypothesis. Not only is the innateness hypothesis not supported by empirical evidence, it is also at odds with evolutionary theory. That is, for natural selection to take place, variance within species has to be present. Therefore, assuming that the capacity of self-awareness is one of the possible evolutionary traits, and that evolution is ongoing, it follows that variance of this capacity within species is inevitable. This therefore poses a question on the validity of the science of animal minds that is based on the innate hypothesis. However, instead of rejecting all the previous work in this field, this paper reconciles the discrepancy by suggesting a revision of the innateness hypothesis.

P1-51: An ERP study on temporal assimilation between the two neighboring short time intervals in the visual modality

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We investigated the neural substrate of temporal assimilation of the two neighboring short time intervals (T1 and T2). T1 and T2 between three successive auditory stimuli can be perceived as equal, when $-80 \text{ ms} \leq (T1-T2) \leq 50 \text{ ms}$ in the auditory modality (Miyachi & Nakajima (2007)). In this study, we recorded event-related potentials (ERPs) to examine the temporal perception of T1 and T2 in the visual modality. Stimulus patterns consisted of T1 and T2 marked by three successive visual stimuli (achromatic sinusoidal gratings). Two experimental conditions were adopted with three temporal patterns. 'T1 ≤ T2' condition was used in which T1 varied from 240 to 400 ms in 80 ms step while T2 was fixed at 400 ms. In 'T1 ≥ T2' condition, T1 and T2 were reversed. Participants judged whether T1 and T2 had the same duration or not by pressing a button. ERPs showed that P300-like component appeared in the parietal area when participants judged as two intervals were not perceived equal in 'T1 ≥ T2' condition. However, in 'T1 ≤ T2' condition, this component did not appear. These results suggest the electrophysiological evidence of temporal assimilation in the visual modality.

P1-52: Behavioral game theory in chimpanzees: building a novel experimental regime

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Much insight into human strategic reasoning has come from studies on how people predict and exploit the behavior of opponents in experimental games. In contrast, relatively little is known about how non-human species might mentalize in competitive situations. An account of how chimpanzees, the closest extant relatives of humans, behave in repeated games may clarify the evolutionary emergence of the strategic sophistication displayed by humans. For the current study, we have developed an experimental framework for testing chimpanzee choice-behavior in games. Our setup includes two interconnected touch-panel stations equipped with automatic feeders. Pairs of chimpanzee subjects (3 pairs, 6 subjects total) participated in a series of repeated rounds of binary-choice games of matching pennies and the inspection game. We present data on the characteristics of

chimpanzee choice-behavior in such games, discuss how their strategic profiles relate to the predicted Nash equilibrium for each game, and show how their behavior can be accounted for by computational models. Additionally, we discuss how the chimpanzee findings differ from those of pairs of human subjects who were given an identical experimental procedure.

P1-53: Interpretation of utterances based on interactive sequences: Experimental comparisons between 6-year-olds and adults

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A series of experiments demonstrated that, in a clear contrast to the results obtained from adult participants, 6-year-old children depend more on the literal form of verbal action than the pragmatic context of interaction that precedes the target utterance. In Experiment 1, adults and 6-year-olds were individually presented a video image in which; the Initiator “requests” a object to the Follower; then, after showing a grounding signal such as nodding to the Initiator, the Follower implicitly demands the object looking directly at the camera (at the participant through monitor), saying “Do you have a XX?” Then, the experimenter asked, “Who wanted the XX?” The results indicated that both children and adults chose the Initiator as the answer. In Experiment 2, however, children chose the Follower while adults chose Initiator, when Follower uses more explicit expression of “Take the XX” In Experiment 3, participants just observed the gesture of the Initiator whispering to the Follower at her ear, who then displayed the grounding behavior; then, the Follower said “Do you have a XX?” The results replicated those of Experiment 2. The adults’ tendency to interpret an utterance automatically weighing the sequence of the preceding interaction might continue to develop even after the children pass such tasks as false-belief. Possible contributing factors to this developmental change were discussed in relation to the levels of ostensiveness of the communicative signals in interaction.

P1-54: Disagreement internalized – normative implications of acting on self-trust

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Recent discussions debating the appropriate normative entailments of disagreement between epistemic peers have varied with regard to whether disagreement with a peer ought to entail a modification of one’s beliefs. Arguments in favour of modification advance theories with a view to the type and measure of modification demanded by disagreement. While arguments claiming that at times one ought to hold on to one’s beliefs typically rest on considerations pertaining to one’s conviction about the evidence and the latter’s probative force. Each of these views raises a variety of underlying assumptions about rationality. Typically, discussions of the normative significance of peer disagreement centre on interpersonal disagreement – on how one should react once one recognizes that one’s epistemic peer has reacted differently with regard to the same evidence. Yet given that epistemic peerage typically rests on equal epistemic virtues and/or equivalent epistemic expectations, it seems that if the notion is viable, it ought also to be applicable to a single agent when considered across time. In this spirit, it would be interesting to see whether epistemic peerage could extend to the inter-temporal beliefs of a single agent. The question would then become whether an agent ought to discount his present beliefs in view of a different beliefs that he himself held, as he would do were these the beliefs of his epistemic peers. After looking into the normative entailment of such a situation I will then explore whether this is a feasible normative demand from a single agent disagreeing with (holding views different from) his past self.

P1-55: Dual-process shifting

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There are two roughly distinctive modes of processing about the nature of human thought, which consists of two systems. System 1 is characterized as being unconscious, rapid and automatic, and System 2 is characterized as being conscious, slow and deliberative (Evans, 2008). The two processes can be manifested with behaviors in the similarity judgment task, in which System 1 thinkers pay more attention to attribution similarity, whereas System 2 thinkers pay more attention to relational similarity (Brakel et al., 2000). We adopt the similarity judgment task as an index for the outcome of dual-system process. We discovered that subjects responded toward relational similarity when the probe was presented with the comparison figures (exp1). In contrast, subjects’ performances were toward the feature similarity when the probe was presented alone for 3 seconds, followed by the two comparison figures (exp2). We further noted that the results of exp1 can be reversed by presenting a valence film before the stimuli. Similarly, the results of the exp2 can be reversed by manipulating subjects’ cognitive state

before the presentation of the stimuli. The results illustrated the processing of the two systems can be penetrated by the properties of external stimuli and/or the intrinsic cognitive state.

P1-56: Implicit learning of sequential and non-sequential artificial grammar

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Two experiments addressed the question whether implicit learning depends on rules associated with task content. We investigated the influences of sequentially processed material (letters) and non-sequential one (faces) on learning of artificial grammars. We used artificial grammar task paradigm proposed by Dienes and our own, non-sequential grammar, based on cooccurrence of different elements in a sequence (but not on their order) to investigate learning of sequential material (experiment 1). In experiment 2 we used two kinds of grammars for the same learning material (strings made of parts of faces, i.e. different types of eyes, noses, ears etc.). The strings were constructed according to both sequential (Dienes) and non-sequential grammar. Parts of the faces were presented consecutively using the rules from Dienes grammar. Non-sequential grammar was based on the simultaneous presence of pairs of parts belonging to 6 different faces (i.e. eyes A and mouth A or eyes B and mouth B etc.). Results show the implicit learning effects only for grammar that is linked to the type of presented material: sequential grammar to sequential material in experiment 1 (strings of letters) and non-sequential grammar to non-sequential material (faces, experiment 2). The transfer of prior material-associated rules hypothesis is discussed.

P1-57: Is semantic memory more primitive than episodic memory?

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One important distinction of human memory is semantic memory (SM) and episodic memory (EM) (Tulving, 1972). SM contains general knowledge of facts without connection to specific subject, time or place; in contrast, EM consists of our past experience with a certain subject, time and place. Is EM unique to humans? Which appears first in evolution, EM or SM? Most scientists hold EM evolves relatively late, while some claim it exists only in humans (Tulving, 2005; Suddendorf & Corballis, 2007). This paper aims to argue the opposite. Our false conception towards animals' absence of EM is due to the discussion without considering the theory of self. According the theory of self, I argue that being a subject is necessary for a creature to have the capacity of making the self/non-self distinction, and the concept of objectiveness requires this distinction. From an evolutionary viewpoint, the primitive creatures just directly respond to their sensation, and the creatures with the concept of objectiveness evolve only after they have the capacity of making the self/non-self distinction. In addition, while episodic memory is egocentric, semantic memory, considered as the abstraction of regularities of episodic memory, is allocentric. Thus, I argue that EM, which only presupposes a subject, is more primitive than SM, which requires the self/non-self distinction. Furthermore, evidences show that most animals and infants are living in their own subjective world without the ability to conceive the objective world. In conclusion, every conscious creature has EM, while only few primates and human adults have SM.

P1-58: Cueing prior probability of a target results in graded improvements in behavior but categorical changes in human early visual cortical activity

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When observers are given prior information about the location of a target, behavioral performance improves and fMRI activity in early visual cortex increases for that location, suggesting that cortical activity represents prior probability of target location. We tested this hypothesis by parametrically manipulating the spatial validity of a cue for a contrast discrimination task with multiple possible targets and measuring the effects on behavior and fMRI activity. Subjects viewed two brief presentations of four gratings. One of the gratings (target) had a difference in contrast between the two presentations. We varied the number of locations cued (1, 2, or all 4, always including the target), thus parametrically changing the prior probability (100%, 50%, or 25%) that the cued location(s) contained the target. Subjects had to report in which presentation the target was shown with a higher contrast. While performance improved in a graded fashion as prior probability increased, fMRI activity between cued and uncued locations showed the same difference regardless of probability. Discrimination thresholds decreased significantly with prior probability ($p < 0.001$, ANOVA). fMRI response amplitudes were significantly higher for cued than uncued locations in V1-V3 (all $p < 0.001$, ANOVA), but did not differ significantly between the 1- and 2-cue conditions ($p > 0.770$, $p > 0.361$, and $p > 0.246$ for V1-V3, respectively, ANOVA). Thus observers could use prior probability of target location in a graded fashion to improve behavioral performance, but activity

in early visual cortex categorically represented the difference between cued and uncued locations, regardless of what probability was indicated by the cue.

P1-59: Core Self and the Problem of the Self

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Core Self and the Problem of the Self The concepts of consciousness and self have been central in contemporary philosophy of the mind. Inevitably, this led to the recuperation, by some philosophers, of a few conceptions from classical Phenomenology, starting with Husserl. It is the case of the concept of “pre-reflective self-consciousness”. The approach of these philosophers[1] is not existential, but what could be called “biological” in the sense that they considered consciousness and self as natural phenomena, explained scientifically. One of the problems that these philosophers intended to resolve is the renowned problem of the self (it means: is the self an illusion?) that was initially formulated by David Hume and more recently by Metzinger, among others. In this lecture, I intend to argue, using the facts regarding the origin of the self in the early stages of life as a foundation for the argument, that the concept of pre-reflective self-consciousness does not resolve this problem. In spite of the facts not being conclusive, I will affirm that there is good reason to reject the idea that the entire form of phenomenal consciousness assumes a feeling, no matter how little, of self.[1] Zahavi, D. (2007) *Subjectivity and Selfhood: Investigating the First-Person Perspective*. The MIT Press; Gallagher, S. (2007) *The phenomenological Mind: An Introduction to Philosophy of Mind and Cognitive Science* Routledge; Parnas, J. (2010) *The Structure of Self-Consciousness in Schizophrenia* in *Handbook of the Self* Oxford University Press.

P1-60: How aliens help us to embrace content internalism.

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Belief content is often taken to be a relation between the believing subject and a set of factors and conditions for setting up intentional objects. Content being external requires external explanatory conditions. Suppose that we encounter strange aliens by distant communication, whose mental world is entirely foreign to us. Nevertheless, we recognize them as intelligent and communicate with them, e.g., by mathematics. During communication, we learn about a hitherto unknown, even unimagined, object *x*, forming concepts about it. We can think about *x* only in terms of our own concepts. Furthermore, only by our own concepts are conditions set that make *x* an intentional object. There is no external description of *x*. Hence the content of any intentional state about *x* is internal, even if we are realists about *x*. On the other hand, human friends, due to proximity of background, apparently are able to talk about the same objects. For judging on that, independent arbiters, teachers and society members, are available. From aliens to close friends, proximity between communicants and arbiters' roles in judging on the communication contents increase gradually, moving towards the case for content externalism. However, since content externalism is not compelling, no slippery slope fallacy is committed in proposing all-out content internalism as a feasible option. Accordingly, society, rather than being an external factor shaping content, provides no more than encouragement and reinforcement of internal content. Proximity between communicants merely facilitates communication. Arbiters, then, view communicants' messages as part of their own internal contents.

P1-61: Silencing awareness of change by background motion

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When a set of objects changing in brightness, color, size, or shape moves across the visual field, the objects appear to stop changing. In previous work introducing this effect (“silencing”), we showed that its strength depends on speed: the faster the objects move, the less noticeable the change. In order to explain it, we had proposed the brief window hypothesis, which supposes that change detection relies on the success of local detectors—i.e., ones that monitor a fixed location in the visual field. Then, since a fast-moving object spends little time at any one location, each detector is afforded only a brief window in which to assess the changing object; this brevity may preclude the detection of change. Here, we show that the brief window hypothesis is wrong via a demonstration of silencing by background motion. We overlaid a set of one hundred dots changing in brightness or color on a pinwheel-shaped background. We then used a matching task to measure the strength of silencing produced by rotating either the set of dots or the background, while keeping the other motionless. The brief window hypothesis predicts that only motion of the objects will produce silencing, because moving them impacts the window, but moving the background does not. We found comparable speed-dependent silencing in the two conditions. These results illustrate that it is the motion signal, not the corresponding change in position, which is responsible for silencing awareness of change.

P1-62: Attention and visual consciousness: How does the conceptual content of perception become conscious?

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The sensory classification theory (Matthen 2005) argues that the mechanism of sensory classification in our early vision provides conscious experience with conceptual content by encoding sensory properties and combining them with the relevant object. The mechanism, however, works preconsciously as the case of subliminal perception shows. There seems to be, thus, a gap between shaping conceptual contents and consciously experiencing them. How can we bridge the gap? The clue for the question must lie in the relation between attention and consciousness. I shall argue, firstly, that the basis for combining classified sensory properties is the relevant object file given by a kind of attentional mechanism that captures several individual objects, and secondly, that attending to the relevant object file is sufficient (if not necessary) for it becoming conscious. To make the latter point, I shall make critical study on the AIR theory (Prinz 2000; 2005; 2010). According to the AIR theory, attention is necessary and sufficient for consciousness. If the periphery of consciousness, however, lies outside of the focus of attention, it follows that attention is not necessary for consciousness. Prinz might respond to the criticism by appealing the concept of diffuse attention. I shall show that diffuse attention of any form cannot play the expected role. Prinz's analysis, however, still does support the claim that attention is sufficient for consciousness. And I shall argue, lastly, that a reflection on the epistemological requirement for perceptual conceptual content will reveal that the sufficiency is enough to bridge the gap.

P1-63: The person identity priming effect modulated by depersonalized tendency

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Depersonalization is characterized by abnormal feeling of self detachment from surrounding world, but the cerebral mechanisms of this phenomenon are not yet fully understood. In this study, we adopted the priming effect using person identity and measured EEG response for individuals with/without depersonalization tendency. Our hypothesis is that the depersonalized individuals show no priming effect on EEG for self and unknown identity. Participants were assigned into depersonalized or not-depersonalized group based on the score of the Cambridge Depersonalization Scale (CDS), which is an instrument for detecting depersonalization disorder under clinical conditions. All participants saw the self/unknown face as prime stimuli, and the self/unknown name or affiliation as target stimuli. Required task was to judge whether the presented target stimuli was related to self or unknown. During this task, EEG was measured from 32 electrodes attached at the participant's scalp. For decomposing EEG activity into spatial independent component, independent component analysis (ICA) was applied and all extracted components were clustered by k-means algorithm. We obtained clusters with dipole sources located in the medial prefrontal cortex (mPFC), the ACC, the left and right primary visual cortex, the right STS, and the parietal cortex. Priming effect on EEG using person identity was observed at ACC and mPFC in the not-depersonalized participants, but not in depersonalized participants. This result suggests that the self detachment in the depersonalized person was related to the function of ACC and mPFC when we discriminate self related information from unknown person's information.

P1-64: Underlying mechanism of subliminal mere exposure effect -When your pupil constricts, you will like what you unconsciously see-

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Kunst-Wilson and Zajonc (1980) found that subjects tend to prefer patterns to which they are subliminally exposed, even when they cannot recognize the pattern they have observed. This is the so-called "subliminal mere exposure effect". One explanation of the effect is that the subject misattributes the resulting cognitive fluency associated with a subliminal exposure to a feeling of preference (Jacoby & Kelly, 1987). It would be reasonable to assume that perceptual fluency corresponds to the amount of mental load invested on processing of the presented pattern. Since it is known that pupil size reflects the amount of invested mental load (Kahneman & Beatty, 1966), we measured pupil responses while subjects were exposed to visually subliminal stimuli. Each visual pattern was presented for 8 msec followed by a random-noise mask pattern. After exposure to visual patterns, subjects conducted a task that examined their preference. They were asked to select between two patterns, one that was presented subliminally and another that was not presented before. About two-thirds of the subjects expressed their preference to the pattern they subliminally observed. We found that the pupil size during subliminal exposure was

significantly smaller for the subjects who exhibited the mere exposure effect later. We conclude that perceptual fluency could be an underlying mechanism of the subliminal mere exposure effect. In addition, by observing the pupil responses while subjects are exposed to subliminal patterns, it could be possible to predict whether they will like the pattern or not later.

P1-65: Is there such a thing as normal perception? Lessons from synaesthesia and hallucinations.

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Most people take perception for granted and rarely stop to consider that others may actually see things differently. Although it is difficult to compare experiences, synaesthesia seems to provide strong evidence for substantial individual differences in perception. Because synaesthetic experience is not shared by all (admittedly, it can depict objects or features that are not really there), synaesthetic experience could actually be considered hallucinatory. Indeed anyone who does not have synaesthesia might conclude that synaesthetic images, like hallucinations, occur "in the absence of an appropriate stimulus" (one of the terms used to define hallucinations; Slade & Bentall, 1988). But who decides what stimuli are appropriate inducers of a given perceptual experience? Should this be down to the majority opinion or could we actually incorporate individual differences into this picture? After all, what is normal or appropriate depends on the neural architecture of each individual. A visual stimulus may be appropriate for evoking a visual experience in most individuals, but not in the blind. Conversely, if one's brain has extra connections between the visual and auditory cortex, then synaesthesia should be expected to be the normal mode of perception in such a case. Thus, as we learn more about the functional neuroanatomy of brains, we can predict more precisely what perceptual experiences should be expected. Perception is thought to facilitate our interaction with the environment. Unlike hallucinations that could be viewed as noise in the signal, synaesthetic experiences appear to serve a useful function: Owing to the stable mapping between inducer and concurrent synaesthetic experience, synaesthetic imagery does convey meaning. We suggest that neuroscience is providing us with direct evidence to support a pluralist view of perception. This evidence should be incorporated into theories concerned with the relationship between perception and reality.

P1-66: Vection induction without the awareness of global motion

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In all previous vection studies, motion perception was inevitably associated with vection, and subjects were certainly conscious of the existence of global motion. In this study, we eliminated awareness of global motion despite the physical presence of a global motion component. By doing so, we examined whether vection can be induced by a stimulus even when global motion is not consciously perceived. Two hundred grating patches were presented. The size, position, and mean luminance of the patches were randomized. The direction of motion for moving gratings was also randomized. We call this stimulus the Mondrian grating. We added a global sine wave luminance component to this Mondrian grating. If the contrast of a global motion grating is high, it is available to conscious perception. Therefore, we set the contrast of the motion grating to 4% so that subjects were not consciously aware of the global motion. Four possible global motion directions (up, down, left, and right) were randomized across trials. Ten subjects reported vection and its direction by button press. There were three trials for each global motion direction. The stimulus duration was 20 sec. The results indicated that vection was significantly longer in the direction that was opposite to the direction of the hidden global motion. No subject reported awareness of the hidden global motion stimulus. Therefore, vection does not require the awareness of global motion.

P1-67: Free energy and continuous flash suppression

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Continuous flash suppression (CFS) is a visual phenomenon closely related to binocular rivalry. Like binocular rivalry, a different image is presented to each eye and perception alternates between these two percepts. In CFS, one eye is presented with a changing pattern that suppresses the image in the other eye. The depth of the suppression is thought to be a function of the strength of the stimulus and the parameters of the flashing pattern. We employed a CFS paradigm to investigate the suppression and dominance periods and associated BOLD responses of a face stimulus when co-presented with a flashing Mondrian pattern. Our aim was to not only capture a BOLD response related to activity for the face stimulus but also to investigate the possible sources or networks

that might be governing the alternation process. This talk will outline the results of 11 participants with a view towards contextualizing these results in light of a predictive coding theory of neural function.

P1-68: Sensing fear before seeing it: Fear detection independently of visual awareness

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Here we tested whether bodily expressions are processed outside awareness. Participants had to detect in separate experiments masked fearful, angry and happy bodily expressions among masked neutral bodily actions as distractors and subsequently the participants had to indicate their confidence. The onset between target and mask (Stimulus Onset Asynchrony, SOA) varied from -50 to +133 milliseconds. Sensitivity measurements (d') as well as the confidence ratings showed that the bodies could be detected reliably in all SOA conditions. Importantly, a lack of covariance was observed between the measurements when the participants had to detect fearful bodily expressions while this was not the case when participants had to detect happy or angry bodily expressions.

P1-69: The prefrontal parietal network, theta burst TMS and metacognitive awareness

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Working memory enables flexible use of visual information and is often proposed to have tight linkage with visual awareness. Thus, it has been believed that working memory would not be available under the condition of 'blindsight' in which the patients with damage to the primary visual cortex (V1) show visually guided behaviors without visual awareness. Here, we examined spatial working memory in a non-human primate model of blindsight. We found that the monkeys with a unilateral lesion of V1 were able to make memory-guided saccades (MGS) in the visual field affected by the lesion: they could retain the positions of the cue for at least 2 seconds and make a saccade to the position. Furthermore, while the monkeys were performing the MGS task, sustained activity was observed in a large fraction of the neurons in the superior colliculus (SC) ipsilateral to the lesion, which is a key node for recovery process after damage to V1. These neurons maintained the spatial information throughout the retention interval, which was not the case in the intact side. The sustained activity was found not only in the visuomotor neurons but also in the visual neurons, suggesting that it is unlikely to represent motor preparation. Error analysis revealed that the sustained activity was correlated with monkeys' behavioral outcome. These results suggest that SC might serve as a neural substrate for spatial working memory in the affected visual field. Our findings challenge the current view on the relationship between visual awareness and working memory.

P1-70: Forward and backward attention differently induce mislocalization of visual stimuli

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Shifts of visual attention cause systematic distortions of perceived locations of visual objects around the focus of attention. In the attention repulsion effect, the perceived location of a visual target is shifted away from an attention-attracting cue when the cue is presented before the target (Suzuki & Cavanagh, 1997). Recently it has been found that, if the visual cue is presented after the target, the perceived location of target shifted toward the location of following cue (attraction effect, Ono & Watanabe, in press). This mislocalization in visual space is thought to be attributed to an error of attentional shift (Ono & Watanabe, in press). The present study compared the attentional repulsion and attraction effects; the attentional attraction effect (0.05° in visual angle) was about half the magnitude of the attentional repulsion effect (0.1°). In the subsequent experiments we found that the attraction effect diminished by presenting a masking stimulus between the target and the cue or a visual cue simultaneously to the target, but the repulsion effect did not. These results suggest that the underlying mechanism of the repulsion effect might be different from that of the attraction effect.

P1-71: Contextual cuing effect with self motion

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When we move, the movement usually changes the viewpoint to see objects around. Despite the viewpoint change, we perceive the objects as unchanged. This suggests that our visual system has spatial representations of objects, independently of viewpoint differences. In this study, we examined whether the spatial representations -viewpoint independent representation- (VIR), can be obtained unconsciously. For the purpose, we used contextual cuing effect (CCE). The CCE is a learning effect of spatial layout in visual search displays and is known to be an

implicit learning effect. Without noticing the repetitions, visual search performance improves by repeating a visual search task. We examined whether the CCE is obtained with viewpoint changes due to observer's self motion. Visual search displays (a target and distractors) were presented on a head mount display so that viewpoint of display and head position were controlled independently. We compared the CCE between with and without a self motion in a visual search task where the viewpoint of stimulus display changed. We found the CCE with self motion when the display changed as the change of the viewpoint due to the self motion. When the display changed without self motion, however, the CCE decreased remarkably. This indicates that there is an implicit learning effect in spatial coordinates and suggests that the spatial representation of object layouts can be obtained

P1-72: A computational model of conscious and unconscious level processing: Consciousness is module combinations formed on the fly

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This paper proposes a computational model of conscious and unconscious level processing. We firstly examine the characteristics of conscious level processing, and point out a distinctive feature: new action patterns and new thought patterns can be composed on the fly without a training period. Then we propose a computational model consists of many modules each of which has elemental function such as recognition, prediction, and action selection. Complicated processing can be realized by combining these modules. In order to change the combination freely and variously, a place or places where the inputs/outputs of the modules gather seems necessary, which we call working memory. Each input/output has a gate, and the states of the gates are controlled by the modules, thus the information flow among the modules, that is, the combination of the modules is controlled by the modules by means of gates. While useful module combinations are learned by trial and error on the unconscious level, new module combinations are formed on the fly on the conscious level. The new combinations can be created either by imitation, by analogy, by planning, or by being told. The paper reports the computer simulation results of (1) making module combinations on the unconscious level by reinforcement learning, and of (2) forming module combinations on the conscious level by imitation, by analogy, and by being told.

P1-73: Ruminative self-focus and heart rate variability in daily life

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People spend a great deal of time for internally oriented thought in daily life; however, excessive or chronic focusing on self, ruminative self-focus, is known to be maladaptive for maintenance and exacerbation of dysphoria. Researches have suggested that rumination is associated with self-regulatory failure and less cognitive flexibility or resources, but there is no evidence for reduced self-regulatory resources during spontaneously generated rumination in everyday life. In the present study, we investigated the relationships between daily experiences of ruminative self-focus and self-regulatory capacity using the experience sampling method and ambulatory monitoring of heart rate variability (HRV), which is proposed as a physiological measure of self-regulatory capacity. In total, 45 participants recorded their thought contents, affective states, and biobehavioral variables 21 times for a day at semi-random intervals via a mobile phone, wearing an ambulatory R-R recorder to monitor HRV. Analysis of multilevel modeling showed that higher levels of rumination are associated with increased negative moods and low HRV, which suggests that ruminative self-focus is a dysphoric mental state with reduced self-regulatory capacity. In contrast, mean levels of rumination are associated with less negative moods and high HRV, while lower levels of rumination are associated with less negative moods but low HRV. These results suggest that moderate levels of ruminative self-focus are calm and adaptive conscious states with increased self-regulatory capacity compared with highly attending to or distracting from self. In such mild self-referential processing, people may store a cognitive resource for further self-inquiry or immediate response to environmental demands.

P1-74: Adults with high-functioning autism learn explicitly in an implicit sequence learning task

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Watson (1994) roots both theory of mind and self-awareness in ability to detect contingencies. Thus, self-awareness develops based on the fact that I can reliably predict the consequences of my actions. Likewise, theory of mind depends on my ability to predict the consequences of the actions that I direct towards other agents. The contingencies involved in social cognition, however, are far less predictable than those arising from interactions with one's self or with objects. An impairment in one's ability to process less-than-perfect

contingencies may thus explain autistic people's difficulties with social cognition as well as their interest in and conscious knowledge of perfect contingency situations. Interestingly, sensitivity to contingencies is at the heart of implicit learning research. One High-Functioning Autism (HFA) patient we recently tested on a deterministic sequence exhibited completely explicit knowledge of the material, in stark contrast to normal participants. Recent research (Barnes et al. 2008; Brown et al. 2010; Nemeth et al. 2010; Travers et al. 2010) likewise suggests that implicit learning is intact in people with autism, provided that IQ is controlled for. Here, we tested 20 adults diagnosed with HFA, and an IQ-matched control group on a Serial Reaction Time task involving a deterministic second-order conditional sequence. All participants were tested for IQ, Autism Quotient (AQ), Empathy Quotient (EQ), Systemizing Quotient (SQ) and "Reading The Mind In The Eyes" (RMET). Results suggest that the HFA group indeed learns explicitly. Further research will contrast deterministic and probabilistic sequence learning.

P1-75: Cognitive achievement of meditative "pure consciousness": sentence comprehension by a Japanese speed-reading expert

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A growing amount of evidence suggests that meditative training methods based on Oriental Zen practice enhances ones' visual perception and cognition (e.g., MacLean et al., 2010). The Park-Sasaki method of speed reading in Japan involves an organized series of visual training while forming a both relaxed and concentrated state of mind, as when one is engaged in meditation with the eyes open. Advanced experts on this method are reported to be capable of reading Japanese sentences faster than 10,000 characters per minute (e.g., Fujimaki et al., 2004, 2009). The present study examined comprehension of novel sentences by an advanced expert on this method as well as by four untrained university students. The participants were instructed to read five Japanese short novels presented on the LCD monitor, each 9,024 characters long on the average, while switching each page display by pressing a response button. Immediately after reading through each novel once, they were asked to answer 16 yes/no questions regarding the content of the novel. The speed reader read these novels at a mean speed of 5,644 characters per minute, before giving nearly 80% of correct answers. Her performance far exceeded that of the students, whose mean reading speed was 1,053 characters/min. before answering the questions at a level comparable to that of the expert. These results demonstrate a case in which "pure consciousness", or a meditative state of mind while calmly focusing on what one is doing at this very moment, can achieve an extraordinarily higher form of cognition.

P1-76: The "fourth state of consciousness": a quantitative meta-analysis of neuroimaging studies on meditation

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Three distinct states of consciousness are known: wakefulness, sleep and dreaming. In eastern philosophy a fourth state, meditation, has been described [1]. Indeed electrophysiological and neuroimaging studies have shown peculiar brain activities during meditative state. Activations in the fronto-parietal attentional control system, and subcortical structures related to emotional processes have been reported [2]. Despite the growing body of literature, results are still controversial due to methodological heterogeneities. The interest of studying neural correlates of meditation is twofold: from a theoretical perspective, it could give some insight to the general problem of consciousness; to the other hand, as meditative techniques are more and more used in clinical practice [3], it could shed some light on the intervening mechanisms. Here we conducted a quantitative meta-analysis [4] of available studies to evidence the core cortical network subserving meditation. We showed activations of basal ganglia, limbic system, insula and medial prefrontal cortex (MPFC). We propose a neurocognitive model supporting meditation comprising: an interference control system (basal ganglia) subserving the inhibitory control necessary to block irrelevant stimulations; a self monitoring system (insula and MPFC) that would reflect the engagement of an inward oriented attention; and a monitoring thoughts system (parahippocampal gyrus) that would underpin the generation and control of the stream of thought to pass by irrelevant thinking. [1] Ramamurthi B. (1995). *Psych. Clin. Neurosci.* 49: 107-110. [2] Rubia K. (2009). *Biological Psychology* 82: 1-11. [3] Kabat-Zinn J. (2003). *Psychol. Sci. Pract.* 10: 144-156. [4] Turkeltaub P.E et al. (2002). *NeuroImage* 16: 765-780.

P1-77: Greater effect of less visible signals on implicit probability learning in perceptual decision making

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Based on current models of perceptual decision making that assume sensory signals are temporally integrated toward appropriate actions, we expect that decisions are more precise and quicker as the signals become stronger. The sensory inputs are used not only for the immediate responses. They and the resultant responses along with contextual information are learned to form prior knowledge for future decisions. We investigated how the strength of visual signals affects the learning of prior knowledge for perceptual decision making, and found that very weak, barely detectable signals on previous trials have greater influence on current decisions than stronger signals do. The experiment was a forced-choice task, and participants performed an orientation identification (22.5 deg vs 112.5 deg) on noisy gratings, for which the occurrence frequencies of stimulus was manipulated separately for different signal-to-noise levels (0, 0.05, 0.15 or 0.2). Frequency for two orientations was 42% vs 58%, 50% vs 50% or 58% vs 42%. We then used fMRI to examine how these counterintuitive behavior could be represented in the brain. Using a multivoxel pattern analysis MVPA, we found that the behavioral results were significantly highly correlated to the decoded performance based on fMRI signals in ventral prefrontal areas but not to that in dorsal lateral prefrontal or intraparietal areas. These results indicate that ventral lateral prefrontal areas reflect an influence of past experiences of weak signals on decision making.

P1-78: Resting state brain activity during propofol sedation in healthy subjects and in patients with disorders of consciousness

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Resting state functional connectivity MRI (rs-fcMRI) is used to study spontaneous activity of the brain when it is devoid of attention demanding tasks. Spatially separated patches of neurons have been found to show synchronized oscillatory activation behavior and are said to be functionally connected. One of the most robust of these resting state networks is the default mode network (DMN), which is associated with intrinsic processes like mindwandering and self-projection. The integrity of this network is disturbed in conditions of altered consciousness, like sleep, general anesthesia and hypnosis. In coma type disorders of consciousness (DOCs), an exponential relationship seems to exist between the level of remaining consciousness and DMN integrity, thus opening the possibility of using these activity signatures to discriminate between states of consciousness, and those without. After independent component analysis, the selection of the DMN component is usually done manually, introducing a bias. However, we developed an automated technique that does not only use spatial information to select the DMN, but also temporal information ('fingerprint' driven), information about the anticorrelation with the so-called external control network, and dynamic masking. About 70% of DOCs patients need sedation before rs-fcMRI scanning to minimize movement, as rs-fcMRI is very sensitive. This does mean interfering with brain activity. We used the automatic DMN selection technique and brain normalization software to examine the effect of propofol sedation on the brain in healthy subjects and in DOCs patients

P1-79: The predicted present in robotic and natural systems: implications for cognition and consciousness

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In previous work, my colleagues and I have argued that a sophisticated cognitive system with a complex body must possess configurable models of itself (or at least its body) and the world, along with the necessary infrastructure to use the modelled interactions between these two components to select relatively advantageous actions. We have successfully demonstrated such a scheme – essentially a kind of imagination – in action on a complex robot. We have since taken note of the recently established connections between imagination and episodic memory in humans in order to study the extension of our scheme to providing a kind of episodic memory both for the system's actions, and for events in the world. Imagination is usually about the future; episodic memory is about the past. In this talk I will explore the problems surrounding the representation of the present in the artificial cognitive system under development within the ECCEROBOT project [eccerobot.org]. There are two aspects to consider: the representation of the state of the robot's body within the self model, and the representation of the state of the external world within the world model. In both natural and robotic systems, the processing of the sensory data carrying state information takes a considerable time, and so the present states of both the robot and the world must be estimated by using predictive models. The talk will consider the implications of this predicted present for imagination and episodic memory, and its significance for cognition and consciousness in both natural and robotic systems.

P1-80: Decoding attention for real-time real world applications

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Control of visual attention, using both spatial and feature based components, provides an operational surrogate of directed brain activity, which may be used to drive a real-time fMRI based brain-computer communication device. We have completed an offline fMRI study in thirteen subjects investigating brain activity associated with manipulations of spatial attention directed towards targets in each visual quadrant. In addition to discrete modulations of activity in retinotopic areas of primary visual cortex, we have used multivariate pattern analysis (MVPA) to show activity associated with the spatial focus of attention in regions of parietal and prefrontal cortex. In a second study, we are developing real-time FMRI measures of spatial attention while the participant attends either overtly or covertly to different spatial locations where relevant real-world visual stimuli are presented. By using an automated decision criterion to evaluate on a trial-by-trial basis which location is being attended by the participant, we intend to establish the legitimacy of pairing these brain activations with specific shifts of spatial attention, as well as any associated feature-specific attentional modulation at these locations. This will form the basis for an operational brain-computer communications platform, as well as shedding light on the neurobiology underpinning conjunctions of spatial and feature based attention.

P1-81: The change in the body image induced by the rubber hand illusion according to the shape of the rubber hand

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It is considered that own body image exists in a human brain and is used for the motor control. This image is composed by the integration of visual, tactile, somatosensory information and so on. The Rubber Hand Illusion (RHI) is a perceptual phenomenon about the body ownership that a rubber hand becomes part of one's own body by integrating tactile and visual stimulus. In this study, the changes in the body image according to the shape of the rubber hand were assessed quantitatively. To induce the RHI, the subjects watched a rubber hand placed beside the unseen their right hand and the index fingertips of both hands were stroked synchronously or asynchronously for five minutes. The index finger's length of the rubber hand was 2cm shorter, normal or 2cm longer. Moreover, its position shifted in the direction of the index finger. The perceived position of the participant's index fingertip was measured before and after the RHI and the proprioceptive drift was analyzed. As a result of a two-way ANOVA on the drift in the direction of the index finger of five participants who had induced the RHI, main effect was significant for the finger's length of the rubber hand and no significant for the position of the rubber hand. This result suggests that the subjects felt their index finger long or short according to the finger's length of the rubber hand and the brain suitably recomposes the own body image according to the perceived information.

P1-82: Being in time

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Philosophical and computational considerations, along with neurobiological data, suggest that phenomenal experience is holistic in the sense that it emerges from the dynamics of the entire brain (Malach, 2007; Tononi, 2008; Fekete & Edelman, 2011). On this account, my experience of the page in front of me (say) is predicated upon coordinated activity, not just of visual areas alone, but of the rest of my brain as well. Experience thus must be inherently temporally extended, if only because coordination requires time. What is the nature of this coordination and how much time does it take for experience to emerge? Lessons from the science of parallel distributed computation (e.g., the Two Generals' Problem) suggest that putting experience (or, for that matter, any other collective action such as decision making) on hold until after all of the brain's constituents have had a chance to reach a consensus about it is a recipe for permanent functional paralysis. To understand why the brain does not have to wait for long (let alone indefinitely) to figure out what experience it is having, note that coordination, like experience that emerges, is an ongoing endogenous process modulated by input, rather than a transient ripple in an otherwise quiescent medium. Thus, the input-influenced present turn of the system's trajectory through the activation space --- the embodiment of experience --- is shaped collectively by the system's history, which likely possesses a variety of natural time scales amenable to empirical investigation.

P1-83: Synesthetic cross-modal sound-color mapping

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Synesthesia is a neurological condition in which stimulation of one sensory or cognitive pathway involves automatic and involuntary responses in another sensory pathway. We present how synesthetic cross-modal mapping, especially sound-color mapping, has been utilized in animation films, and, based on these evidences, present how synesthetic cross-modal sound-color mapping in animation can generate different emotions using cross-modal “key modulations.” In order to find the synesthetic sound-color cross-modality, we performed a set of tests to 52 synesthetes based on a standard battery of tests that include: a scale, chord, key tests. We were very surprised at how strongly test subjects associated colors with keys, especially with major keys in the tests. The colors picked by test subjects are strongly clustered about several colors for each key. We use the k-means method to cluster the selected colors, and obtained representative colors for each key. The representative colors for the scale, chord, and key tests are strongly correlated. In many animations, the inserted music must finish in a few minutes so it has no time to change keys to invoke some emotions. One surprising outcome is that synesthetic cross-modalities between the music and colors may be used to “modulate keys.” In a Japanese animation named “Spirited Away” produced by Studio Ghibli, synesthetic cross-modal key modulations are adopted. The opening music of this film is an A-minor song named “Summer's Day”, and distinguished synesthetic C major colors are used in the opening images for this cross-modal “key modulation.

P1-84: Would cognitive control modulate the bottleneck of the mind ? Metacognition impaired by cognitive control magnitude

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The circuit including dorsolateral prefrontal cortex (dlPFC) and anterior cingulate cortex (ACC) has been associated with access to consciousness, cognitive control and error detection. This network presents numerous abnormalities in schizophrenic patients, who have been reported to show a more elevated threshold of access of information to consciousness than controls (Del Cul et al., 2006), cognitive control impairments at a specific locus among the cognitive control hierarchy (Barbalat et al., 2008) and reduced ERN. Assuming that dlPFC-ACC circuitry might play a critical role in metacognition we reasoned that metacognitive performance of normal subjects should be altered when one manipulates some variables and factors that network is sensitive to. We choose a task-selection paradigm known to recruit the dlPFC (Koechlin et al, 2003); we used a masked/unmasked priming technique to generate nonconscious/conscious conflicts, respectively; we manipulated the cognitive control load at two different time scales --trial or transient, block or sustained. Importantly, we splitted the trials into those that necessarily recruit a task selection stage ('high') and those that don't ('low'). Finally, in one third of trials, subjects (n=24) had to assess their own performance. Main result: In incorrect trials, metacognitive performance severely dropped down according to prime congruence and visibility (multiplicative effects): subjects performed nearly at chance in detecting their errors despite high confident reports. That interaction was obtained in 'high' trials only. If confirmed by fMRI, ACC-dlPFC might turn out critical for metacognition, thus raising the question of a fundamental metacognitive deficit in schizophrenia.

P1-85: Activity of macaque prefrontal neurons during oculomotor delayed-response performance may reflect explicit memory processes

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Prefrontal neurons are known to exhibit spatially selective persistent activity while monkeys are engaged in oculomotor delayed-response (ODR) tasks. This activity has been considered to be a neural correlate of the short-term maintenance of visuospatial information. However, little is known about whether this activity reflects a type of memory that is analogous to human explicit memory. To address this issue, we recorded single-neuron activity from the prefrontal cortex while two monkeys performed a modified ODR task. In this task, the monkeys had to remember the location of a visual cue during a several-second delay period, after which they were sometimes forced to take a recognition test (forced-test trials) and were sometimes allowed to choose either to take or escape from the test (chosen-test or chosen-escape trials, respectively). We determined the spatial selectivity of neurons with persistent delay-period activity on the basis of their firing patterns in correct forced-test trials. For one monkey that showed higher memory performance in the chosen-test trials than in the forced-test trials, which indicates the ability to discern the presence and absence of memory for the cued location, the firing patterns of the neurons were more similar between the forced-test and chosen-test trials than between the forced-test and chosen-escape trials. This tendency was not observed in the other monkey that did not show a clear difference in memory performance between the forced-test and chosen-test trials. These results suggest that

spatially selective persistent activity of prefrontal neurons reflects explicit memory for visuospatial information during ODR performance.

P1-86: Who is the most effective in implicit learning process? The role of individual differences

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A fundamental ability of human cognition is automatic and implicit detection of complex regularities in the environment. The researchers have claimed that the implicit processing system is evolutionarily older than explicit cognition. This implies little individual variation in the construct relative to explicit processing (e.g., Reber, 1993). However, some evidence has shown a correlation between an intuitive cognitive style and implicit learning performance (Woolhouse & Bayne, 2000). Some other researchers found correlation between implicit learning and the intuition facet of the Myers-Briggs Type Indicator (Kaufman et al., 2009), NEO-PI-R openness to feelings (Norman, Price & Duff, 2005), and aspects of self-reported personality, including intuition, Openness to Experience, and impulsivity (Kaufman et al. (2010)). The aim of the presented studies is to establish the role of motivation (promotion and prevention) and cognitive style (global vs. local, measured by Navon test) in artificial grammar learning task (AGL). Förster and Higgins (2005) found that promotion focus was positively correlated with global processing, whereas the reverse was true for prevention focus. In presented studies participants performed the AGL task, Navon test (which defined their cognitive style) and their motivation was manipulated in preventive and promotive way. There was also manipulation of the instruction in AGL (liking task versus rule-conformity judgments). The results indicate that motivation has influence on implicit learning process, especially in interaction with cognitive style and instruction type. The hypothesis that the instruction in AGL task can modify influence of cognitive style and motivation on effectiveness of implicit learning is discussed.

P1-87: Synaesthetic letter-color binding is mediated by type-based association

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Synaesthesia is an unusual perceptual phenomenon that a perception of a real stimulus induces secondary perception. Grapheme-color synaesthesia is the most common one in which perception of color is induced by letters or numerals. The nature of letter-color binding in grapheme-color synaesthesia, however, remains unknown; one possibility is that the synaesthetic color binds to the same location as graphemes (token representation), and another is that the binding is not location-specific and more abstract (type representation). To address this issue, we employed a synaesthetic version of the object-reviewing paradigm. Ten synaesthetes and non-synaesthete controls participated in this experiment. The controls learned the association of graphemes and colors of a synaesthete participant beforehand. The preview display had two graphemes within each placeholder. A colored grapheme was presented at either of the placeholders in the following target display, and subjects judged whether its physical color matches synaesthetic or learned color. The target was a preview letter at the same location (Same Object [SO] condition), at different location (Different Object [DO] condition), or a different letter from previews (No Match [NM] condition). Token-based association predicts an advantage of SO condition over DO condition, while type-based association does not. In the synaesthete group, response time did not differ between SO and DO conditions, while response was significantly longer in NM condition than SO and DO conditions. In contrast, no such effect was observed in the control group. These results suggest that synaesthetic letter-color binding is mediated by type-based association.

P1-88: Resources and implicit learning

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Discussion surrounding implicit learning is focused on the nature of the knowledge acquired during the process. Nonetheless, it seems crucial to describe the nature of the learning process itself to understand the former. There is no one definition of the term 'implicit'; it is described as an opposition to such constructs like: conscious awareness, control or resource engagement. Some authors (eg. Frensch, Wanke & Runger, 1999, Hsiao & Reber, 2001) deem implicit learning resource-independent, some (eg. Cohen, Ivry & Keele, 1990, Standler, 1995) treat it as resource-consuming. Our findings lead to an assumption that there are specific kinds of limited resources required for implicit learning to process efficiently. First study performed in AGL paradigm shows a decrease in learning efficacy when other than letter strings' regularity was included into the environment and participants were not informed about it, and no influence of such regularity on learning, when participants were informed about this regularity. Second study testing sequence learning (specially adapted DIVA paradigm) shows a decrease in implicit learning efficacy when a second rule (other than main task, forming regular sequence) was presented and unimpaired learning when another sequence was absent. The results of both studies show competition

between operations responsible for processing hidden patterns (task related and concurrent) which disappear with pattern uncovering to attention or absent. This and alternative explanations of findings are discussed.

P1-89: Monkeys understand other's attentional state by reading gaze

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To efficiently communicate with other individuals, we should understand her/his mental state (e.g., attention and intention). Gaze is one of the available cues to infer other's mental state. This study examined whether Japanese monkeys recognized other's attentional state with gaze cue and modified their own actions. To examine the extent to which the monkeys were sensitive to other's gaze, we set up three conditions wherein directions of eyes and face were controlled: Condition 1, 'direct gaze (face front)' vs. 'averted gaze (face turn)'; Condition 2, 'direct gaze (face front)' vs. 'closed eyes (face front)'; Condition 3, 'direct gaze (face front)' vs. 'direct gaze (face turn)'. We tested the monkeys under the feeding situation. For each condition, the caretaker performed one of two types of gaze state in each 60s-trial. During a trial, she ignored the monkey irrespective of his actions, and after that she gave him a food. Monkeys' looking and begging responses to a caretaker were assessed. As a main result, we found that the monkeys showed more begging when the caretaker looked at them and show more looking when she did not look at them. That is, monkeys looked at the caretaker and investigated whether she did or did not look at them, and when she looked at them, they exhibited begging. This suggests that monkeys recognize whether or not others intend to interact with them by reading its gaze and change their actions in response to it. This implies embryonic understanding of other's mind in non-human primates.

POSTER SESSION 2 (1:30pm-3:30pm)

P2-1: Daisetz Suzuki's two layers of the unconscious

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Daisetz Teitaro Suzuki (1870-1966), a renowned scholar of Zen Buddhism, describes two layers of the unconscious. The first layer, the psychological unconscious, is similar to the unconscious in Western psychology because it can encompass the Jungian collective unconscious that is shared by all human beings from the past to the future. The second layer, which Suzuki calls the metaphysical unconscious (or Cosmic Unconscious), exists under the first layer. This layer has no equivalent English word because there is no self consciousness in the metaphysical unconscious. According to Suzuki, this layer is "the principle of creativity" or "the store-house of possibilities." After making all possible endeavor for self-improvement (or some other accomplishment), each individual must face their limitations. Subsequent to the ultimate exploration of psychology, an individual will move into the realms of metaphysics. In the realm of the metaphysical unconscious, an individual can do something that s/he normally cannot do because of the metaphysical power and help. All kinds of great work can be accomplished by abandoning all self efforts and following the metaphysical power and help. For example, timeless pieces of art can be created from experiences in the metaphysical unconscious. In this poster presentation, I would like to discuss Suzuki's two layers of the unconscious in comparison to the standard eight different modes of the human mental system in the Yuishiki (Mind-Only) school of Mahayana Buddhism as a psychologist.

P2-2: Neural correlates of the undermining effect of monetary reward on intrinsic motivation

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Rewards are believed to enhance motivation. However, psychological experiments have repeatedly revealed that extrinsic rewards (e.g. money or food) can paradoxically undermine people's intrinsic motivation to engage in a task for the inherent pleasure and satisfaction derived from the task itself. In order to reveal the neural mechanisms of this "undermining effect" of extrinsic rewards on intrinsic motivation, we measured the brain activity by using functional magnetic resonance imaging while participants (N=28) were performing an intrinsically interesting task. In the task, the participants were presented with a stop-watch that started automatically and the goal was to press a button with the right thumb so that the button press fell within 50 ms of the 5-s time point. A point was added to their score when they succeed. Behavioral results showed that intrinsic motivation was indeed undermined after the participants obtained a performance-based monetary reward. Along with the behavioral effect, the activity in the anterior striatum and midbrain during the success feedback dramatically decreased between two sessions before and after the monetary reward. Furthermore, the activity in the lateral prefrontal cortex during the preparation of the upcoming stop-watch task showed the same pattern. These results suggest that the cortico-basal ganglia valuation system underlies the undermining effect through the integration of extrinsic reward value and intrinsic task value.

P2-3: Agency and self-consciousness under cognitive load

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The sense of agency describes the feeling of being the author of one's actions. Research on agency has focused on discrete, goal-directed movements of the upper limbs. However, agents often perform continuous, highly automated movements that involve the entire body such as walking, cycling, and swimming. These latter actions require full-body representations and these have recently been argued to form a fundamental aspect of self-consciousness (Kannape et al, 2010). While locomotion is adversely affected by cognitive loading, no data exist on its effects on the sense of agency – an issue we address here by investigating full body agency under cognitive load. In the current study we investigated how gait agency is modulated by temporal mismatches during a non-goal-directed, continuous walking paradigm. Participants judged the movements of a virtual body which displayed their own movement in real-time (75ms delay) or randomly delayed (up to 1350ms), while walking on a treadmill. In a second block, participants repeated the task with an additional cognitive load – articulated backwards counting. Our results demonstrate that participants perceived movements as self-generated when delayed by up to 200ms and up to 350ms under cognitive load. They also experienced agency for movements delayed by a full step-cycle (~1200ms delay) and unconsciously changed their gait depending on the delay of the feedback. A crucial finding was that this automatic motor behaviour was suppressed by cognitive loading across all delays while agency was only affected in trials with strong temporal conflicts suggesting specific influences of cognition on the sense of agency.

P2-4: The emotion effect on facial emotion recognition

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Foa, Gilboa-Schechtman, Amir, and Freshman (2000) found that happy expressions were better remembered than angry ones, and emotional expressions (angry, happy, disgust) were better recognized than neutral ones. A cross-cultural study, Shioiri, Someya, Helmeste, & Tang (1999), documented that Japanese faces of contempt expression were better recognized than American faces for Japanese participants. Brody (1985) examined the gender difference and mentioned that female participants demonstrated superior recognition performance at judging negative emotions. Taken together, we proposed that the recognition performance was the follows: happy > contempt > angry > neutral and female observers had better recognition in negative expressions than male observers did. Sixty undergraduate students were recruited to join our studies. For each trial, they were informed to pay attention to 16 pictures randomly displayed on the screen one by one, four pictures for each expression (neutral, happy, angry and contempt), and then required to do the emotion recognition test to select the previous displayed emotion for the neutral target faces (the pictures are the same models, but with neutral emotion). Our results showed that neutral expressions were better recognized than happy ones, but not significant, and neutral and happy expressions were significantly better recognized than contempt and angry ones. Contempt and angry expressions were not differently recognized. The aforementioned results replicated the happy face advantage effect in our emotion recognition task. As for the gender effect, female participants significantly better recognized angry expression than male ones. This confirmed that female observers could better recognize negative expressions than male ones did.

P2-5: Avoidance of attentional blink in grapheme-color synesthesia

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Grapheme-color synesthesia is a condition in which particular digits or letters induce particular color sensations. There is debate regarding the level of processing required for stimuli to induce grapheme-color synesthesia: prior to attention or subsequent to attention. Previous studies dealing with the temporal allocation of attention indicate synesthetes showed attentional blink (AB), which is thought to reflect a limit in the temporal allocation of attention. Thus, those previous studies suggest attention is necessary for inducing letters to evoke colors in synesthesia. In contrast, here we indicated a grapheme-color synesthete showed no AB by a case study. Before starting experiments, we ensured whether the synesthete had an experience of synesthesia by the grapheme-color consistency test. The synesthete's score sufficiently exceeded the criterion of synesthesia. In experiment 1, we conducted a rapid serial visual presentation (RSVP) task with alphabets that evoking grapheme-color synesthesia. We observed no AB in the synesthete's data whereas nonsynesthetic controls showed strong AB. In experiment 2, we manipulated graphemes not inducing synesthetic colors to test whether the synesthete's data in experiment 1 was due to an experience of grapheme-color synesthesia. In results, attentional blink occurred for both the synesthete and nonsynesthetic controls. These results indicate that synesthetic colors arise during a time period in which temporal allocation of attention is interfered with processing of the first target, and help the processing of the second target by an experience of synesthetic colors. Therefore, our findings suggest attention is not essential for inducing letters to elicit colors in synesthesia.

P2-6: Contributions of configural information to the synchronization in the binocular rivalry change timing

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When different images are presented to the two eyes, each image is alternately changed. This is known as binocular rivalry. When two distinct rivalry stimuli were presented in the upper and lower visual fields of the same eye while other two conflicting stimuli were presented in the opposite eye, the binocular rivalry change timing were synchronized if these two stimuli were identical images (Quinn, H., & Arnold, D. H. (2010). Binocular rivalry and multi-stable perception: Independence and monocular channels, *Journal of vision*, 10, 1-9.). We explored the generality of this phenomenon by presenting slightly different pairs of stimuli, one of which were either transformed to the left-right reversing, brightness reversing, figure-ground reversing, or rotated shape of the original image. The results showed that the perceptual change timing of the left-right reversal or brightness reversal pairs of stimuli in the same eye were synchronized, but not for the figure-ground reversal or rotated pairs. These results suggest that the binocular rivalry is sensitive to the sameness of shape orientation and figure-ground relationship but not to the particular features of the image in the monocular channel.

P2-7: Do non-human animals have episodic memory?

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Do non-human animals have episodic memory? Yes, I hold that they have episodic memory. Endel Tulving is the first psychologist, cognitive neuroscientist, to coin the term episodic memory and refer to the concept of memory systems and he suggests that different systems deal with different kinds of information. Tulving described that the semantic memory is a kind of declarative memory for facts about the world. On the other hand, the episodic memory is a unique extension of semantic memory, which is stored by personal experiences that happened to me where and when. The semantic memory is fundamental and it develops earlier than the episodic memory. The information of episodic memory concerns the self's experiences in a subjective space and time. Thus claims Tulving that only human can have the episodic memory. Using Tulving's original definition of episodic memory, Clayton and Dickinson hold further that animals are also able to remember about what-where-when. They referred this ability as episodic-like memory to describe an indefinite form of remembering is attended by conscious recollection. According to Clayton's studies, Western scrub-jays can store different kinds of food in different places, and timely retrieve the food before it goes bad. These strong evidences revealed that Western scrub-jays seem to have memories about not only facts of the world but temporal-spatial experiences as self's experiences. Thus, Tulving's claim seems to have exceptions, that some species could have episodic memory. However, Tulving can insist that the scrub-jay's memory is still semantic memory, which is still a relation about facts of events in the world. Clayton's evidence does not work to support animals to have episodic memory. In this article, I will argue that neither Tulving's claim nor Clayton's claim is correct. There have been many psychological experiments showed us that the knowledge of infants is always about themselves and guides their action. In this view, infants seem to have only episodic memories. Accordingly, the semantic memory is not necessarily a foundation of the episodic memory, and the animals, just like human infants, could have and only have the episodic memory.

P2-8: Is there a nonconceptual point of view?

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Bermudez claims that there is a nonconceptual point of view, but I don't think so. The notion of a nonconceptual point of view is registration of the distinction between experience and what is experienced. Bermudez recommend the term in his book, "The paradox of Self-Consciousness." He claims that the nonconceptual point of view is constituted of the recognitional abilities and the spatial awareness. The recognitional abilities are the abilities involving conscious memory to recognize places. The capability of recognizing place need to presuppose the navigational capacities that let creature navigates from one place to another. The navigational capacities require creature to think about places independently of the features located at those places. Hence, creatures navigate their way through the world by recognizing places rather than by recognizing objects. However, the idea that the spatial relation is determined by the objects is generally accepted. Hence, recognizing places without recognizing objects is impossible. Therefore, the nonconceptual point of view that consists of the navigational capacities can hardly exist. Bermudez claims that creature recognize place before object because he thinks object recognizing involve the possession of concepts of objects, and holding the view that concepts are linguistic. Since he needs a nonlinguistic content to solve the paradox of self-consciousness, he has to argue that there is a nonconceptual point of view. I will argue against the view that concepts are linguistic here. If conceptual abilities don't presuppose linguistic capacities, then we don't need to require the impossible nonconceptual point of view.

P2-9: Consciousness and the contentious hedonist

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The popular discourse of rights over the body has remained primarily judicial rather than medical, and the conception of the body- primarily theoretical. Neuroscience has since confronted what were the previous conception's primarily essentialist terms, 'rationality', 'autonomy', 'harm' and 'pleasure', inciting substantial controversy to the justification of public ethics and care. The neurological study of consciousness has become key to comprehending the motivations and reasoning of the individual, and consequentially the extent of the right to self-regarding actions. This paper is centred upon ethics and the body when confronted by objective studies into consciousness, harm and pleasure, illuminated by the contemporary debates in drug policy according to these key terms. Drug policy negotiations are among the most compelling examples of the current crisis in the public recognition of evolving concepts of health and consciousness amid the induction of neuroscience. In this example, contemporary neuroscience is in negotiation with the predominant depiction of drug use as being necessarily irrational, unconscious (compulsive, non-autonomous) and disassociated from a recognized conception of pleasure (replaced instead with 'affect' or fulfilment of 'need'), in fidelity to a prudent, normative view of the

body that values reason, risk-management and self-control. Neuroscience has since re-introduced the user as a consenting, rational and conscious actor in pursuit of pleasure. This paper describes the ethical controversy in comprehending conscious choice among previously contentious, unreasonable actions via the neurological rationalisation of the drug user and her motivations, conclusively anticipating the necessary re-evaluation of orthodox conceptions of health and healthy cognition.

P2-10: Accomodating abstractness across the perceptual/conceptual divide

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With the borderline between perceptual and conceptual content systematically blurred and the gap between them bridged by attempts to either show that perceptions require conceptual frames or that all concepts are of perceptual origin, the familiar distinction no longer serves to account for the various levels of generality and abstractness of mental representations. How to introduce those remains a conundrum on both empiricist (Concept Pragmatism or even Concept Empiricism – cf. Barsalou, Prinz, Landy, Goldstone) and nativist (Concept Referentialism, Atomism – cf. Fodor) stances which seem to be equally ill-equipped for the task of accommodating abstract notions. An insufficient account of abstracta is the main charge against extreme-end empiricists who endorse a view of perception-based concepts. This being so, it is striking how disregarded abstract concepts prove to be on the opposing nativist view to the effect that there is a set of basic atomistic concepts. If some primitive notions are independent of each other in terms of their meaning, ranking them with respect to their generality or abstractness misses the point. I will proceed by comparing the two rival views and demonstrating their commonalities in the treatment of generality and abstractness, focusing on the theories of Fodor's and Barsalou and Prinz's. I shall I will then go on to show the significance of incorporating an account of generality and abstractness into the theory of mental representations and indicate a direction I think promises to offer a solution. Literature: [1] Fodor J.A., *LOT 2: The Language of Thought Revisited*, Oxford, England: Oxford University Press, 2008. [2] Prinz J.J., *Furnishing the Mind: Concepts and Their Perceptual Basis*, Massachusetts Institute of Technology Press, 2004. [3] Goldstone, R., Barsalou, L.W., *Reuniting perception and conception*, *Cognition* 65, 1998, pp. 231-262.

P2-11: Imitation and visual perspective of the model: Interactive effects of view and congruence of the body facilitate imitation

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Previous studies have demonstrated that imitation of action is easier when the model to imitate is similar to the imitator from a visuospatial perspective. To clarify what determines visuospatial similarity, the present study investigated the effect of the view (1st-person view or 3rd-person view) and congruency of the body (anatomically congruent or different, i.e., shown as if looking in a mirror) on the time taken to initiate the imitation. Five right-handed individuals observed a set of video clips of a simple hand movement, namely, lifting of the index, middle, or ring finger from a resting position on a computer keyboard. The participants were requested to lift the same finger as that lifted in the stimulus as quickly as possible. A two-way ANOVA showed a significant interaction between the two factors: the time taken to initiate lifting the same finger was significantly shorter for the 1st-person-congruent condition than the other three conditions, whereas the time was significantly longer for the 3rd-person-congruent condition than for the other three conditions. In addition, the time was significantly shorter for 3rd-person-mirror condition than for 1st-person-mirror condition. These findings suggest that the interaction between the view and the congruence of the body determines the visuospatial similarity between the model and the imitator. It is likely that compatibility of the alignment of the fingers, but not the congruency of the body, between the model and the imitator strongly determines the ease of imitation.

P2-12: Body language: measuring lateralized electromyographic response in the Implicit Association Test

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The idea that behaviour can be automatic and driven by unconscious determinants has become so widespread in social psychology that it is even not questioned anymore. There is a difficulty with this view, however: If an unconscious prime can so readily trigger a specific behaviour, should we not be constantly be tossed around by the countless messages we are bombarded with everyday? Conceptually, there are two possible ways of overcoming this difficulty. The first paints an “active view” of automaticity, and suggests that one has the ability to consciously inhibit or change a primed behaviour as long as one’s attention is focused upon it. The second, “passive view”, suggests that the relationship between the prime and the behaviour is unconsciously modulated by internal dispositions such as implicit attitudes. To contrast these two views, we conducted a series of experiments

in which participants performed the well-known Implicit Association Test (IAT). While overt responses in an IAT are taken to reflect implicit attitudes, it is impossible to distinguish between behaviour in which a response was initiated and later inhibited and behaviour in which a cognitive decision was made and settled before engaging the motor system. Concurrently with overt responses, we thus also recorded the lateralized electromyographic signal through electrodes placed on the hand, known in this case to be pre-behavioural and non-intentionally changeable. This made it possible to assess the role that both implicit and explicit attitudes play in modulating cognitive control on automatic behaviour. Results will be presented at the meeting.

P2-13: Choice blindness in the attractiveness of paintings

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“Choice blindness” refers to a person's failure to detect a mismatch between one's intentions and the outcome of one's choices in a decision task, without their notice. In previous studies, Johanson and his colleagues (2005; 2010) showed participants pictures of various pairs of stimuli including pairs of patterns, female and faces, or tasted jams and teas. Participants were asked to judge which member of a given pair was more attractive. On some trials, the experimenter switched the outcome of the participant's choices such that the outcome was the opposite the participant's intended choice. It turns out that participants failed notice the mismatches between their intended choices and presented outcomes. Moreover, they reported introspective reasons for the choices they had made for the manipulated pictures that they did not choose. In this study, we followed this phenomenon using pairs of the Western paintings in order to introduce more declarative reasoning why they had chosen the painting. One goal of this study involves an analysis of what the participants actually say. The aim is to discover the extent to which they provide reasons for preferring their original choice or to the manipulated outcome.

P2-14: Differential factors for time retrospection and time production

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In order to explore the factors that influence time production and time retrospection, we inserted a 15-min dummy experiment during a 3-hour session that contained various unrelated psychological experiments. One group performed an oddball detection task. The other group performed a memory task concurrently with the oddball task. Before and after the dummy task, the participants performed a 10-s time production task. They also retrospectively estimated the elapsed time for the dummy task. The produced time lengthened after the dummy task in the single-task group (415 ms longer on average) whereas it did not change in the dual-task group. The retrospective time estimation largely varied among individuals from 5 to 25 min, but did not differ between the groups. Then, we divided the participants into two groups based on whether the dummy task was performed in the first half of 3-hour session or in the second half. The retrospective time estimation was shorter in the former (9.4 min) than the latter group (15.7 min), while the time production did not differ. These results imply that the separable factors influence time production and time retrospection. The process relevant to time production might be events in the temporal vicinity, while the internal state (e.g., motivation, fatigue, and circadian rhythm) would influence the retrospective time.

P2-15: Validation studies of the Consciousness Quotient Inventory (CQI)

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This study reports the validation assessment of the Consciousness Quotient Inventory- CQI (Brazdau, 2008). The CQI is composed of six dimensions of the conscious experience, which form the Consciousness Quotient (CQ): physical, emotional, mental (cognitive), spiritual, social-relational and self-consciousness. This research is the first part of an extensive validation process of the CQI. In this stage, four studies to measure the concurrent validity were developed, using other validated assessment instruments, which measure different psychological constructs. The following validation criteria were used: General Mental Ability (GMA) measured with the General Ability Measure for Adults (GAMA); Emotional Intelligence, measured with the Emotional Quotient Inventory - EQ-I. The CQI relation with personality traits was measured using two different personality questionnaires, in order to cover various areas of personality: California Psychological Inventory (CPI) and NEO Personality Inventory, Revised (NEO PI-R). The participants (N=120) were randomly assigned, aged between 19 and 65 years. The data was analyzed, calculating the correlation and regression coefficient. The results show that consciousness

can predict a significant part of the criteria variance and it is concluded that the CQI may serve as a useful measure in psychological assessment.

P2-16: Development of face perception in infant rhesus macaques

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Previous studies have shown that non-human primates also employ configural processing for face perception as we humans do. However, little is known about how such perception develops in nonhumans compared to that in human. To understand primate origin of human cognitive ability, comparative approach to the cognitive development is necessary. In this study, using habituation-dishabituation paradigm, we demonstrated that infant Japanese macaques experience Thatcher illusion both in human faces as well as in conspecifics' faces. Combined with the previous study which demonstrated adult rhesus macaques do so only in conspecifics' faces, but not in human faces, the current study suggests that the configural processing of faces develops first and then their perceptual system would be more specialized for processing conspecifics' faces through the perceptual narrowing. This developmental course of perceptual system for faces in rhesus macaques are very similar to that found in humans. Our findings indicates that perceptual mechanisms for individual recognition have been conserved through primate cognitive evolution.

P2-17: Seeing without knowing: qualia are present during inattention blindness

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Qualia are considered to be the hallmark of conscious sensations. When we perceive the color red for example, visual processing has progressed from registering light with a wavelength of 650nm towards perceiving a quale. Similarly, visual illusions are useful to investigate whether a visual stimulus has progressed from a mere sensory representation to a conscious percept. Currently, there is much controversy whether conscious percepts are present when people cannot report or access visual information. To investigate this, we presented people illusory Kanizsa figures during an attentionally demanding task while measuring fMRI. When asked about the figures afterwards, 30 % of the participants were not able to report which figure was shown. We investigated whether the neural correlates of the Kanizsa illusion were present for the participants that did not report the illusion. The illusory figure was contrasted with the same inducers turned outward, and with inducers that could be bound to form the same geometrical figure, but that did not have the perceptual quality present in the illusion. Comparing these conditions, only the Kanizsa illusion produced a pronounced pattern of activation in early visual areas. Importantly, this pattern of activation was independent of whether participants correctly identified the illusion or not. It thus seems that the Kanizsa illusion added a perceptual quality to the image even when people were not able to report about it. This suggests that reportability is not a necessary condition for conscious percepts to occur.

P2-18: Dimensions of metacontrast

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Metacontrast masking is a powerful visual illusion by which the visibility of a brief stimulus (the target) is drastically reduced when it is followed by a surrounding second stimulus (the mask), presented shortly thereafter. While the critical parameter of metacontrast, the Stimulus Onset Asynchrony (SOA), varies along the single dimension of time, it creates a host of very rich perceptual phenomena. In the present study I sought to map the subjective perceptual space of metacontrast percepts. While most extant studies of metacontrast use behavioral performances or predefined scales to measure the impact of the mask, I used multidimensional methods in order to reveal the subjective dimensions along which metacontrast percepts vary. I asked participants to rate the subjective similarity of target / mask pairs, while SOAs were systematically varied, and submitted the resultant similarity matrices to Multidimensional Scaling. I also collected traditional measures of metacontrast, so as to facilitate the interpretation of scaling results. This new approach reveals that the perceptual space in metacontrast is essentially two dimensional, with one dimension mirroring the overall visibility of the target, while the second captures the impression of movement that the target – mask pair elicits. Overall, these results are consistent with our extant knowledge of the mechanisms of metacontrast. Still, I suggest that closer attention to the subjective side of metacontrast could yield finer grained response scales and might benefit to the sensitivity of our measures of visual awareness.

P2-19: Representational Primitives in Perceptual Experience

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It is often argued that phenomenal experiences that accompany perceptual constancy are difficult to interpret representationally because they introduce an apparent gap between how things look and how they look to be. For example, a wall half in shadow looks to be completely white, though one part looks different (darker, in some sense) than the other. Straight forward representational approaches to phenomenal experience have been unsuccessful in giving a convincing account of this. David Hilbert has recently suggested that if we suppose that illumination is a dimension of colour (alongside hue, brightness and saturation) the apparent gap disappears: part of the wall looks to be different in the amount of illumination it is receiving. I argue that Hilbert's approach fails, partly because it does not generalise to the other perceptual constancies. I offer a approach similar to Hilbert's which, I argue, does generalise.

P2-20: Exploring the texture of communication: The transparency of consciousness that links grammar and lexicon

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Two major components of language are grammar and lexicon. However, a link between the two has not been studied in depth. Our working hypothesis is consciousness mediates grammar and lexicon; this is because lexical items are processed consciously while grammatical items are not. For the purpose of this study a communication game between two subjects was designed to see how the grammar/lexicon division is organized temporally. Twenty subjects were asked to communicate using an artificial language, where the expressions were the spatial pattern of the triplet in a 3-by-3 bit square. They were allowed to rewrite the pattern alternatively. Then, we asked them to report their intentions behind the sent messages, and their interpretations of the received messages. The pattern of symbol arrays was analyzed mathematically, and the reports linguistically. We found that when the proximity between successive patterns became smaller, subjects tended to report using metaphors. The subjects enjoyed processing patterns and trying to assign meanings to it. In a report the former shows up as literal description and the latter metaphorical. We regard the latter form-meaning linking as a generation of a lexicon which facilitates subjects to convey messages more consciously. In contrast, in the former process, subjects explored the texture of 3x3 bits until they became so familiar with the game itself that it became consciously transparent. We regard this as an emergence of proto-grammar since speakers unconsciously express individual perspectives using grammar. In brief, consciousness working behind communication can be analyzed by observing temporal pattern changes.

P2-21: Differential BOLD activity associated with subjective and objective reports during "blindsight" in normal observers

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The study of conscious visual perception necessitates some means of report. Report can either be subjective, i.e., an introspective self-report of conscious experience, or objective, e.g., a forced-choice discrimination regarding different stimulus states. However, the link between report type and fMRI-BOLD signals remains elusive. Here we used continuous flash suppression (CFS) to render target images invisible, and observed a striking dissociation between subjective report of visibility and subjects' forced-choice localization of targets ("blindsight"). Our results show a robust visibility effect in high-order visual areas even under equal objective performance. No significant BOLD difference was found between correct and incorrect trials in these areas when subjective report was constant. Objective performance was linked to the accuracy of a multivariate pattern classifier in early visual and object-related lateral occipital cortex. Our data support the notion that subjective and objective reports tap cortical signals of different location and amplitude within the visual cortex.

P2-22: Higher-order motion information increases perceived duration

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Previous studies have shown that visual motion increases perceived duration: the duration of moving or faster stimuli is perceived to be longer than that of stationary or slower ones. However, it is still unclear that which processing stages of motion information are involved in this duration distortion. In the present study, we used moving plaid stimuli and examined the effect of lower- and higher-order motion information on perceived

duration. Plaid stimuli are composed of two superimposed drifting sine-wave gratings with different orientations. These plaid patterns appear to drift coherently in a single direction as pattern motion. While component gratings of plaid stimuli are processed in early stages, their pattern motions are processed in higher stages of motion processing. Therefore, if pattern motion speed (or component speed) of plaid stimuli increases perceived duration, it can be considered that higher-order (or lower-order) motion information is critical for duration distortion. We manipulated the pattern motion speed of plaids in two ways: (1) by changing the speed of component gratings, and (2) by changing the orientation of component gratings. The combination of these manipulations made us possible to manipulate the plaids' component and pattern motion speed independently. The results of our three experiments revealed that perceived duration of plaids increases with the pattern motion speed regardless of the component speed. We suggest that higher-order motion information plays an important role in duration distortion caused by visual motion.

P2-23: Development of Contextual Inference about the Ambiguous Referent in Other's Utterance: Experimental comparison between 3- and 5-year-old children

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We systematically examined how children fix the referent (in name/color dichotomy) of the adult's utterance under the ambiguous context. Three- and 5-year-old Japanese children were individually tested in a task including 4 trials; a trial consisted of 5 events in which the participant was shown 5 color illustrations in the predetermined sequence. In each trial, on being shown the illustration, the participant was asked as follow; "What's the name of this?"/"What's the color of this?"(Explicit Question1), "How about this?"(Implicit Question1), "What's the color of this?"/"What's the name of this?"(EQ2), "How about this?"(IQ2), and "How about this?"(IQ3), for 1st,2nd,3rd,4th,and 5th.event, respectively. The explicit dimension of the question (name/color) was changed between 1st. and 3rd. events. Adult participants in our preliminary experiments answered to the IQ with the dimension that reflected the adjacent EQ. However, not small number of children answered in different ways from the adults. Specifically, in both 3- and 5-year old groups, participants were classified into 2 (High/Low "accuracy") groups, each of which showed different tendencies: the results showed significant interaction between age (3/5 yrs) and group (H/L). Further analysis suggested that, while the different performances in EQ2 between H and L groups could be explained by different abilities of the cognitive shift, the performance in IQ 2 by 3-H group did not fit this explanation. The findings suggested that other factors than the ability of cognitive shift, such as reference assignment, should be considered in approaching the developmental changes in strategies of the contextual inference.

P2-24: Crossmodal constraints on human visual awareness: Can auditory semantic context modulate binocular rivalry?

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We report a study designed to investigate whether auditory semantic context modulates visual awareness by utilizing the binocular rivalry paradigm. Binocular rivalry refers to the phenomenon whereby when two different figures are presented to each eye, observers perceive each figure as being dominant in alternation over time. The results revealed that participants reported a particular percept as being dominant for less of the time when listening to an auditory soundtrack which was semantically congruent to the competing percept, as compared to when listening to an auditory soundtrack that was irrelevant to both visual figures. When the participants simply maintained the corresponding name of the soundtrack in memory, no such semantic effect was observed. We then further demonstrate that the crossmodal modulation of binocular rivalry by auditory semantic context can be dissociated from two visual factors: participants' attentional control over the dichoptic figures and the relative luminance contrast between the figures. In sum, the crossmodal semantic effect reported here cannot simply be attributed to the meaning of the soundtrack guiding participants' attention or biasing their behavioural responses. Instead, the auditory semantic cues themselves can enhance the likelihood that any semantically-congruent stimulus (or reduce the likelihood that the semantically-incongruent stimulus) wins the competition for awareness in the binocular rivalry situation. We suggest that auditory semantic congruency can serve as a constraint on resolving perceptual ambiguity in the visual system; and, in turn, that audiovisual stimulation provides a novel means of probing the contextual constraints on visual awareness in humans.

P2-25: Self-consistent learning of the environment

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Perception of the environment is a basic ability of a biological system to understand its environment and take appropriate actions. Understanding who we are is also strongly related with our image reflected in the environment and the self-consistent world image created from the sensory signals. Since the sensory information channels have finite reliability, the features of the environment should be estimated from the noisy sensory signals, where the Bayesian estimation uses knowledge on the a priori distribution of the environmental features. We study two problems : how the estimation error depends on the a priori distribution of the features and how the distribution is learned self-consistently. Many different features of the environment are usually highly correlated and the estimation error greatly depends on the correlations. Self-consistent learning process renews the prior distribution of correlated features jointly with the estimation of the environment. Here, Maximum A posteriori Estimation (MAE) decreases the effective dimension of the feature vector. There are finite critical noise levels in the self-consistent learning with MAE, which cause hysteresis behaviors of learning. The self-consistent learning process with stochastic Bayesian estimation (SBE) makes the presumed distribution of environmental features converge to the true one for any level of channel noise. But the SBE is less accurate than MAE. We also study another stochastic estimation method, SBE2 with smaller estimation error than SBE without hysteresis phenomena.

P2-26: Introspection: a little bit more than mere confabulation

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On the default view, introspection is taken to be a direct, non-inferential, quasi-perceptual process the result of which is a self-ascription of mental states. According to deflationary positions (Carruthers 2009, Gopnik 1993, Dretske 1981) the target state is inferred or confabulated on the basis of external, publically negotiated criteria. We defend an intermediate position according to which self-ascription is the result of an indirect process by which the target state is inferred from internal effects, e.g. upon actions plans, decision-making and expectations concerning sensory input. An important consequence of this view is that introspection is not generally necessary for mental states to have their typical causal effects upon the selection and planning of actions and upon decision-making. Rather, the production of these effects is generally a necessary prerequisite to introspection. But introspection is not merely epiphenomenal, since it generates representations which enhance the cognitive system's ability to carry out actions and to form and revise expectations. Our position is deflationary in that the target state is inferred rather than being directly accessed; on the other hand it is like the default view in that the criteria for self-ascription are privately negotiated. As we will demonstrate, our position has the virtue of being consistent with evidence commonly marshaled in defense of deflationary positions (Persaud 2007; Nisbett & Wilson, 1977; Gazzaniga, 2000, Wilson & Schooler 1991) while at the same time doing justice to the intuition of privileged access motivating the default view.

P2-27: Neural correlates of implicit memory and subjective feeling of familiarity

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Priming refers to the change in speed, accuracy or bias in processing a stimulus without conscious awareness of prior exposures to the same stimulus. Priming is thought to be a form of implicit memory and dissociable from explicit memory, such as "familiarity" - a component contributing to explicit recognition memory. Familiarity reflects the strength of memory or the confidence level of participant's subjective feeling. So if priming and familiarity are dissociable, they should show different neural signatures. However, recent neuroimaging studies have found similar repetition suppression (RS) phenomenon accompanied with both priming and familiarity. RS refers to the reduction of neural activity in several cortical regions, often associated with repeated (primed) or familiar stimuli, compared to novel stimuli. Whether the brain regions showing RS associated with priming and familiarity are distinguishable is still controversial, because they were often studied in different experiments or behavioral paradigms. Some cognitive theories did propose that priming and familiarity share the same basis. Therefore, the main goal of the present study is to design a well-controlled fMRI experiment to compare the neural responses to priming and familiarity, to see whether RS can be found in fusiform gyri and perirhinal cortex, respectively, for example. Twenty-five participants performed four different priming tasks and one recognition task with closely-controlled black/white silhouette visual stimuli. Both commonalities and differences were found for priming and recognition tasks, depending on the cognitive operations involved. The implication to the relationship between implicit and explicit memory and how they work are discussed.

P2-28: Retino-tectal pathway is essential for visually guided saccades after V1 lesion: an implication for neural network of ‘blindsight’

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After the damage to the primary visual cortex (V1), patients lose visual awareness. However, some patients retain the ability to localize visual stimuli presented in their scotoma by saccade and/or manual response. This unconscious vision is called ‘blindsight’. It has been proposed that the direct input from retina to the superior colliculus (SC), namely the retino-tectal pathway, contributes to blindsight, but the direct evidence is still sparse. Here we examined this possibility using monkeys as an animal model of blindsight. First, we confirmed that the monkeys with unilateral V1 lesions were able to localize visual stimuli in the visual field contralateral to the lesion by saccade. Then we reversibly inactivated the SC of those monkeys by microinjection of GABA antagonist muscimol to test the role of the SC in blindsight. When the muscimol was injected in the contralateral SC to the V1 lesion, corresponding to a ‘normal’ field, it resulted in relatively minor deficits, such as elongation of saccadic reaction time. However, when the muscimol was injected in the ipsilesional SC, corresponding to their scotoma, the monkeys became unable to localize the target in their scotoma. This effect cannot be explained by motor deficits as they were still able to make spontaneous saccade to their scotoma after inactivation. These results indicate that the SC plays an essential role in residual vision after V1 lesion, and further suggest that the retino-tectal pathway is involved in mediating unconscious vision in blindsight patient.

P2-29: Conscious perception affects unconscious perception with the deployment of attention

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We have shown that conscious perception and unconscious perception are independent of each other under inattentive blindness (Lo & Yeh, 2011, *Consciousness and Cognition*). Here we demonstrate that they can be interactive with the deployment of attention. We used the continuous flash suppression paradigm to dissociate consciousness and attention, so that participants could pay full attention to the “invisible” stimulus when it was suppressed by dynamic Mondrian patches shown in the other eye. A suprathreshold beep was either presented at the same location as the visual stimuli or at a different location. Participants were required to detect any parts of the visual stimulus, and the difference in the time of release from suppression was used as an index of interaction between conscious and unconscious perception. We found a shorter detection time when the visual event was accompanied with the sound than when alone, and this occurred only when the visual-auditory stimuli were spatially congruent. This result implies that attention plays a critical role for interaction of conscious and unconscious perception and this is based on proximal functional space between implicit and explicit processing. This research is supported by National Science Council of Taiwan (NSC 96-2413-H-002-009-MY3 and NSC 98-2410-H-002-023-MY3).

P2-30: Self-consciousness and Indexicals: talking about the world without a “self”

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Is consciousness related to linguistic abilities and to the mastering of indexical terms (words such as “I”, “you”, “tomorrow”, “this”, “that”, etc.) in particular? Typically, the philosophers of language, who think that sentence analysis can shed light on the metaphysics of conscious mental states, focus on the first-person pronoun only. I expand the terms of the debate by analyzing indexical terms other than “I”. Besides the self-reference entailed by the usage of the first-person pronoun, I’ll argue, another kind of indexical reference should be investigated, namely the referential mechanism involved in the identification of objects in one’s experienced world by means of terms such as “this”, “that”, and the like. Hence, I distinguish between a first-person self-reference displayed in the uses of “I”, and an “egoless” reference at work in the uses of any other indexical term. These data support a view that I call “Minimal Phenomenological Account of Consciousness”: a two-level theory of consciousness constituted by the “egoless-consciousness”, which is ubiquitous, implicit, and unreflective, and the “egoic-consciousness” of an ephemeral, reflective, and explicit nature. The presented indexical data account for a phenomenological approach to consciousness and allow for the following conclusions: i) first-person self-reference is irreducible to egoless reference; ii) the characteristics of the egoless-consciousness are displayed in the mechanisms of egoless referential mechanisms, and are always present in the subjects’ experience; iii) the characteristics of the egoic-consciousness are displayed in the first-person self-referential mechanisms alone.

P2-31: Implicit modulation of visual detection of facial expression

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Emotional visual images, such as facial and bodily expressions or evolutionally determined threats (e.g., spiders and snakes), cause behavioral, psychophysical and neurophysiological responses even when the images fail to reach visual awareness. In the present study, we examined whether the emotional visual images that were suppressed in binocular rivalry could influence the subsequent visual detection of facial expressions. Observers performed a go/nogo detection task wherein they were required to press a button as rapidly as possible after detecting the face that expressed the target emotion (happy or anger). We also presented a task-irrelevant prime face (happy, anger, or absent) shortly before and in the opposite visual hemi-field of the target face. The prime face was suppressed using the continuous flash suppression technique. The correct detection rates were nearly 100% irrespective of the types of prime faces. However, the reaction time was significantly slower when the facial expressions of the prime and target were incongruent and when the prime face expressed anger, compared to when the prime face was absent. Another control experiment confirmed that the observers barely noticed the facial expression of prime faces. Taken together, these results suggest that emotional faces, even when they were not explicitly perceived, implicitly affect the subsequent visual detection of the facial expression, and that the implicit effect might depend on the type of the expressed emotion.

P2-32: Cortical areas related to both the self-body parts drawing and the body image: a functional MRI study

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In the clinical rehabilitation, a self-portrait drawing is used as an evaluation for patients' body image after being damaged in the parietal cortex. Thus, the parietal cortex is thought to be involved in both the self-portrait drawing and the body image, however, there was no clear evidence. In order to examine this possibility, the cortical activities were measured while the subjects performed the following three tasks. The drawing task: the subjects imagined a body part or an object instructed in a word slide and drew them. The copy task: the subjects copied the photograph of the body part or the object showed in a slide. The imagination task: the subjects imagined the body part or the object instructed in a word slide. During the drawing and imagination tasks, the subjects were strongly instructed to image their own body parts. In all three tasks, we found that the right inferior parietal lobe became more active in the trials for the body parts compared with those for the objects. Thus, the right inferior parietal lobe may be involved in both the body parts drawing and the self-body image. This result may support the fact that the quality of a self-portrait drawing of the patient reflects the ability of the body image of that patient.

P2-33: Selective face processing in the vegetative state: evidence from fMRI

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Many patients who survive brain insults develop a state of chronically impaired consciousness (either vegetative or minimally conscious state). These states embody dissociation between the two clinical components of consciousness – wakefulness and awareness. Recent functional neuroimaging studies have documented more elaborate brain responses than expected in these clinically unresponsive patients. Notably, almost all previous studies used auditory stimuli. In a first study of its kind, we examined brain responses in vegetative patients to visual stimuli, specifically to human faces. Using functional magnetic resonance imaging (fMRI) we scanned three vegetative patients exposed to pictures of non-familiar faces, familiar faces and themselves. All patients showed response to faces in the fusiform face area, as defined by the healthy brains. In two patients, familiar faces elicited further activation in the middle frontal gyrus and the anterior cingulate cortex as well as in parahippocampal gyrus and the amygdala. One patient also showed selective activation to self portrait in the medial prefrontal cortex, an area involved in self-related processing. Our results demonstrate that at least some vegetative patients retain unexpectedly selective brain responses to salient visual stimuli, such as faces. These responses suggest that some cognitive and emotional functions might stay intact even in severely disordered consciousness, possibly pointing to some awareness in the absence of wakefulness. We believe that despite multiple logistic and procedural obstacles involved, studying residual cognitive function in vegetative patients

may not only greatly affect their management but also advance our scientific understanding of the clinical mechanisms and components of consciousness.

P2-34: Studying mind time structure with a video feedback machine

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How can Newtonian time be reconfigured or recast for the mind? This work explores the subjective experience of time, called here 'mind time' or Bergsonian time. Principles investigated by EStetson et al. (2007) are here framed positively for developing a machine visual system where mind time is interpreted as processing frame rate. The rationale is that attention to something involves more precise perception, thus the frame rate increases, whereas frame rate decreases during moments of low information. Although such a fact was not confirmed in Eagleman's experiment, we believe this process to be one of the few mechanisms required for understanding how the mind structures time. Our purpose is to construct a fully realised machine that autonomously changes its own time structure using a video network. Extending the design of the Mind Time Machine project (Ikegami 2010), our system firstly consists of a video camera and projector aimed at the same region. Video feedback is used for consolidating system memories and constructing a subjective time scale. Images are processed using a chaotic fully connected neural network with Hopfield structure and synaptic connections modified by Hebbian dynamics. Based on the system's memories, a change in frame-rate occurs if the network needs restructuring through gross changes in its weights. The network controls locally coupled per-pixel frame rates across the visual field. Neighboring pixels can have similar frame rates, so that clustering frame rate patterns can form. Subsequently, higher frame rates can be associated with salient image regions, determined by the system's memories. References: Stetson C, Fiesta MP, Eagleman DM (2007) Does Time Really Slow Down during a Frightening Event? PLoS ONE 2(12): e1295 Ikegami, T Studying a Self-Sustainable System by making a Mind Time Machine, (Keynote at S3 Workshop on Self-sustaining systems) in press (2011).

P2-35: Using complexity measures in consciousness

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A key aspect in the study of consciousness is the identification of quantitative markers that help unveil the neural dynamics of consciousness. Recording physiological data with time-resolved methods, and analyzing the dynamics of the underlying neural processes with appropriate mathematical tools it is of importance both for theory and for medical applications. Here, we present an original quantitative marker, the permutation entropy. This marker can be used to characterize the complexity of the signal and allows us to detect the changes in the underlying dynamical system. We hypothesized that changes detected with this method would correlate with the dynamics of consciousness. The presented analysis can be applied both locally and also to study the interactions and couplings between brain regions. We tested the method in normal controls subjects with a recently designed cognitive paradigm. In this paradigm a series of sounds are presented with two levels of regularity: local (within trial) and global (across trials). Previous evidence indicates that the violations of the local regularities elicits brain activity both in conscious and non-conscious conditions, but the violations of the global regularities are only detected under conscious processing. Using our method we found clear neural fingerprints that differentiates these two states. To conclude, with the presented marker we introduce a conceptually simple and computationally efficient method that allows us to quantify the complexity of the neural signal, featuring it as a promising tool to study the dynamics of consciousness in patients with altered states of consciousness and healthy controls.

P2-36: Rethinking consciousness and communication

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Philosophers tend to accept first-person authority of the "phenomenological mind" (Jackendoff 1987), which is one of the crucial premises for the so-called other's mind question to arise. Claiming that there are no such things as selves, Thomas Metzinger has been arguing against the authority (2003; 2009). We present another strategy to cancel the premise in question. From an ecological point of view, we focus upon the relation between consciousness and communication. The guiding idea is embodiment. This may not sound particularly new. There are many precursors, e.g. Prinz and Clark's (2004) argument against Fodor's rationalism, Clark's Hypothesis of Experience-Based Selection (EBS) and so on. But they seem to miss the fact that animals with social brains

essentially, even in the lab, have readiness to cope with the social environment. Actions of embodied beings are made not only in a complex material world but also in the communication environment. Language communication is corporeal activity. A word has a meaning when it is incorporated into interpersonal interactions such as sexual, nurturing, fighting, cooperative, economic, political interactions. “Language does not arise from input that is processed, but from affordances that are brought forth by active engagement, and which enable further action and interaction” (van Lier 2002: 146). As far as consciousness is concerned, however, Prinz (2009) argues against the radical embodiment theories. We critically evaluate Prinz’s four moderate proposals that take embodiment seriously.

P2-37: Dynamics of evidence accumulation in subliminal and conscious conditions: an EEG/MEG study

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One of the crucial points in the study of consciousness is to understand how sensory evidence from an incoming stimulus is accumulated across time and either crosses the threshold for conscious access (conscious trial) or, on the contrary, remains below threshold (subliminal trial). Investigating this question, Del Cul et al. (Plos Biology, 2007, Brain, 2009) used a masking paradigm in which they varied continuously the target-mask stimulus onset asynchrony (SOA) to demonstrate the existence of a non-linear threshold for access to consciousness. They proposed a dual-route model for conscious versus non-conscious evidence accumulation, according to which subliminal information can be accumulated in specialized processors, whereas conscious information triggers the ignition of higher-level cortical regions and the Global Neuronal Workspace (GNW). Here, we used a similar parametric masking design and a trial-by-trial judgment of visibility and performance, to investigate how different processing stages, from visual integration to response programming, are modulated by available evidence and conscious reportability. We recorded brain activity simultaneously with magneto- (MEG) and encephalography (EEG), to monitor the variations of event-related potentials (ERPs) and fields (ERFs) and their underlying cortical sources as a function of target-mask SOA, separately for trials reported as conscious or subliminal. The results replicate and extend those obtained by Del Cul et al., showing that early processing stages in occipito-temporal regions remain stable in conscious and subliminal conditions but are nevertheless sensitive to evidence accumulation, while only late stages associated with fronto-parietal and motor activations show a non-linear dissociation reflecting conscious access.

P2-38: An extended case study on the phenomenology of spatial-form synaesthesia

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Synaesthesia has many sub-types and shows large inter-individual variation. At the level of phenomenology, our understanding of these subtypes remains rudimentary. We report an extended phenomenological investigation of spatial-form synaesthesia in a single case (BC). We used the ‘Explicitation Interview’ method, which facilitates the reliving of a particular experience by inducing an ‘evocation state’ within which the subject’s attention can be selectively guided by the interviewer (Vermeesch, 1994; Petitmengin, 2006). In a first application to synaesthesia, BC was guided to explore phenomenological details of his spatial-form synaesthesia. Detailed analysis of the resulting 11 hours of interview transcripts provided a comprehensive description of BC’s synesthetic experience, including several novel observations. The basic phenomenology of BC’s spatial-form involves the appearance of numbers and letters in definite visuo-spatial configurations. Although the appearance of synesthetic concurrents is usually described as automatic, BC reports to engage in various cognitive acts in order for concurrents to be fully visible, suggesting an important role for attention and motor intention. BC’s concurrents also appear within specific contexts of a ‘white page’, in a ‘corridor’ or in a ‘cave’; BC describes a ‘mental room’ in which his percepts are experienced and asserts an ability to voluntarily switch attention between ‘mental’ and ‘physical’ rooms. These descriptions move beyond existing subtype categorisations based on general phenomenology (e.g., projector versus associator synaesthesia), providing new targets for neurobehavioral analysis. Strikingly, some aspects of BCs synaesthesia were previously unknown even to him.

P2-39: The gap effect in great apes

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In humans, the latency for making eye movements to the peripheral event is shorter when the central events disappear shortly (200–400 msec) before the appearance of peripheral events than when central events remain presented. This is called the ‘gap effect’, and this phenomenon is biologically and psychologically interesting because foveal (central) vision is critical in the scanning of visual world. Previous studies reported that the degree

of gap effect differs among various population of humans depending on the developmental and neurological conditions (e.g. autism). Despite the wide interest in this topic, no one has examined the gap effect from comparative evolutionary perspective. To examine the evolutionary background of this phenomenon, it is important to compare between the closely related species which have various socio-ecological backgrounds. In this study, we compared the degree of gap effect in four great ape species, chimpanzees (n = 16), orangutans (n = 10), and gorillas (n = 4), and humans (n = 58). We used non-invasive infrared eye-tracking system (Tobii, 60 Hz) to measure their eye movements. We found that humans showed significantly greater gap effect (3-4 times larger) than did chimpanzees and orangutans. However, interestingly, gorillas showed greater gap effect than chimpanzees and orangutans and did not significantly differ from humans in that respect (however, note the small N). Therefore, the disparity exists among great ape species in terms of visual strategy involving eye-movement timing, and the slow timing for making eye movements is a human characteristic (and perhaps gorilla as well).

P2-40: Anarchic Hand Syndrome and the sense of agency

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In Anarchic Hand Syndrome (AHS), patients claim that actions of the “anarchic hand” are not under their own control. Actions performed by an “anarchic hand” can be complex such as unbuttoning a shirt. From a third-person perspective, such actions appear to be intentional. But the AHS patient claims not to have initiated the action, i.e. they are not intentional actions from the first-person perspective. Despite the fact that AHS patients lack an experience of having initiated such movements, they are aware that it is their own “anarchic hand” performing them. In other words, they are aware of the action but have no experienced ownership of it. This discrepancy gives rise to the hope that AHS can be a window to the neural mechanisms that underlie the sense of agency, i.e. the feeling that one is the agent of one’s own actions. However, AHS is a phenomenon that is found in patients with schizophrenia and patients who have suffered from a traumatic brain injury or a stroke. Thus, AHS seems to express an underlying pathology. It is therefore worth considering if it is meaningful to compare AHS actions to normal actions. We will investigate this question by clarifying the conceptual framework and the underlying assumptions in the current experiments on sense of agency that uses AHS as a paradigm. Thereby providing a better understanding of whether AHS is a good place to search for the neural mechanisms that underlie the sense of agency.

P2-41: Effect of processing fluency on visual one-shot learning

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We tackle various puzzles from sudoku to the mind-brain problem through our daily life. Once a new concept or solution flashes into our mind (crossing the border between unconscious and conscious states), restructuring and understanding of the problem occurs abruptly and by surprise. Such an insight problem solving is characterized by four prominent features: (i) suddenness, (ii) ease, (iii) positive affect, and (iv) truth and confidence (Topolinski & Rober, 2010). These subjective and affective aspects of insight are distilled to the term “Aha” experience (Gick & Lockhart, 1995). Some cases of visual object recognition under uncertainty, such as the famous puzzle pictures of Cow (Dallenbach, 1951) and Dalmatian (Gregory, 1970) meet these conditions of insight. Once the subjects realize in a moment of insight what objects are hidden, there is no going back to the previous state of ignorance (one-shot learning). Neural underpinnings of hidden figure perception have been suggested to be the synchronized neural activities for a few hundred milliseconds in broad networks (Rodriguez, et al., 1999; Grützner, et al., 2010) containing parietal (memory templates) and temporal (3D shape perception) areas (Dolan, et al., 1997; Hegdé, et al., 2010). A fluency account of insight has been proposed to elucidate all its features (Topolinski & Rober, 2010). Here we investigate the effect of processing fluency on visual one-shot learning by using morphing paradigm (Ishikawa & Mogi, 2011) with varied presentation speeds of gradually revealed stimuli. Based on the results, we discuss the nature of “border crossing” in visual one-shot learning.

P2-42: The interaction between embodiment of emotions and emotion discrimination

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Previous studies demonstrated the interaction occurred between embodiment of emotion and emotion judgment (Niedenthal, Brauer, Halberstadt, & Innes-Ker, 2001; Niedenthal, 2007; Wiswede et al., 2009) and the cultural difference existed in processing emotional information (Ashton-James, Maddux, Galinsky, & Chartrand, 2009). This study aims to investigate the embodiment effect on the performance of facial emotion discrimination. By

holding a pen between teeth, between lips, ear and holding a pen between lips along with wrinkling between eyebrows, they separately embodied the emotions of happy, angry, neutral and more angrier conditions. Within these four embodiment conditions of emotions, participants were required to discriminate the emotion of happy, angry and neutral faces displayed on the screen. We expected the congruent/incongruent effect would exist to enhance/impede emotion discrimination performance. Employing within-subject design, we recruited five Americans and five Taiwanese participants to join our studies, which allowed the further investigation on the cultural difference. The results showed that American participants discriminated faster in emotional faces than in neutral faces and faster in happy faces than in other ones. The incongruent effect occurred, showing slower response time of judging negative faces than neutral condition while holding pen between teeth (positive emotion embodiment) and judging positive faces than neutral condition while holding pen between lips (negative emotion embodiment). Taiwanese participants performed the emotion discrimination task in a similar manner. In contrast, the incongruent effect between emotion embodiment and discrimination did not occur, which might reflect the cultural difference for embodiment effect.

P2-43: Consonance and consciousness: Harmonies in fMRI signals correlate with perceptual and motor events in healthy subjects; dissonance characterizes schizophrenia

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To describe the structures and relations that compose a state of consciousness, classical phenomenologists appealed to metaphors of harmony. For Husserl, "harmonious manifolds" describe the intrinsic coordination of proprioception, sensation, and action in constructing a stable phenomenal world. For James, "overtones" denote the conscious fringe with its "feelings of tendency." In this study we take harmony literally, correlating consonance and dissonance in the dynamic brain with global differences in awareness, re-analyzing fMRI data from Garrity, Pearlson, McKiernan, Lloyd, Kiehl, & Calhoun (2007). ("Aberrant 'default mode' functional connectivity in schizophrenia." *Am.J.Psychiatry*, 164(3):450-457.) Functional MR signals from different brain regions were decomposed into their fundamental frequencies and overtones/subharmonics. Using methods from cognitive musicology (Sethares, Tuning Timbre Spectrum Scale, 2004), global consonance/dissonance can be measured in individual subjects and experiments. Also, by factoring signal intensity moment by moment, we track a changing index of consonance over time in fMRI. We analyzed 15 schizophrenia patients and 18 healthy controls, performing an auditory oddball task. The healthy controls were more globally consonant than patients ($p < .00001$). Also, for healthy subjects, but not for patients, significantly greater consonance accompanied target tones (requiring a button press) and random intrusive sounds. Consonance could be the global correlate of either successful recognition/response or attention. Either interpretation fits with cognitive deficits observed in schizophrenia. Overall, we suggest that musical forms can characterize brain dynamics and phenomenology jointly, capturing multivariate "polyphonic" states and changes at an intermediate level of description. Dynamical systems and classical computational approaches to the conscious brain merge under tractable, re-purposed musicological methods.

P2-44: Insights from Anthropological and clinical research into altered (non-ordinary) states of consciousness

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The term "non-ordinary states of consciousness" came from the clinical research of Stanislav Grof—these states are characterized by a fundamental change in consciousness which is not impaired by any pathological processes. In such states, subjects tend to remain fully oriented in terms of space and time, but at the same time, their awareness is flooded with contents from other dimensions of existence in a way that can be overwhelming. These states can be induced in many different ways, that can include breath, sound technologies like drumming, rattling, use of sticks, gongs, dancing and other forms of movement, social isolation and sensory deprivation, meditation etc, the ingestion of hallucinogens being just one of the them. One of the more outstanding accounts in the realms of anthropology and consciousness research was done by the anthropologist Jeremy Narby during his fieldwork in the Peruvian Amazon forest. Quite briefly, Narby has gone through several ayahuasca sessions and started to doubt some of the established anthropological practices in which the anthropologist attempts to give an "objective account" of a certain culture and the "inner landscape" of natives through observation; practices which couldn't give an appropriate account of "the sources of botanical and healing knowledge" of the Amazonian shamans. Can a clinical and anthropological research of this kind have any relevance in the longer term in our understanding of consciousness and the mind? Furthermore, if such research is to have any credence, what are its implications in the philosophy of mind, anthropology and clinical research?

P2-45: The ambivalent stimulus

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As ambivalent can be perceived objects or words e.g., like Schadenfreude that is glossed as “a feeling of pleasure that you get when something bad happens to someone else” (Longman, 2005). On the one hand, being happy at somebody’s misfortunes seems to involve feelings that contradict each other. On the other hand, the experimenter of such a state must feel ashamed at being happy on such an occasion as soon as s/he recognizes that. Should the resultant state of consciousness be considered as a unified and internally coherent one? The words expressing ambivalent emotions and attitudes were thus far never taken as object of investigations in psycholinguistics, cognitive and affective neuroscience, etc. There are certain good reasons for not using them as stimuli in experimental studies because we do not know (1) what is their semantic structure, (2) what is the scope of the phenomenology of ambivalent experience, and (3) how to distinguish ambivalence from similar language-dependent phenomena involved, e.g., in the expression of irony, euphemism, hypocrisy and the like. The aim of the present paper will be to discuss the phenomena of ambivalent meaning from linguistic point of view. The analysis will aim at finding out explicit criteria for identification of ambivalent words for the sake of collecting a set of them for the purposes of running psycholinguistic experiments investigating dissociative states of consciousness in norm and pathology.

P2-46: Electrophysiological correlates of attention-spreading for a partly-occluded object

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By using an event-related potential (ERP) paradigm, it was previously found that attention spreads over an object twice, associated with perceptual grouping and object unity (Kasai, 2010, Attention-spreading based on hierarchical spatial representations for connected objects. *Journal of Cognitive Neuroscience*, 22, 12-22). The present study examined the case of a partly-occluded object, i.e., involving physically-discontinuous regions, yet perceived as a single object. Ten participants were required to pay their attention to the left or right visual field and to press the button in response to infrequent targets at the attended side during a rapid presentation sequence of bilateral stimulus arrays. A large object (occluder) remained visible at the center. The bilateral stimuli (rectangles) were presented separately from the occluder in the separated condition; a line physically connected the bilateral stimuli in the connected condition; the connecting line was perceived as in the back of the occluder in the occluded condition. The typical ERP attention effect, i.e., amplitude enhancement at posterior electrode sites contralateral to the attended visual field, decreased for an early phase of N1 (140-180 ms poststimulus) in the occluded condition rather than the connected condition. The attention effects of a late phase of N1 (180-220 ms) similarly decreased in the occluded and connected conditions, compared to the separated condition. Subsequent attention effects depended on physical aspects of stimuli. These electrophysiological results visualize a processing sequence of perceptual object formation and fragmentation.

P2-47: The relationship between subjective confidence and performance in implicit learning

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It is known that as a result of exposure of a series of letter strings that follow some complex rules (i.e. artificial grammar) participants could select regular strings from unregulated ones in implicit learning research. In such a typical paradigm of artificial grammar learning, we examined if the difference of participants’ subjective confidence at each judgment predicted their performance objectively. Procedure of this study was composed of two phases, the learning phase and the testing phase. In the learning phase, the size and luminance of presented stimuli and participants’ attention were manipulated as independent variables. In the testing phase, participants were informed the existence of rules and asked to distinguish “grammatical” strings from “nongrammatical” strings. After each selection, they were also asked to rate the confidence of their selection. Eighty undergraduate students were participated in this study. Results showed that correct rates of judgments with relatively higher subjective confidence (i.e. explicit judgment) depended on the perceptual size and luminance as well as the effect of attention (i.e. attended / unattended) in the learning phase. In contrast, the correct rates of judgments with relative lower subjective confidence (i.e. implicit judgment) depended only on the attentional factor. The availability and limitation of participants’ confidence ratings for their own performance in the field of implicit learning research will be discussed. It is known that as a result of exposure of a series of letter strings that follow some complex rules (i.e. artificial grammar) participants could select regular strings

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P2-48: Neural substrates of multifaceted autobiographical memory: A meta-analysis

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Autobiographical memory (AM) is a complex concept encompassing various types of knowledge about the self (Conway, 2005). The episodic component of AM contains personal specific events in a particular time and space, for which the subject can mentally travel back through subjective time, reliving the encoding context (Piolino et al., 2009; Tulving, 2002). Otherwise, the semantic component of AM stores the general knowledge of a person's past for which the subject can be aware of information in the absence of specific recollection. According to Conway's AM model, it contains general self knowledge of significant persons, common locations, and general events, and at the most abstract representation level, the conceptual self which contains personal beliefs, evaluations and currently active self-images and goals. The aim of this study was to investigate the distinct neural substrates of different form of AM self-knowledge. With this goal, we conducted a meta-analysis based on Activation Likelihood Estimation (ALE) of available neuroimaging studies on episodic component of AM, general self knowledge and conceptual self. Our results demonstrate a large antero-posterior network including limbic and posterior medial regions in episodic component of AM while self-knowledge mainly activates lateral temporal structures with low recruitment of posterior structures corresponding to scene reconstruction and specific remembering. Moreover, the conceptual self only activates anterior structures (dorsolateral and medial prefrontal cortex) linked to the evaluation of self-referential stimuli (VanDerMeer et al. 2010). In conclusion, our results shed light on the shift from posterior and hippocampal regions to anterior regions with the abstraction representation format of AM.

P2-49: Response strategies in sequential behavior in rats

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All behaviors consist of sequences of action elements. When specific sequences of action elements have meaning, they are termed sequential behaviors. Then, how do humans and other animals process sequential information and perform sequential behavior? Though a lot of psychological experiments in humans and primates about serial learning and sequential behavior have been executed, neuronal mechanisms are unclear yet. The goal of this study is to train rats a serial reaction time (SRT) task with nose-poke holding for 2 sec and to elucidate the neuronal mechanisms processing sequential information of stimuli. In this SRT task we used an operant chamber for rats with five nose-poke holes arranged horizontally on the wall. First we conducted learning sessions in which two specific sequences of nose-poke were required and repeated and test sessions in which random sequences of nose-poke including the two specific sequences were required, and we investigated the behavioral data by comparing the specific and random sequences. The subjects learned two specific sequences, composed of three successive stimuli for nose-poke, which might be a coherent sequence by chunking, recollecting each specific sequence from the start position. Furthermore, the subjects responded systematically in random sequences. These results indicate that the subjects memorized sequence information of stimuli as declarative memory and switched response strategies by implication of start hole. Subsequently, we are recording the multineuronal population activity using multi-electrodes from the hippocampus and analyzing the neuronal activity expressing sequences of stimuli the rats should response. Here, we report preliminary neuronal data.

P2-50: Priming and awareness modulated by quality of representation

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According to Cleeremans (2002), a representation's availability to awareness depends on its quality, which is defined by three properties: strength, stability and distinctiveness. In this study, we specifically manipulated strength of representation by varying the number of times each stimulus is presented. We expected that such multiple presentations of a weak stimulus would increase stimulus strength and hence make it conscious. Marcel (1983), however, showed just the opposite by demonstrating that 20 repetitions of a subliminal stimulus improved performance in a priming task yet failed to increase awareness. In a first experiment, we tried to replicate Marcel's experiment exactly. The results showed no priming effect, regardless of the number of prime presentations. In hindsight, this result is not surprising given that the prime was extremely short (10 ms), whereas the delay between each prime presentation (500 ms) was very long. Further, the results showed no increase of awareness with the number of prime presentations. We thus conducted a second experiment in which we removed the delays between primes and increased prime duration. We also used repetition priming rather than semantic priming. We obtained a priming effect that failed to increase with the number of prime presentations. Strikingly however, awareness increased with the number of presentations. Thus, we unexpectedly obtained a dissociation between priming and awareness, but in the completely opposite direction as that observed in Marcel's study. We suggest that these results may be explained by a difference of top-down attentional amplification on the prime between the two tasks.

P2-51: Older adults overestimate their physical ability in stepping over action

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Physical ability generally deteriorates with age. Further, older adults may be unaware of decrease in their physical ability. To successfully perform motor action, one requires an accurate self-estimate of physical ability. Conversely, inaccurate self-estimation could lead to severe accidents in daily life, particularly in older adults. The present study investigated the accuracy of self-estimation in 264 aged and 45 young adults by using a stepping over test (SOT). Participants first observed a horizontal bar placed 7 m in front of them while the height of the bar was manipulated in a descending/ascending direction. They were asked to verbally report the maximal height (estimated height, EH) of the bar they believed to be capable of stepping over. Then, they attempted to step over the bar at the EH. If they failed, the bar was moved to a lower height and they attempted to step over it again. This was repeated until they succeeded, and the final height was measured as the actual height (AH). Forty-nine older adults (18.6%) failed to step over the bar at the EH (i.e., overestimation), while all the young adults succeeded. The differences between the EH and AH were significantly correlated with age ($r = 0.308$) and AH ($r = -0.465$), which indicated that older adults tend to overestimate their physical ability to a higher degree. Our results highlight that overestimation of physical ability in stepping over action is mediated by aging, particularly in older adults with low physical ability.

P2-52: The effect of auditory stimuli on visual size perception

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Size perception is essential for safety in our daily lives. For example, we always discriminate the size of objects heading toward us and avoid them to prevent dangerous collisions. Nonetheless, visual illusions influence size perception. The typical factors behind visual size illusions are assimilation and contrast. Furthermore, it has been recently reported that attention increases the perceived visual size of a moving object. Regarding multisensory integration, it has been reported that haptic information dominates visual information on size perception in specific conditions. However, the effect of sound has not yet been examined, while we can discriminate the differences in the objects' volume only by dropping sounds. Furthermore, it is easy for us to conduct subjective matching object size with loudness. Previous studies have demonstrated that auditory stimuli alter visual size perception. Therefore, we examined the effect of audio—visual interaction on size perception in the present study. We manipulated the sound pressure levels (SPLs) of auditory stimuli presented simultaneously with visual stimuli. The results indicate that adding sounds of relatively higher SPL increased the perceived visual size. Moreover, we confirmed that this effect could not be attributed to the participants' response bias, by applying the signal detection theory. These results demonstrate the integration of visual and auditory information on size perception. We discussed the mechanisms underlying the process that alters visual size perception by the size information contained in auditory stimuli.

P2-53: Conscious selection of unconscious representations in visual working memory

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The change blindness phenomenon demonstrates that only a limited subset of the visual scene is actually consciously processed. Recent studies presenting location-cues after perceptual events have shown that by a conscious and voluntary effort, attentional selection can amplify the unconscious representation at a particular location within visual working memory (VWM). Here we investigated whether representations held in VWM can be modulated by feature-cues and whether the effects of feature-cueing differ from those of location-cueing. In the current experiments, participants viewed memory arrays of four items, followed by a feature-cue (50% validity), location-cue (50% validity), or neutral cue, and later by a probe stimulus. The task was to decide whether the probe stimulus matched the item presented at the same location in the memory array. We fit the data to the EZ-diffusion model which has been proved useful in simultaneous analysis of reaction time and accuracy data. The fits showed that the rate of accumulation of evidence was significantly improved when participants were retrospectively cued to the probe stimulus feature or location, reflecting better output of cued representations from VWM entering the decision process. In addition, we found that when a change had actually occurred, feature-cueing led to a small advantage in the non-decision components of reaction time on valid trials but a great disadvantage on invalid trials. However, the effects of location-cueing did not differ across conditions. This indicates that feature information and location information might modulate processing outside decision such as encoding and response execution in a different way.

P2-54: Effect of auditory stimuli in color perception; What cognitive/perceptual processes are involved in lightness-pitch correlation?

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Sound-color synaesthetes perceive a specific color due to musical elements (pitch, chord, genre and so on) when they hear certain sounds/music. Previous studies have shown that there are similar straightforward relationships between lightness and pitch in synaesthetes and nonsynaesthetes (Mark, 1974; Hubbard, 1996; Ward et al., 2006). These results indicated that nonsynaesthetes have lightness-pitch mapping similar to synaesthetes. However, in their experimental paradigm such a similarity seems to stem from not so much sensory phenomena as high-level memory associations in nonsynaesthetes. So, we examined what process in perception and/or cognition relates lightness-pitch synaesthesia-like phenomena in nonsynaesthetes. In our study we targeted perceived colors (luminance) per se rather than the imagery of color (luminance) via memory association. In experiment 1, subjects were given 2s to memorize colors under three different conditions (control, high-pitch=6300Hz, low-pitch=200Hz) and selected the colors that she/he perceived. In experiment 2, subjects were repeatedly exposed to two serial colors (ISI=500ms) and required to report which color was brighter (more vivid) as quickly as they could. As to the two serial colors, one was control and the other was simultaneous auditory stimuli condition. In experiment 3, we displayed not simple color stimuli like experiments 1 and 2 but color in subjective figures (Kanizsa triangle/rectangle). Results indicated that the performances in color selection were interfered by task-irrelevant stimuli (auditory information) but there were little significant correlation between color and auditory stimuli (pitch) in simple color conditions (experiments 1,2). However, in experiment 3, in subjective figures conditions, the result showed a different tendency and partly showed correlations. Recent work indicated synaesthesia needs selective attention (Rich et al., 2010) and some research showed perception of subjective contours needs attention (Gurnsey, 1996). We conjecture that lightness-pitch synaesthesia-like phenomena may need some kind of attention or another higher brain activity (e.g., memory association, cognition).

P2-55: Separability and commonality of auditory and visual bistable perception

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Bistable perception is useful for clarifying the mental processes underlying perceptual organization. However, it is still unclear whether different forms of bistable perception are based on common or separate neural mechanisms. The present study used auditory and visual stimuli that induce bistable perception phenomena: auditory streaming, verbal transformations, visual plaids, and reversal figures. With these stimuli, constant physical stimulation leads to spontaneous switching between different percepts. Here, we examined how neurotransmitter functioning influences the number of perceptual switches. We focused on functional polymorphisms of catechol-O-methyltransferase Val158Met and serotonin 2A receptor -1438G/A genes, which are involved in the modulation of dopamine and serotonin, respectively. The results of factor analyses demonstrated that a

three-factor solution provides a better fit to data. These factors – the "auditory", "shape", and "motion" factors – were separable but correlated with each other. The number of perceptual switches was greater for the Met/Met group than for the Val/Met and Val/Val groups in auditory streaming and verbal transformations; greater for the A/A group than for the G/G group in reversal figures. This indicates that the "auditory" and "shape" factors represent functioning of the dopamine and serotonin systems, respectively. Our findings suggest that auditory and visual bistability is implemented in different sensory modules but governed by a common factor.

P2-56: Brain mechanisms of bodily self-consciousness: neurological evidence from heautoscopy

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The everyday sensation of a spatial unity between our body and our self and the experience of identifying ourselves with this body may break down during illusory own body perceptions in neurological patients. One such illusion is called heautoscopy (HAS) during which patients experience affinity with his own (physical) and with the illusory body (of a seen double). This may lead to a loss of experienced unity of the self. Here, we studied the functional and neural mechanisms in HAS that we deem crucial for understanding the brain mechanisms of self-identification and experienced spatial unity (i.e. the singularity of the conscious mind. We analyzed the lesion data from a large sample of HAS of neurological origin to elucidate its neuroanatomical origin performing quantitative lesion analysis (MRIcron), and comparing the distributions of brain lesions confirmed by multimodality imaging in nine patients with HAS with 8 patients showing other complex hallucinations We found the left temporal lobe including mesial temporal structures and the insula was found to be affected in 7 patients with HAS (confirmed by statistical analysis). Statistical lesion overlap comparison revealed the left posterior insula. The present lesion analysis reveals a novel implication of the left insula that previous work has linked to self-awareness, visceral and vestibular perception. We argue that abnormal interoceptive signals play an important role in illusory own body perceptions, distinguish the brain dysfunction from those in other disorders of self-consciousness, and discuss the brain mechanisms of the experienced unity of the self.

P2-57: Epiphenomenalism and methodologies for understanding consciousness

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This paper argues that two seemingly disparate threads of debates within scientific approaches to consciousness must be woven together. I show that lessons from studying the evolution of consciousness must inform attempts to understand the neural correlates of consciousness as follows: studying the so-called 'easy problems of consciousness' will result in a solution to the so-called 'hard problem of consciousness.' Evolutionary approaches to consciousness have been largely unsatisfactory, despite providing evidence for sentience in non-human animals, and helping to understand the relationship between language and consciousness. Since evolution operates on properties of organisms that provide a selective advantage, and since two organisms that differ only terms of having conscious experience will fail to differ in any way that provides a selective advantage, consciousness does not have an evolutionary function. I justify the second premise by an appeal to the failure by philosophers to provide an account of mental causation. On the hypothesis argued for, that consciousness did not provide an evolutionary advantage, I then consider methodologies for understanding the nature of biological mechanisms that are spandrels. By comparison to a number of current, controversial cases of hypothesized spandrels, I show that there is good inductive evidence that an understanding of the easy problems of consciousness will do two things. First, it will provide the necessitating relationship between neural/computational states and conscious states, thus solving the hard problem of consciousness. Second, by providing an explanation for neural/computational states that necessitate conscious states, it will close the so-called explanatory gap.

P2-58: Towards the use of DTI techniques in the diagnostic process of the vegetative and the minimally conscious state

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The differential diagnosis between the vegetative (VS) and the minimally conscious states (MCS) is currently based on subjective clinical judgments about the patient's exhibited behaviour. This process is associated with a high level of misdiagnosis. We recently demonstrated that diffusion tensor imaging (DTI) allows classifying the patients into their appropriate diagnostic category (Fernández-Espejo et al, 2011). The main aim of this study was to establish the accuracy of the former and other DTI-based classification techniques at a single-subject level in order to determine their possible clinical impact. We acquired DTI data in an independent sample of 17 VS and MCS patients. FSL (<http://www.fmrib.ox.ac.uk/fsl/>) was employed to pre-process the data and calculate mean

diffusivity (MD) maps of the subcortical white matter and the thalami. Matlab was then used to obtain histograms representing the distribution of the MD values within the masks, which were characterized by a number of indices. Finally, we applied several classifiers (e.g. logistic regression, linear discriminant analysis) to categorize the patients. The results will be discussed in terms of their accuracy for classifying the patients into their appropriate diagnostic category. They suggest that DTI could be a useful technique in the diagnosis of patients following severe brain injury, complementing the information obtained from other neuroimaging techniques, along with standard behavioural tests.

P2-59: The relationship between self-awareness and theory of mind in healthy adults

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Self-awareness (SA) has been defined as knowledge of knowledge of self. Theory of Mind (ToM) refers to the ability to reason about the mental states of others. The relationship between SA and ToM is controversial. According to Gallup (1998: 68) self-recognition warrants theory of other minds: “...organisms aware of themselves are in a unique position to use their experience as a means of modelling the experience of others. When you see someone in a situation similar to one you have encountered, you automatically assume his or her experience will be similar to yours”. In the same way, simulation theory postulates that an observer attributes mental states to another person by using her own mind as a model of the other mind (Gallese and Goldman, 1998). “Theory theorists” rather suppose that we are born as “little psychologists” who discover belief and desire through experimentation, observation, theory-building and, possibly, based on innate concepts. Unlike, “theory theory”, “simulation theory” makes the assumption of a strong link between self-awareness and theory of mind. Previous studies in schizophrenia patients have supported the hypothesized link between ToM and self-face recognition. In this study, our goal was to explore the link between SA and ToM in healthy adults participants. We asked our participants to fill in a series of ToM and SA tests and questionnaires. As we suspected that the relationship between SA and ToM might depend on personality traits, we also asked them to fill in a personality questionnaire (NEO-PI-R).

P2-60: Coherence between color and shape promotes interocular grouping during binocular rivalry

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Interocular grouping is a phenomenon in which incomplete visual elements presented to the two eyes are grouped together and perceived as an entirety during binocular rivalry. This phenomenon is a useful means to study conscious visual awareness, since it provides an unusual case where physical stimulation and observer’s awareness are dissociated. Previous studies showed that individual features such as color and motion promote interocular grouping (Kim & Blake, 2005; Pappas et al., 2005). The interaction between these individual features, however, has not been addressed. We performed a pair of experiments to investigate the influence of coherence between individual features on interocular grouping. Both the color (red/green) and the shape (circle/square) of partially occluded objects that comprised rival targets were systematically manipulated. Experiment 1: Observers tracked perceived shapes. Perception of complete shapes behind the occluder (circle or square) indicated incidence of interocular grouping. Perceived complete shapes were either in uniform colors (coherent) or in half red/half green (incoherent). Experiment 2: Observers tracked perceived colors. Perception of uniform colors behind the occluder (red or green) indicated incidence of interocular grouping. Perceived uniform colors were either in complete shapes (coherent) or in the shape of half circle/half square (incoherent). Results from Experiments 1 & 2 showed in concert that incidence of interocular grouping was greater in the coherent condition than in the incoherent condition. Conclusion: Color and shape promote grouping of incomplete features distributed between two eyes, only when these features are coordinated properly.

P2-61: An experimental study of behavioral mimicry in chimpanzees using matching to sample task

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Previous studies suggest that unconscious mimicry and/or synchrony of behaviors between individuals promote bonding and facilitate prosocial behaviors. However, little is known about whether and to what extent nonhuman primates share such tendencies. In this study, using matching to sample task, we investigated behavioral mimicry of chimpanzees. In a test trial, a video clip where another conspecific (or an object) choose (or approach) a target or distractor stimuli was presented after touching a sample stimulus. We analyzed how the video clip affected chimpanzees’ choice of the target stimuli. The result suggested that chimpanzees were more affected by conspecific’s behaviors than those of objects, although these two models moved in a similar way. Asymmetrical

effect of the video clips, that is strong effect of distraction but little facilitation on their performance, was also found. Relationship between this result and common coding theory of perception and action is discussed

P2-62: Spatial working memory in the monkeys with unilateral lesion of V1

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Working memory enables flexible use of visual information and is often proposed to have tight linkage with visual awareness. Thus, it has been believed that working memory would not be available under the condition of ‘blindsight’ in which the patients with damage to the primary visual cortex (V1) show visually guided behaviors without visual awareness. Here, we examined spatial working memory in a non-human primate model of blindsight. We found that the monkeys with a unilateral lesion of V1 were able to make memory-guided saccades (MGS) in the visual field affected by the lesion: they could retain the positions of the cue for at least 2 seconds and make a saccade to the position. Furthermore, while the monkeys were performing the MGS task, sustained activity was observed in a large fraction of the neurons in the superior colliculus (SC) ipsilateral to the lesion, which is a key node for recovery process after damage to V1. These neurons maintained the spatial information throughout the retention interval, which was not the case in the intact side. The sustained activity was found not only in the visuomotor neurons but also in the visual neurons, suggesting that it is unlikely to represent motor preparation. Error analysis revealed that the sustained activity was correlated with monkeys’ behavioral outcome. These results suggest that SC might serve as a neural substrate for spatial working memory in the affected visual field. Our findings challenge the current view on the relationship between visual awareness and working memory.

P2-63: The capacity of visual short-term memory for expanding and contracting objects

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Takeuchi (1997) showed that in a visual search task, the search time for expanding objects was shorter than that for contracting objects. This indicates that expanding motion is dominant in detection process. However, it remains to be examined whether the predominance of expanding motion extends to higher-order visual processes (such as visual short-term memory: VSTM). Thus, in this study, we have aimed to examine the effects of expanding/contracting motions on VSTM by performing a change-detection task. In this task, several expanding/contracting line segments were presented in both memory and test displays. The test display was either identical to the memory display or included an object with a different orientation from that in the memory display. Participants judged the presence/absence of an orientation change in successive displays. Results showed that the VSTM capacity for expanding objects was larger than that for contracting objects when the set size was more than 5 (Experiment 1). These results were replicated even though we equated the size of the expanding/contracting objects just before judgments to exclude the possibility that adjacent object sizes affect VSTM (Experiment 2). Further, we examined the predominance of the expanding motion in the VSTM capacity to elucidate the effect of motion congruency between memory and test displays in the change-detection task (Experiment 3). Results showed that the predominance of expanding motion was observed only when the consistent motion of the objects was presented between displays. These results indicate the predominance of expanding motion in short-term memory, such as for detection. This research was supported partially by JSPS Grant-in-Aid for Scientific Research to J.G. (No. 21530757) and by JSPS Research Fellowship for Young Scientists to J.T. (No. 22-8068).

P2-64: Mental ownership and essential thoughts for perception

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I will argue that one’s thought identifying a particular subject who has a certain mental state is essential for one to be aware of one’s own perceptual states or to take actions in some cases. John Perry (1979) has argued that an “I”-thought, a thought having the first-person pronoun in its content, is essential for one’s actions, but he only discussed “I”-thoughts about one’s physical conditions. In this paper, by showing the separable relationship between one’s introspected perceptual state and mental ownership in some empirical cases, such as thought insertions, I will argue that one’s thought identifying a particular subject who has a certain mental state can be essential for one’s perceptual states or actions. The case of thought insertion shows that this kind of “essential thought” do not always require the usage of the first-person pronoun. Instead, other terms referring to people different from the subject having the thought can be used. It means that one’s essential thought for perception or actions is not always an “I”-thought. Finally, I will go further to discuss the special causal status this kind of “essential thought” has and whether we can give a functional characterization to it.

P2-65: Unconscious processing of illusory line orientation

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One of the core questions in consciousness research concerns the types of information that can be processed unconsciously. We investigated whether real and illusory line orientations are processed without awareness and whether this information is represented in ways similar to conscious representations of orientation. In two experiments, one that used an objective and the other a subjective measure of awareness, we assessed the processing of real and illusory line orientations using priming with metacontrast masking. To assess real line orientation priming without awareness, we briefly presented a line tilted to the left or the right inside a rectangular frame. The priming line was then masked with a tilted target line, for which the left or right tilt had to be discriminated. To measure unconscious illusory line orientation processing, we used the well-known rod-in-frame illusion: a vertical priming line was presented inside a tilted left or right rectangular frame so that the vertical line was consciously perceived as tilted left or right when the frame was tilted right or left. When subjects were aware of the primes, the magnitude of priming was comparable for lines with real and illusory tilt. When participants were unaware of the primes, however, priming effects were much stronger for lines with illusory than with real tilt. Our results demonstrate that illusory line orientation processing occurs without awareness and that unconscious representations are influenced by higher order perceptual effects. Additionally, our results also show that unconscious representations can sometimes differ from conscious ones in unexpected ways.

P2-66: Constraints for Phenomenal Quality Realists

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Constraints for Phenomenal Quality Realists Phenomenal quality realists – whether they are metaphysical dualists or physicalists who admit only a conceptual dualism – are very plausibly committed to the existence of sets of neural activation patterns that satisfy the following constraints. (1) Richness. There are thousands of distinct phenomenal qualities, and thus thousands of distinct sets of neural activation states. (2) Modal Segregation. Some series of just noticeable differences will take you from any quality to any other quality in the same sensory modality; but not from a quality in one modality to a quality in another. (3) Location Neutrality. Location as such is never a causal property (although location is sometimes a handy proxy for an efficacious property that is in that location). The present paper both explains the difficulty of providing a set of neural activation patterns that satisfies all these demands, and constructs a solution that shows their mutual satisfaction to be possible. This solution provides a way of identifying distinct "concurrency patterns" by which the same set of firing ratios within a set of neurons may be achieved in different ways. The ratio sets, even for small numbers of neurons, can adequately provide for Richness, while concurrency patterns can provide Modal Segregation; and in neither case is there a violation of Location Neutrality.

P2-67: A dozen strategies for investigating the biological evolution of consciousness

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The strategies that have been employed by consciousness researchers to learn more about the biological evolution and potential functions of consciousness differ not only in the quality of their implementation but also in their usefulness for this purpose. Here I present the results of a systematic evaluation of the promise of 12 such strategies for making progress toward a scientifically respectable evolutionary explanation of consciousness. The strategies can be grouped into (a) input-focused strategies, (b) general reasoning strategies, (c) general research strategies advocated for consciousness studies, and (d) strategies from evolutionary biology. To be able to systematically evaluate these research strategies, it was necessary to construct a suitable evaluation tool. The tool combines qualitative analyses of the strategies with the use of rubrics for assigning weighted scores on multiple criteria concerning a strategy's relevance, efficacy, and practicality. Although multiple methods should be used to approach research questions and the particular research situation taken into account when selecting a strategy, the evaluation results allow general recommendations to be made about which strategies are most likely to advance research on the evolution of consciousness: Comparative methods are most promising for increasing our knowledge about the evolutionary history of consciousness, followed by inferences from models or theories of consciousness. The three general research strategies in group (c) hold additional promise for determining evolutionary functions of consciousness and/or evolutionary alternatives. Better knowledge of available research strategies is important for the evidence-based development of evolutionary theories of consciousness.

P2-68: Prediction of future memory cognition by multivariate pattern analysis

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Previous studies using multivariate pattern analysis (MVPA) have extracted information about cognitive status that is experienced simultaneously with functional magnetic resonance imaging (fMRI). However, to our knowledge, no previous study has predicted cognitive states that will be observed after the scanning. Here, by focusing on activity in the medial temporal lobe (MTL), we demonstrate that MVPA on fMRI data is capable of predicting subsequent memory cognition. In this experiment, six runs of fMRI signals were acquired during encoding of non-semantic phonogram stimuli. In the analysis, using data acquired in runs 1–3, we first conducted MVPA-based voxel-wise search for the most informative clusters in the MTL. Next, using the fMRI signals acquired in runs 1–3 from the selected clusters, we trained a classifier function in MVPA. Finally, the trained classifier function was applied to fMRI signals acquired in runs 4–6. Consequently, in 10 of 13 subjects, we succeeded in predicting the subsequent recognition performance for stimuli studied in runs 4–6 with significantly high accuracy. Furthermore, we demonstrate that fMRI signals in the inferior frontal gyrus do not have enough information for the same analysis to predict accurate prediction on subsequent memory cognition. This accurate prediction suggests that appropriate MVPA can extract information that is associated with future cognitive status.

P2-69: Neural networks for action representation

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Action representation, which codes the way of action, has been suggested to play a role for connecting between production and perception of action. Here, we tested the hypothesis that the representation of action was implemented as a dynamic interaction between the neural substrates of production and perception of action, via the posterior parietal cortex (PPC). We predicted that the connection from the superior temporal sulcus (STS) through the PPC and onwards to the ventral premotor areas (PMv) forms an inverse model, converting the visual representation in the STS into a motor plan, whereas reverse connection forms a forward model. Subjects observed changes in the rotation speed of two visually-presented balls that were either actively manipulated by the investigator ('Hand') or automatically rotated ('No-hand'). While viewing these stimuli, subjects either rotated ('Execution') or did not rotate ('Observation') two balls. The left inferior parietal lobule (IPL) and anterior intraparietal sulcus (aIPS) showed both execution and hand effects, and their interaction. The primary sensorimotor cortex (S/M1) and PMv showed only execution effect, and the occipital-temporal regions including STS and MT/V5 showed only hand effect. Execution enhanced the effective connectivity within the motor network, and from IPL to the STS, consistent with forward model. Hand observation enhanced the effective connectivity within the sensory network, and from both aIPS and IPL to PMv, consistent with the inverse model. Thus the representation of hand movement is implemented as dynamic interaction of the core nodes in the parietal cortex with perceptual and executive substrates of the action.

P2-70: Number of delta oscillating neurons increases after ejaculation in the nucleus accumbens in male rats

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Ejaculation drastically changes the physical and mental state of a male. The change of the mental state may include a decrease in conscious level. Therefore, ejaculation could provide a chance for investigating neuronal mechanisms involved in altered conscious level. The nucleus accumbens projects to the reticular nuclei of the thalamus involved in attentional gating, which is suggested to control sensory flow to the cortex. These findings suggest that the nucleus accumbens might be related to altered consciousness after ejaculation. However, few studies investigated neuronal activity after ejaculation. Recently, we recorded single unit activities from the nucleus accumbens of male rats before and during copulation, and after ejaculation. We found that number of neurons oscillating in delta frequency range was increased after ejaculation, compared with those before and during copulation. It has been suggested that accumbens delta oscillation may reflect idling state in this nucleus. The results suggest that delta oscillation in the nucleus accumbens may play a role in altered consciousness after ejaculation.

P2-71: Hierarchy of the dorsal attention network revealed by causal connectivity analysis

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Previous functional magnetic resonance imaging (fMRI) studies with effective connectivity analysis have reported that top-down causal streams along the dorsal attention network (DAN) mediate voluntary attentional control in the human brain. However, resting-state fMRI studies with correlation analysis have proposed that the DAN is also intrinsically configured by functional connectivity during the resting-state even when observers are required to perform no explicit task. This evidence may contradict the findings from effective connectivity studies as stated above. In order to resolve this contradiction, we performed a causal connectivity analysis based on partial Granger causality (pGC), which can factor out external and implicit influences from unmeasured variables, on an event-related fMRI data during a Posner's cueing paradigm with optimized experimental and fMRI scanning parameters for pGC analysis. Typical regions along the DAN with greater activation during voluntary orienting than holding of attention were selected as regions of interest (ROIs). pGC analysis on the fMRI data from the ROIs indicated that top-down causal streams along the DAN from frontal to parietal or visual regions appeared during voluntary orienting, whereas no causal streams from frontal to parietal regions along the DAN were identified during other experimental epochs and less systematic causal streams appeared during such less-attentive states. Our results demonstrated that top-down causal streams from frontal to parietal regions along the DAN exclusively mediate voluntary covert orienting and suggest that neural representation of attention in frontal regions would be the top of the hierarchy of the DAN for embodying voluntary attentional control.

P2-72: Temporal expectation of the first target onset attenuates the attentional blink

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Visual events often do not reach awareness because of temporal limitations of visual attention. For example, when two targets are embedded in a rapid stream of distractors, the second target is often misidentified if the second target follows the first target by less than 500 ms (attentional blink: AB). Previous studies have been suggested that a temporal expectation of the second target onset reduces the AB deficit. However, there is no evidence of the attenuation of the AB by the first-target cuing, although attentional processing of the first target plays a key role in the AB. In the present study, we examined whether the expectation of the first target onset would reduce the AB magnitude by comparing the target accuracies under the self-generation condition in which the first target appeared after the voluntarily key press with those under the automatic condition in which the first target appeared automatically. Three experiments showed that the voluntary key press to generate the first target attenuated the AB deficit. This attenuation effect was observed only when the first target appeared within about 300 ms after the voluntary key press. However, the voluntary key press unrelated to the first target onset did not have the attenuation effect. These results suggest that the expectation, not just a physical movement, enhances temporal selective attention reflected by the AB deficit for about 300 ms after the voluntary action.

P2-73: Neural correlates of subjective colors with Benham's top: a functional MRI study

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The rotating black-and-white pattern, known as Benham's top, fuses forming concentric rings of different colors (Prevost-Fechner-Benham subjective colors). The mechanism of this color illusion was explained by local interactions in retinal cells, however, recent reports suggested the involvement of visual cortex. Cortical response and dynamics of this illusion was largely unknown. Here, we conducted a functional MRI to investigate the neural mechanisms of this illusion employing general linear model and dynamic causal modeling. Our hypothesis was that the neural representations of the subjective colors induced by the illusion and perceptually-matched physical colors stimuli would show similar cortical responses but differences in their dynamic interactions by means of effective connectivity. Seven subjects with normal vision participated. To identify anatomically and functionally segregated regions in the visual cortices (V1, V2, V4, V4alpha, and V5), functional localizer mappings were also performed. The activation patterns for each condition were almost identical, but the effective connectivity from V4 to V2 and V2 to V1 was stronger during subjective color perception than when viewing perceptually-matched physical colors. All subjects perceived subjective color when the rotation speed of Benham's top was greater than or equal to 3 Hz, which was coupled with enhanced effective connectivity between V4 and V1. These results indicate that modulation from V4 to V2 to V1 plays an important role in subjective color perception during the Benham's top illusion.

P2-74: Mental transformation between the self and others

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Assessing other's mental state by taking other's perspective plays an important part in social communication and conscious experience. Imitation based on visual information is a special case of the translation of sensory input into action. Although humans are often successful in imitating complex actions, the mechanisms that underlie successful imitation are poorly understood. In earlier findings, understanding others' mind through imitation has been suggested to be realized in the course of comparison between the representations of the self and others, involving a transformation of the egocentric perspective to the allocentric one. There are two possible processes of transformation between the representation of the self and others. One possible scenario is that the imitator perceives and imitates others as if looking in a mirror (mirror-image imitation, where e.g., the demonstrator's right hand corresponds to the imitator's left hand). Alternatively, the imitator might estimate the demonstrator's action using the anatomically congruent limb (anatomic imitation, where e.g., the demonstrator's right hand corresponds to the imitator's right hand). Here we have conducted a series of experiments in which the subjects imitated simple hand actions such as pushing a button presented from several types of spatial orientation rotated by various angles (plus or minus 0, 45, 90, 135 and 180 degrees). We observed how the imitators change the strategy of imitation (mirror-image or anatomic imitation) in these spatial configurations. The behavioral data from this experiment supports the hypothesis that the mirror-image and anatomic imitation provide complementary systems for understanding other's action and intention.

P2-75: Rapidly measuring the speed of unconscious learning: Amnesics learn quickly and happy people slowly

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We introduce a method for quickly determining the rate of implicit learning in a person. To date there has not been a systematic method for determining the speed of acquisition of unconscious knowledge for a person on a task. Normal implicit learning tasks do not suffice because their complexity means there is a non-linear relationship between underlying learning rate parameters and task performance. Our task involves making a binary prediction for a probabilistic sequence over 10 minutes; from this it is possible to determine the profile of influence of events of a different number of trials in the past on the current decision. This profile directly reflects the learning rate parameter of a large class of learning algorithms including the delta and Rescorla-Wagner rules. We show that the learning on the task is both associative and unconscious. To illustrate the use of the method, we argue theoretically and demonstrate empirically that both amnesia and also transient negative moods are each associated with an especially large learning rate: amnesics can learn quickly and happy people slowly.

P2-76: Restrictions in access: A cognitive account of the epistemic gap

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The 'hard problem' of consciousness research is phenomenal consciousness: explaining the phenomenal character of conscious experience in terms of physical (scientific) knowledge. The essence of this problem is the so-called epistemic gap—the lack of epistemic entailment from physical knowledge to phenomenal truths. In contemporary literature, the standard way of explaining the existence of the epistemic gap is by claiming that it is due to a conceptual gap between a special set of (phenomenal) concepts we possess and our physical concepts. However, the question if this explanation is physically acceptable is hotly debated. The main objective of this paper is to give an alternative account of why the epistemic gap occurs. Since, instead of hard-to-anchor conceptual features, this alternative explanation relies on low-level brain processes (e.g. Bayesian inferences), it is readily acceptable for physicalists. The paper defends three premises. First, most experiences are complex with constituent structure, while some are simple without such structure. Second, those familiar with the phenomenal character of simple experiences are able to conclude on the phenomenal character of complex experiences on the basis of structural descriptions alone. Third, in our cognitive system there is a hierarchy of representations most of which are structured while some are unstructured for further processes. From this, the paper argues that if the phenomenal character of simple experiences corresponds to how certain representational states unstructured for further processes are treated by the rest of a cognitive system, then the epistemic gap necessarily arises.

P2-77: Violent offenders are impaired in recognizing emotions in the context of task irrelevant yet threatening cues

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Previous reports have suggested impairment in facial expression recognition in violent offenders, but it is still unknown whether these findings extend to other nonverbal cues such as bodily expressions of emotion and whether they are still impaired when these expressions are placed in a context. Our goal was to test how aggressive males perceive aggressive body expressions from other males and whether they are more distracted by task irrelevant threatening cues. We used direct and indirect emotion recognition tasks and tested 29 aggressive incarcerated offenders and 31 control participants, carefully matched on age, education level and cultural background. On the direct tasks of matching either facial or bodily emotion expressions, violent offenders performed similarly to controls. But in contrast to controls, dynamic fearful body expressions were often misinterpreted as angry. This bias toward interpreting emotions as hostile angry expressions was clear in the indirect tasks. Violent offenders were impaired in recognizing a happy facial expression when the body showed a different, threatening expression (fear or anger). Moreover, they had great difficulty in categorizing the happy body expression of a target figure when it was presented against the background of a violent scene. These results indicate that one of the underpinnings of aggression and violent offences may be impaired recognition of emotional expressions, with a specific bias toward interpreting emotions as hostile angry expressions, especially when a threatening context was provided.

P2-78: Image-based and perceptual representation of materials

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Daily objects made from real-world materials (metal, wood, fabric etc.) have their own surface qualities. Surface quality provides important information for object identification and categorization. It also influences affective impressions, leading to appropriate interaction with the objects. Little is known, however, about how surface quality of materials is represented in the brain, or how that representation is related to material perception or the physical properties of material surfaces. By combining multivoxel pattern analysis of functional magnetic resonance imaging data with perceptual and image-based physical measures of material properties, we found that representation of materials is transformed from image-based representation in early visual areas into perceptual category representation along the ventral pathway. We suggest that meaningful information about multimodal aspects of real-world materials resides in the ventral cortex around the fusiform gyrus, where it can be utilized for categorization of materials.

P2-79: Sequential effects in attractiveness judgment for faces

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A number of psychological experiments have shown that the response of current trial is biased to assimilate toward the response of the preceding trial in perceptual decision-making tasks, which is referred to as the sequential effect (Holland & Lockhead, 1968). The sequential effect has been widely observed in evaluation of the physical property of stimuli (e.g., loudness or brightness; Ward & Lockhead, 1970; Ward, 1982) as well as more naturalistic properties (e.g., price of furniture; Matthews & Stewart, 2009). However, it is unclear whether subjective decision (e.g., preference) is also susceptible to the sequential effect. Here, we examined whether the sequential effect would occur in face attractiveness judgment. Forty-eight pictures of male and female faces were presented successively. Participants rated the attractiveness of each face on a 7-point scale. The results showed that the attractiveness rating of a given face assimilated toward the rating of the preceding trial. In a separate experiment, we provided a feedback indicating the average attractiveness rating by others for each trial. The feedback weakened the sequential effect for the participants whose rating was largely deviated from the feedback (i.e., others rating). These findings suggest that attractiveness judgment is also biased toward the preceding judgment, and hence the sequential effect can be extended in the domain of subjective decision-making.

P2-80: Relationship between Empathy and Social Skill

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Empathy plays a key role in social cognition and communication. Empathy measured by the Empathizing Questionnaire (EQ; Baron-Cohen, 2004) based on the E-S theory shows a drive to infer another persons' emotion and thoughts. The Interpersonal Reactivity Index (IRI; Davis, 1980) is also a self-report scale designed to assess empathic tendencies, and consists of four separate sub-scales: Perspective Taking (PT), Fantasy (FS), Empathic Concern (EC), and Personal Distress (PD). In this study, using two measures of empathy, the Interpersonal Reactivity Index (IRI) and the Empathy Quotient (EQ), we examined relationships between empathy and social skills (KISS-18, The Consciousness of Others). Results showed that scores on the EQ was related to social skills, but scores on the IRI wasn't related. This study suggests that relationships between empathy and social skills, in part.

P2-81: The role of local adaptation and target transience in subjective disappearance of a moving target with flickering flankers

Takahiro Kawabe, Shin'ya Nishida

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A peripheral target subjectively disappears from visual awareness in the presence of nearby dynamic stimuli. The mechanism governing the subjective disappearance and subsequent reappearance is largely unknown. Previous studies have shown that as target speed increased, the disappearance was diminished. The increase in the target speed not only weakens local adaptation of the target but also strengthens its transience. It was thus unclear how the local adaptation and target transience contributed to the subjective disappearance. We demonstrated that the local adaptation contributed to the target disappearance while the target transience led to its reappearance. The target was a bright Gaussian blob moving along a circular trajectory, and was accompanied by flankers of four dark blobs placed at corners of an imagery square centered on the target. The flankers flickered or remained static. The observer's task was to press an assigned key while the target was invisible, and release the key as soon as it got visible. We measured the rate, latency, and duration of disappearance. First, we replicated the detrimental effect of the target speed on the rate, latency, and duration. Second, we fixed the target speed but altered sampling frequency of target motion. The decrease in sampling frequency strongly shortened the disappearance duration, moderately elongated the latency, but had no effects on the rate. The lower sampling frequency of target motion causes the stronger target transience, with keeping local adaptation almost intact. Thus, the target transience is likely critical for the target reappearance but less critical for its disappearance.

P2-82: Can Hume save himself? On the role of contiguity in the constitution of personal identity

Fauve Lybaert

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I demonstrate how Hume could find a way out of the problems he admits to have with his analysis of personal identity if he would consider the importance of the contiguity of a person to his body for the former's constitution. This recognition of the role of contiguity in the constitution of personal identity is fruitful for the contemporary discussion on personal identity. It allows one to criticize views which reduce persons to psychological continuity or bodies. A person is neither, but the fact that one can trace oneself via the body allows for the generation and discovery of psychological continuity. The here laid link between contiguity and personal identity also highlights the ignored relevance of Kripke's analysis of proper names for the question of personal identity. Kripke discovers that we still call someone the same as long as he has the same origin and regardless of the specific character traits he develops. I point out that we follow a person in such a case through the perception of the apparent continuity of his body and contiguity of him to his body.

P2-83: Quantifying stimulus dissimilarity in binocular rivalry: Wheatstone revisited

Anastasia Gorbunova, Jakob Hohwy

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Binocular rivalry, a phenomenon referring to changes in perceptual dominance while viewing incompatible monocular stimuli, is an important tool for studying the neurocognitive mechanisms involved in conscious perception. Previous research has suggested that the rate of binocular rivalry largely depends on monocular inhibition occurring early in the visual pathway. However, the influence of stimulus salience is still widely debated. The present study quantifies the effect of stimulus dissimilarity and stimulus familiarity on switch rate and dominance duration in binocular rivalry. The stimulus pairs used in this study were either comprised of letters from the English alphabet (as per Wheatstone, 1838), letters and symbols from other writing systems, or both. The dissimilarity measure was computed by performing a Fast Fourier Transform on the difference image of the

stimulus pair, and dividing the total power in the Fourier spectrum by the power in the spectrum for each individual stimulus (after Anderson & Thibos, 2004). It was found that while dominance duration was sensitive to stimulus pair familiarity, switch rate was lowest for highly similar pairs. Implications for the nature of binocular rivalry and conscious perception as well as possible cognitive mechanisms of the phenomenon are discussed.

P2-84: A double positive forms a negative in perceptual enhancement of near-threshold emotional words

Shuo-Heng Li, Su-Ling Yeh

Department of Psychology, National Taiwan University r98227111@ntu.edu.tw

Mounting evidence has shown that emotion-laden stimuli enjoyed more efficient processing than neutral ones; for example, emotional words (negative and positive) are better identified than neutral words. Here we report a series of experiments demonstrating that when two positive words were presented briefly together and then masked, the beneficial effect of positive emotion (relative to neutral words) becomes a negative effect in identification accuracy. Participants conducted a two-alternative forced-choice identification task in the response display that contained the target and the foil. In the preceding target display, there were one target and one competitive word in one of the following pair types: target (positive, neutral, negative) x competitive word (positive, neutral, negative). We found a competitive advantage for both positive and negative target words when it was presented together with a neutral competitive word, but not when both the target and the competitive word were emotional words. Interestingly, both positive and neutral target words led to higher accuracy in a positive-neutral pair but, paradoxically, the positive-positive pair led to the worst performance. These results suggest that while negative words capture attention, positive words expand attentional span and facilitate the whole context. However, more is less—two positive effects offset each other. This research is supported by National Science Council of Taiwan (NSC 96-2413-H-002-009-MY3 and NSC 98-2410-H-002-023-MY3)

P2-85: Cross cultural differences in unconscious knowledge

Sachiko Kiyokawa[1], Zoltan Dienes [2], Daisuke Tanaka [3], Ayumi Yamada [4]

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Previous studies have indicated cross cultural differences in conscious processes, such that Asians have a global preference and Westerners a more analytical one (e.g. for reviews see Nisbett, 2003; Nisbett & Miyamoto, 2005). We investigated whether these biases also apply to unconscious knowledge using the artificial grammar learning paradigm. To determine the conscious status of the knowledge people acquired, we used the structural knowledge attributions of Dienes and Scott (2005; and Scott and Dienes, 2008). In Experiment 1, Japanese and UK participants were asked to memorize so-called “GLOCAL strings” which constitute one sequence of letters at a global level and a different sequence at a local level. The results showed the cultural differences in implicit learning, indicating that Japanese participants unconsciously learned the grammar at the global and not the local level but the English equally at both levels. In Experiment 2, Japanese and UK participants were asked to attend to one of the two aspects of the GLOCAL strings, global or local. Now the cultural groups performed similarly, indicating the bias largely reflects preference rather than ability. In sum, we show for the first time that cultural biases strongly affect the type of unconscious knowledge people acquire.

P2-86: Subjectivity, methodological reduction and self-consciousness

Karen Yan

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If consciousness exists necessarily with subjectivity, what is it? This question, however, is unanswerable unless one has proper analysis of the sense of subjectivity in this question. It is natural for one to start with notions like person, self, or agent to do the analysis, to see whether there could be a sense of self/person/agent that makes the question intelligible. These notions, however, have tendency to over-intellectualize the subjectivity by building in unwarranted conceptual requirements. The paper firstly establishes a common ground among major theories of consciousness, which I map under the three labels: Direct Realism, Representationism, and Phenomenalism. This common ground can generate an analysis of subjectivity that motivates all disputants without disputable conceptual requirements. Based on this ground, the paper secondly analyzes the subjectivity by explicating a notion of phenomenological first-person present. If this analysis is acceptable, it puts one in a good position to evaluate different answers to the above question. The paper thirdly evaluates David Rosenthal’s (2004, 2005, 2010) explanation of the subjectivity, which originates from his higher-order thought theories of consciousness and self-consciousness. I argue against this explanation and consider the possible implications Rosenthal’s failure has on other theories of consciousness.

P2-87: Can we control evaluative responses? Evaluative conditioning with subliminal stimuli and the question of intentional control

Robert Balas [1], Joanna Sweklej [2]

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The presented studies test two predictions derived from a propositional account of evaluative conditioning. First, that propositional knowledge about CS-US contingencies should enable intentional control over the expression of conditioned responses. Secondly, that EC depends on awareness of CS-US contingencies. In a series of experiments on intentional control over conditioned evaluations participants were asked to either conform or ignore the influence of US valence on CS evaluative ratings. The results show significantly lower, but not reversed, EC effects when the US influence had to be ignored. Moreover, this was observed only when participants were aware of the affective category of US paired with initially neutral CS. The second line of studies (on the impact of contingency awareness on EC) tested whether evaluative responses might be learned when perceptual awareness of stimuli is strongly limited. The results revealed EC effect with and without contingency awareness. We conclude that there are two distinct processes that underlie forming evaluative responses. One is associative in nature, automatic and do not depend on conscious awareness. Second depends on conscious propositional knowledge describing relationships between environmental events that cause affective reactions. The relationships between the two processes are discussed and explored.

P2-88: Correlation between the activity of deep brain regions and the change of arousal level

Kei Omata [1,2], Masako Morimoto[1,2], Takashi Hanakawa [1,3], Manabu Honda [1,2]

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There are two dimensions of the term consciousness: the contents of consciousness, such as awareness, and the states of consciousness, such as arousal and vigilance, which are the focus of this study. It is typically thought that a number of nuclei with distinct neurotransmitters in the midbrain and pons conforming the reticular activating system play a central role in controlling the arousal state. However, underlying mechanisms related to controlling the arousal level still remain unclear. We conducted a simultaneous EEG-fMRI recording during a resting state to investigate the relationship between brain activity and the change of arousal level. Fourteen subjects participated in this study and were instructed to lie still on a scanner bed with their eyes closed for 20 min. After artifact corrections, the EEG data were segmented and categorized into two groups: the wakeful state and the drowsy state, by a polysomnographic technologist. The transitions between two states were regarded as events, then convolved with the hemodynamic response function and used as a regressor in a general linear model. Brainstem activity transiently increased when the arousal level changed from the drowsy state into the wakeful state. Conversely, no activation was found when shifted from the wakeful state to the drowsy state. This result suggests that transient activation in the reticular formation may trigger the wakeful state and related to the state of consciousness.

P2-89: The Tell-Tale Heart: Cardio-visual convergence alters tactile perception and self-consciousness

Jane E. Aspell [1], Lukas Heydrich* [1] [2], Guillaume Marillier [1], Tom Lavanchy [1], Bruno Herbelin [1], Olaf Blanke[1] [2]

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The brain's representation of internal states likely contribute to the neural basis of self-consciousness yet most studies on the bodily self have manipulated only exteroceptive processes, e.g. vision and touch, to distort bodily self perception, as in the rubber hand illusion and the full body illusion (Botvinick & Cohen (1998); Lenggenhager et al. (2007); Ehrsson,(2007)). In this study we investigated whether interoceptive (heart beat) signals could be utilised to modulate exteroception (tactile perception) and two crucial aspects of bodily self-consciousness (self-location and self-identification). Fourteen subjects were filmed by a camera from behind while their heart rate was recorded. They wore a head mounted display and viewed a real time video image of their body ('virtual body') surrounded by a periodically glowing silhouette that flashed synchronously or asynchronously with their heartbeat. To measure tactile perception during the task we attached four vibrators and four small lights to participants' backs and measured the crossmodal congruency effect (CCE). The drift in self-location and questionnaire responses were also measured. Participants were found to self-identify with their virtual body and to experience themselves as shifted towards this body when the glowing outline flashed in synchrony with their heartbeat. We also observed a greater tactile mislocalisation - measured by the CCE - towards the virtual body during the synchronous condition. Our data reveal that interoceptive (cardiac) and exteroceptive (visual) signals are integrated and that these cardio-visual signals alter bodily self-consciousness and tactile perception.

Tutorial

TUTORIAL 1: "Integrated information, causal density and conscious level"

Adam Barrett (University of Sussex, UK)
Anil Seth (University of Sussex, UK)

A key challenge in the neuroscience of consciousness is to develop theoretically grounded and practically applicable quantitative measures sensitive to conscious level. We begin by motivating the hypothesis that, given fundamental phenomenological properties, conscious level must somehow correlate with the extent to which underlying neural dynamics are simultaneously differentiated and integrated. We will describe two groups of proposed measures based on this hypothesis:

(i) Measures of integrated information, which reflect the extent to which the information generated by the whole system exceeds that generated by its parts. We will introduce the concepts and mathematics of information theory necessary to understand integrated information. We focus on two new versions we have developed to overcome previous limitations, which are applicable to realistic neural models and to time-series data.

(ii) Measures of causal density, which characterize the overall causal interactivity between different system elements. Again, we introduce the necessary concepts and mathematics, in this case those of Granger causality which have broad application beyond measures of conscious level.

These measures are gaining prominence in consciousness science, but are more complex than other measures such as synchrony, coherence, etc. There is therefore a need, and likely a strong demand, for a clear account of their formulation and application.

We will contrast and compare the two groups of measures, both in their conception and in their properties in simulation, and discuss – with audience participation – their merits and shortcomings as measures of consciousness. We finish by discussing practical application of these measures to real data.

TUTORIAL 2: "Disorders of consciousness: coma, vegetative state and minimally conscious state"

Tristan A Bekinschtein (MRC Cognition and Brain Sciences Unit, UK)
Melanie Boly (University of Liege Sart-Tilman, Belgium)
Olivia Gosseries (University of Liege Sart-Tilman, Belgium)

Disorders of consciousness such as coma, the vegetative and minimally conscious states are among the most mysterious and less understood pathologies of the human brain. In this tutorial will explore disorders of consciousness in relation to three issues. First, we will give an overview of what disorders of consciousness are, and how coma, the vegetative state and the minimally conscious state differ from each-other. Secondly, we will tackle the question of how to assess the presence of residual cognition and consciousness despite the lack motor or verbal responses. In this section we will focus on standard clinical and experimental behavioural assessments, and neuroimaging approaches, including electroencephalography (EEG) and functional magnetic resonance imaging (fMRI). A major focus of this section will be interpretation of brain data and the relationship between brain activation and awareness: What does brain data allow us to infer, about a patient's mental life, and under which (experimental) conditions? In the last section of the tutorial we will explore the possible theoretical frameworks for understanding the phenomenon of consciousness, and how this could lead to a measure for quantifying its presence.

This tutorial is aimed primarily at two audiences. For scientists, the overview of the topic together with the strong focus on methodology should provide an ideal first step into this field of research. For clinicians that are confronted with these patients, the tutorial will provide an overview of the how novel approaches can inform their decisions, and, in particular, what are the advantages and constraints of brain data. For philosophers will be a crash course into basic concepts on how to go from data to results to scientific interpretation. For all will be an exciting discussion about the limits of testing conscious processing without motor or verbal responses and the implications of this to neurosciences of consciousness.

TUTORIAL 3: "Transcranial magnetic stimulation and conscious awareness"

Tony Ro (The City University of New York, USA)
Hakwan Lau (Columbia Univ, USA)

Transcranial magnetic stimulation (TMS) is one of the few methods that allow the direct manipulation of neural activity in human subjects in a safe and reversible fashion. Unlike brain imaging methods, TMS allows us to directly test for the causal role played by different brain regions in different psychological processes. TMS can induce vivid changes in human subjects' conscious experience, by for instance inducing illusory percepts when it is applied to the visual cortex, or by inducing involuntary motor twitches when applied to the motor cortex. Compared to brain imaging facilities, TMS is easy and cheap to set up (less than US\$25,000 for the initial setup of a basic laboratory). Therefore, more and more researchers in cognitive neuroscience are employing TMS. This is true also for consciousness research. This tutorial introduces the basics of TMS, and requires minimal background knowledge in cognitive neuroscience. We use examples from the consciousness literature, on various topics such as visual awareness, experience of volition, and sleep research, to illustrate different aspects of the technique, drawing on work by ourselves as well as those by other laboratories. We will also give critical analysis of selected individual studies, so participants with substantial experience will also find the materials stimulating. We hope that this tutorial will help attendants understand this state-of-the-art method, and the potential future developments of TMS studies on consciousness. Also, we hope this will help some attendants decide how best to incorporate this technique into their research.

TUTORIAL 4: "Self-Knowledge: Philosophy meets Cognitive Science"

Peter Carruthers (University of Maryland)

Philosophers almost universally maintain that knowledge of our own occurrent mental states (including not only our own perceptions, images, and emotional feelings, but also our own current judgments, desires, and decisions) is somehow privileged and authoritative. In contrast, a wide range of evidence from across cognitive science suggests that while our own experiences are globally broadcast (thereby becoming conscious) and hence made available to the mindreading system (thus being easily self-attributable), we can only know of our own propositional attitude states via interpretation of sensorily-accessible data. Hence our knowledge of our own propositional attitudes is little different in epistemic status from our beliefs about of the attitudes of other people. The first section of the tutorial will explain the contrasting approaches, and will develop the interpretive account, explaining how it is consistent with global broadcasting architectures and with current models of working memory. The second section will seek to explain the intuition of immediate access that underlies philosophical accounts, arguing that this results from a simplifying heuristic built into the structure of the mindreading faculty. The third section will examine evidence on meta-memory and meta-reasoning that bears on the debate, and will discuss evidence from schizophrenia, autism, and brain imaging that is alleged to show a dissociation between the mechanisms of self-knowledge and other-knowledge. Finally, the fourth section will look at evidence that people often make confabulatory claims about their own current attitudes, discussing how this seems to strongly support the self-interpretive account.

TUTORIAL 6: “Towards the neuroscientific definition and empirical investigation of Qualia”

Naotsugu Tsuchiya (RIKEN, BSI)

Ryota Kanai (UCL, UK)

Finding the neuronal correlates of consciousness (the NCC) has become a central issue in cognitive neuroscience. However, the definition of the key word, "qualia", remains elusive, and even researchers within the same field use “qualia” in many different ways, to the extent that we cannot answer simple questions such as “whether percepts of faces are qualia?” or “emotion of fear a quale?” Here, we offer a possible definition of “qualia” by considering what are irreducible units of perception from a neuroscientific point of view. We propose that whether a percept should be considered as a single quale or compound of qualia hinges on whether the percept requires top-down attention for binding or not. Our hypothesis predicts that “qualia” emerge from neuronal circuits that bind elements of percept via genetically instructed wiring or via rewiring through extensive learning. Chunked qualia can be bound flexibly via top-down attention, yet this is just a combination of qualia, which needs to be distinguished from genuine qualia. We believe the effort to make a clearer consensus of what qualia are could lead to a surge of neuroscientific investigation of consciousness, based on an analogy with researches on ‘elementary features’ following the proposal of Feature Integration Theory by Anne Treisman. We propose that our new hypothesis will facilitate empirical research into qualia by illuminating more focused issues directly relevant to the Hard Problem.

TUTORIAL 7: “Comparison of the major scientifically oriented theories of consciousness ”

Ned Block (New York University, USA)

These theories will be compared with regard to their accounts of 3 basic dimensions of consciousness: what distinguishes different contents of consciousness (for example, the experience of red vs the experience of green); what distinguishes a conscious perception from an unconscious perception (for example, what distinguishes a conscious perception of a fearful face from an unconscious perception of a fearful face); and what the difference is between a conscious creature and something unconscious or non-conscious (for example, a conscious human vs a non-conscious computer).

Background reading:

No knowledge of the issue will be presupposed, but the following might be useful:

“Comparing the Major Theories of Consciousness,” *The Cognitive Neurosciences IV*, Michael Gazzaniga (ed.) MIT Press, 2009

Speacil Session (3:45pm-5:45pm)

" Japanese contibution toward understanding consciousness "

Chair: Tetsuro Matsuzawa (Kyoto University Primate Research Institute, Japan)

Venue: 1F Centennial Hall

Four speakers will illuminate various approaches to understanding consciousness: brain-machine interface, biological molecules, neuroscience, and primatology.

Manipulating conscious and unconscious brain states by decoded fMRI neurofeedback

Mitsuo Kawato (ATR, Japan)

Systems neuroscience still lacks the most important experimental technique: the manipulation of neural codes. Lesions, electrical stimulation and pharmacological manipulations do not directly manipulate "codes". Several techniques of brain-machine interface are promising candidates to overcome this difficulty. I review two studies from our group aimed at this goal, utilizing decoded real-time fMRI neurofeedback to control and change spatiotemporal brain activity. One is long-term change of temporal correlation between default mode network and task network. The other is inception of visual perceptual learning without presentation of a visual stimulus during training. Equipped with new techniques to experimentally manipulate neural codes, a new era could open up for systems neuroscience and especially for studies of consciousness.

Let's make some noise! How the brain uses fluctuations to process information

Toshio Yanagida (Osaka University, NICT CiNet, Riken QBiC)

One of the many amazing aspects of the brain is that it can process massive amounts of information using only 1 W of power, which is millions of times less than the most advanced computers. This suggests that the human brain uses operation principles that are vastly different from artificial machines. One explanation is that the brain uses noise rather than disregards it, a phenomenon we call "yuragi" and have seen in biological molecules and cells. This could make the brain flexible such that it does not need a comprehensive set of data to make the correct conclusion. For example, we have investigated how the brain can identify an image from incomplete information, like seeing only certain aspects of the image or seeing it with a very limited greyscale. We found that the kinetics for processing these incomplete images resemble those of the famous Arrhenius equation that applies to molecules and cells, indicating "yuragi" is also used by the brain. One wonderful property of "yuragi" is its low energy consumption. Therefore, understanding how it functions in the brain should provide general design principles for controlling complex systems in extremely low energy cost and robust manners. <http://www.fbs.osaka-u.ac.jp/labs/yanagida/>

Triadic (ecological, neural, cognitive) niche construction viewed through primate brain evolution

Atsushi Iriki (RIKEN Brain Science Institute, Japan)

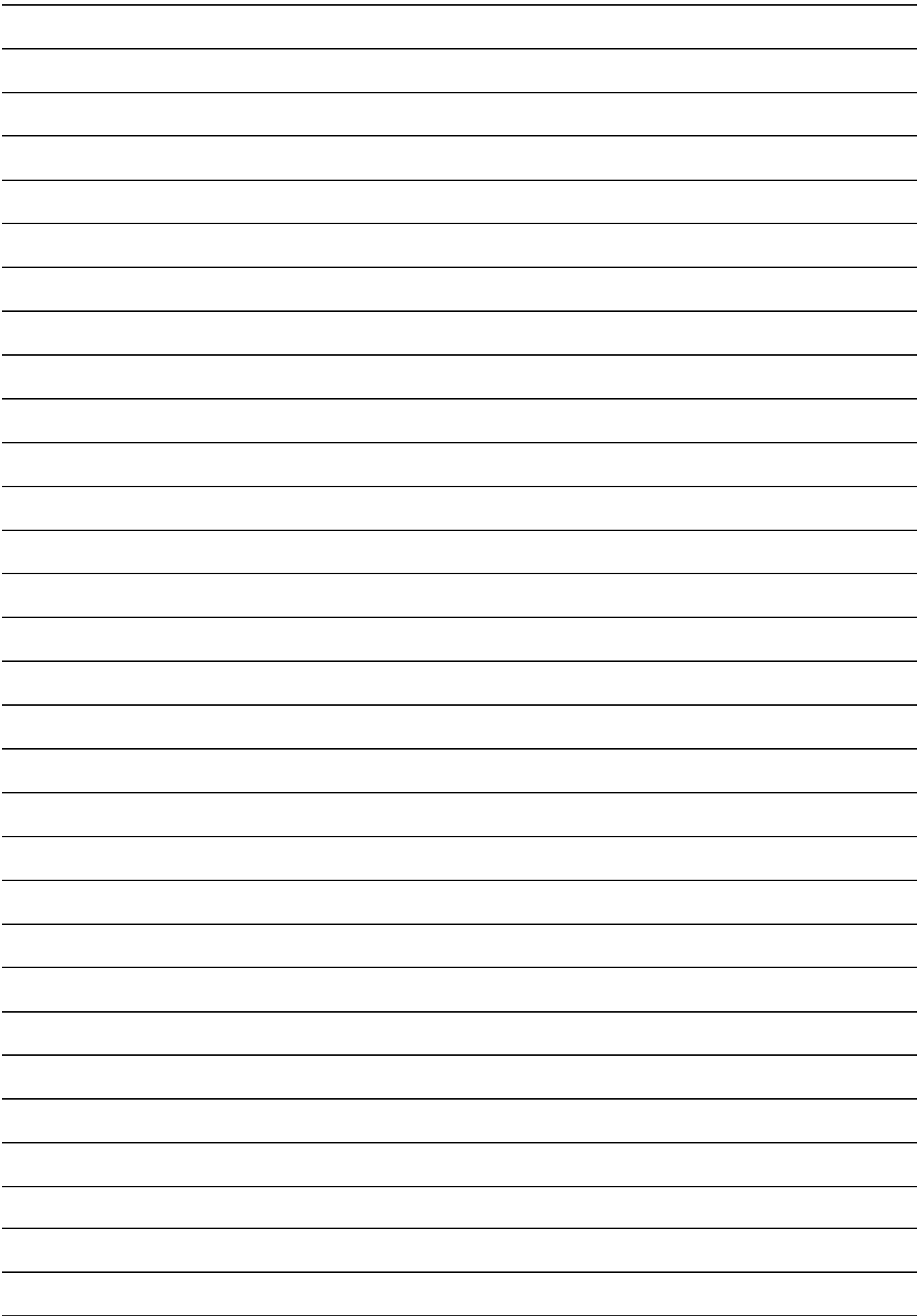
Over the past few hundred thousand years, human ancestors created novel habitats from hunter-gatherer environments to agriculture-based fields and villages, and further to modern civilized technological cities. The continuous addition of various novel types of cognitive capacities, including the manufacture and use of tools and the establishment of linguistic faculties, are most likely to have driven these ecological developments. The dramatic expansion of the hominin brain, accompanied by the addition of novel areas, progressed together with such evolution. Hence, humans have constructed novel "niches" for each of these ecological, cognitive and neural domains. Interactions among these three classes of "niches" should have accelerated hominin evolution, which seems too remarkably rapid to have simply been driven by natural selection through accidental environmental changes. That is, environments have dramatically modified, not as a cause of hominin cognitive evolution, but rather as a result of it, and this has in turn put selective pressure on brains to adapt to the modified environments. Enhanced brain functions constitute the bases for further novel cognitive functions and

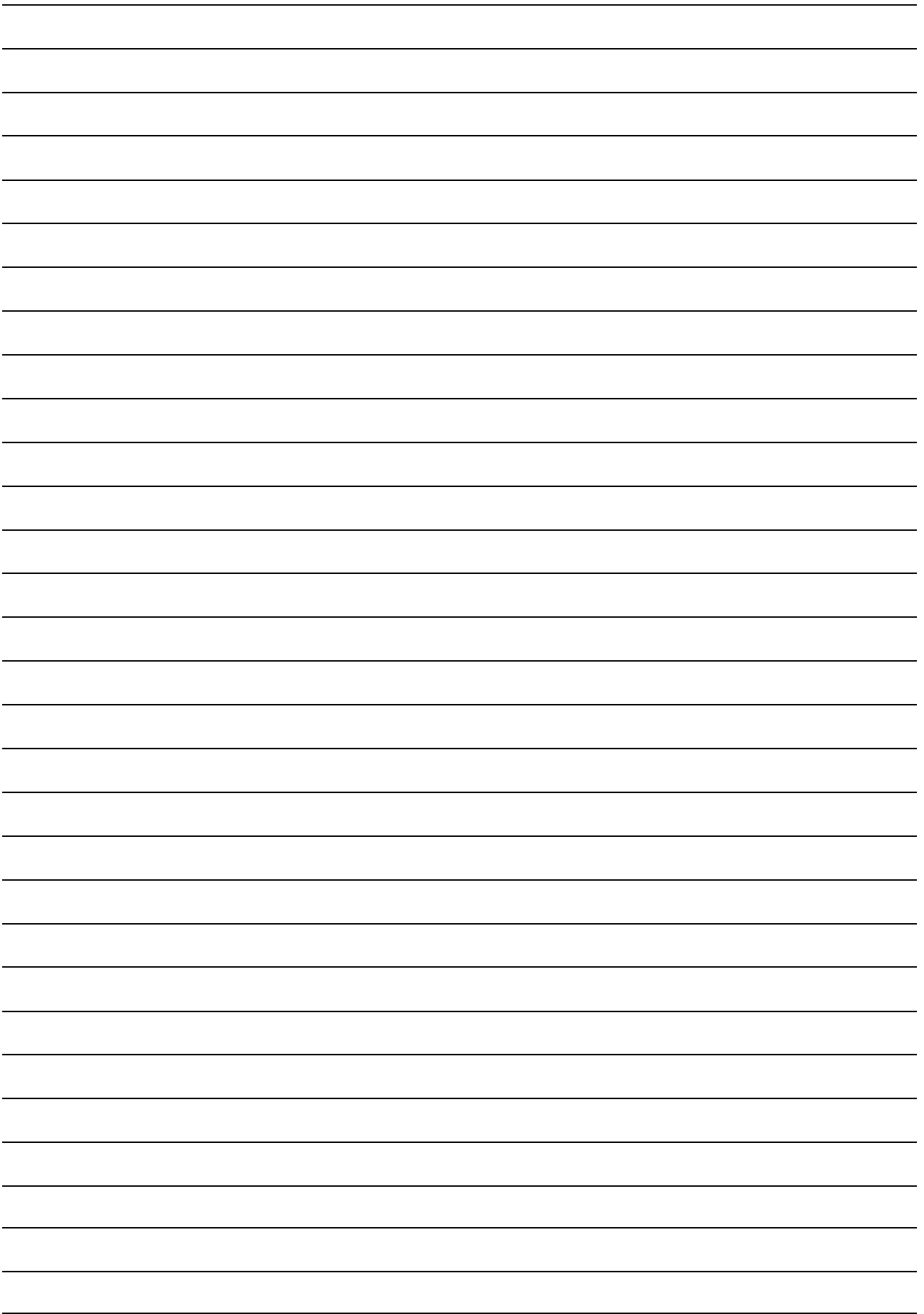
accordingly modified environments, thus comprising “triadic niche construction”. Hence, human higher cognitive activity could be viewed as one of the parts comprising a holistic terrestrial ecosystem.

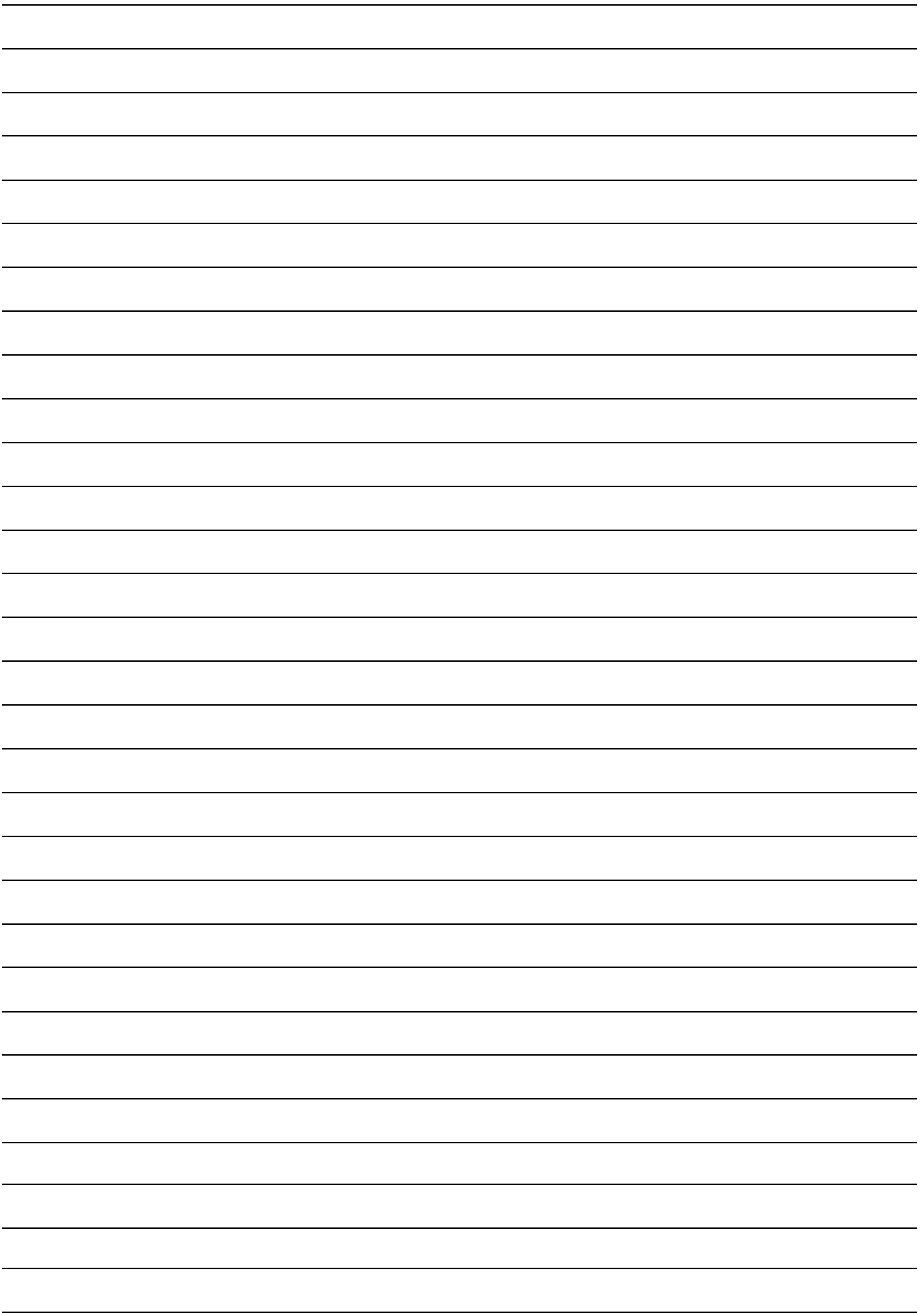
What is uniquely human? A view from comparative cognitive development in humans and chimpanzees

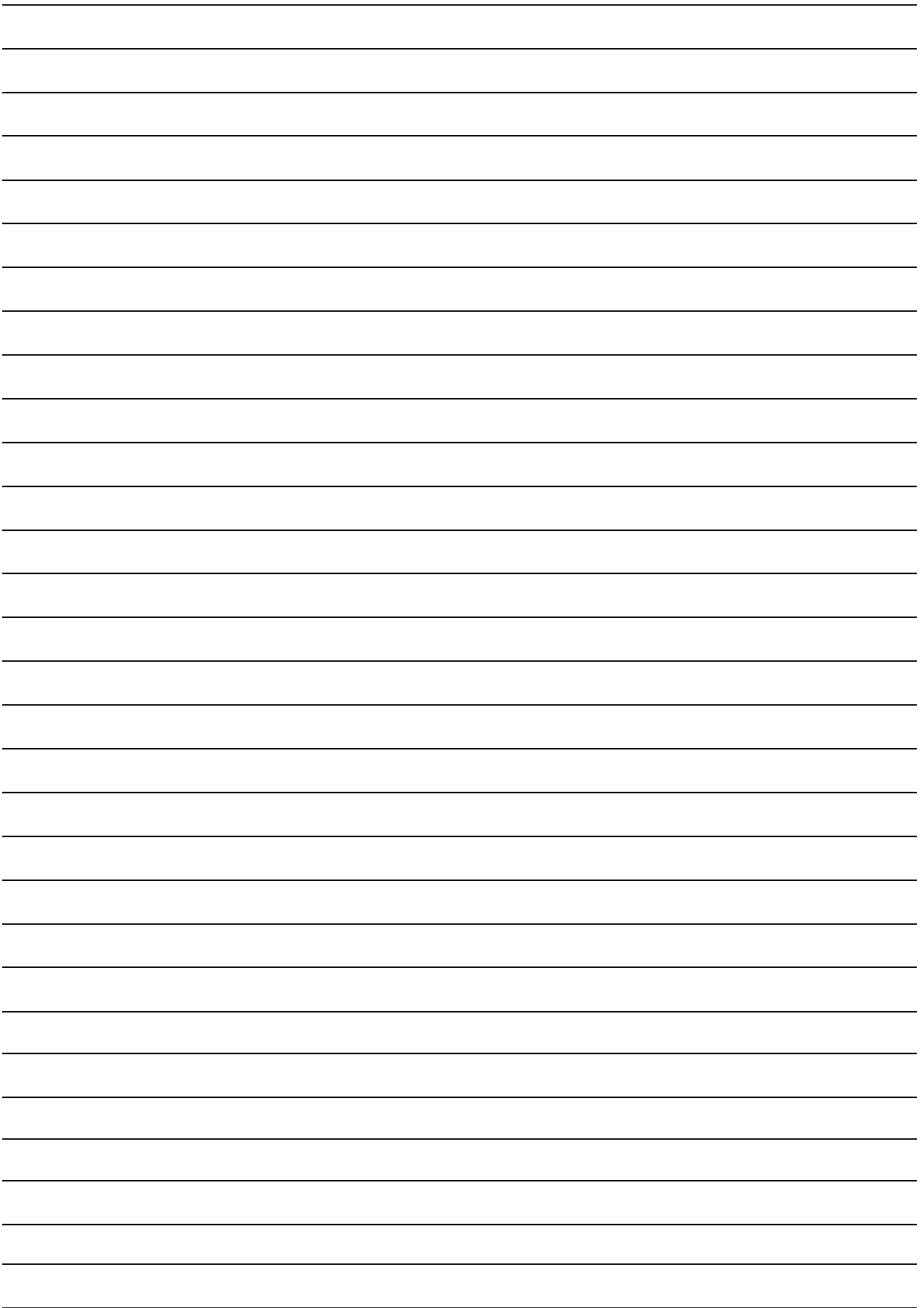
Tetsuro Matsuzawa (Primate Research Institute of Kyoto University, Japan)

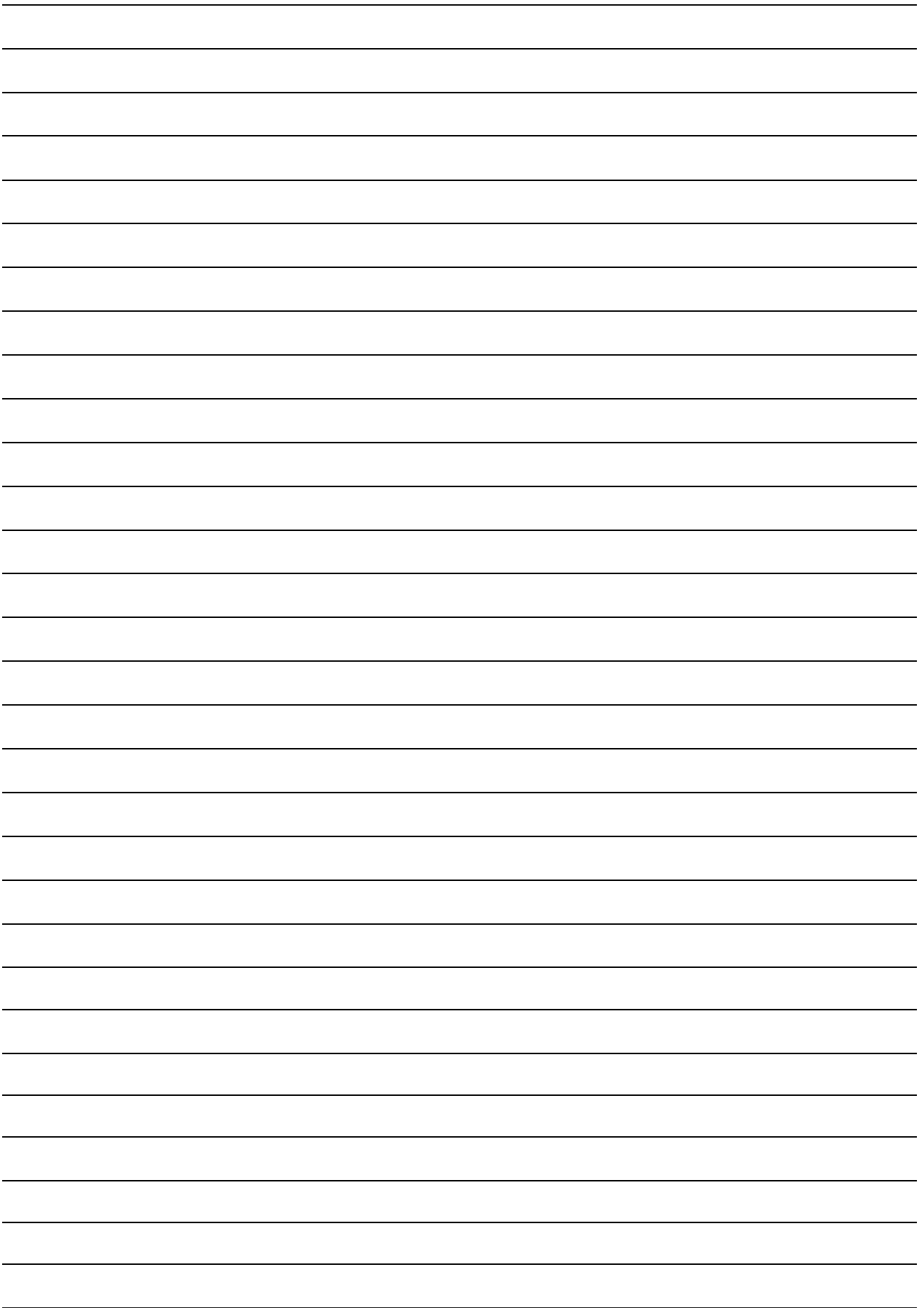
What is uniquely human? Where did we come from and how did we get here? In this talk I attempt to provide answers to these questions based on the study of chimpanzees. By definition, hominins (including both modern humans and their ancestors) are primates who maintain an upright posture and move by bipedal locomotion. However, bipedalism itself may not have been the primary impetus in the evolution of modern humans. Other, currently neglected factors may also have played a role, such as the stable supine posture unique to human neonates from right after birth. The supine posture enables face-to-face communication, vocal exchange, and object manipulation as a precursor of tool use. Recent progress in the comparative study of cognition has also pointed out the superiority of young chimpanzees to adult humans in an immediate memory tasks. The two species additionally differ in a number of cognitive domains. Among them, human cognition can be characterized by the power of imagination. Chimpanzees live in a world of the here and now. In contrast, humans can reflect over centuries of the past, and think ahead to many future centuries. Following a natural disaster on the other side of the planet, they feel empathy towards people they have never met. This talk aims to elucidate evolutionary scenarios that may have allowed humans to develop the powerful cognitive capacity of mental travel.

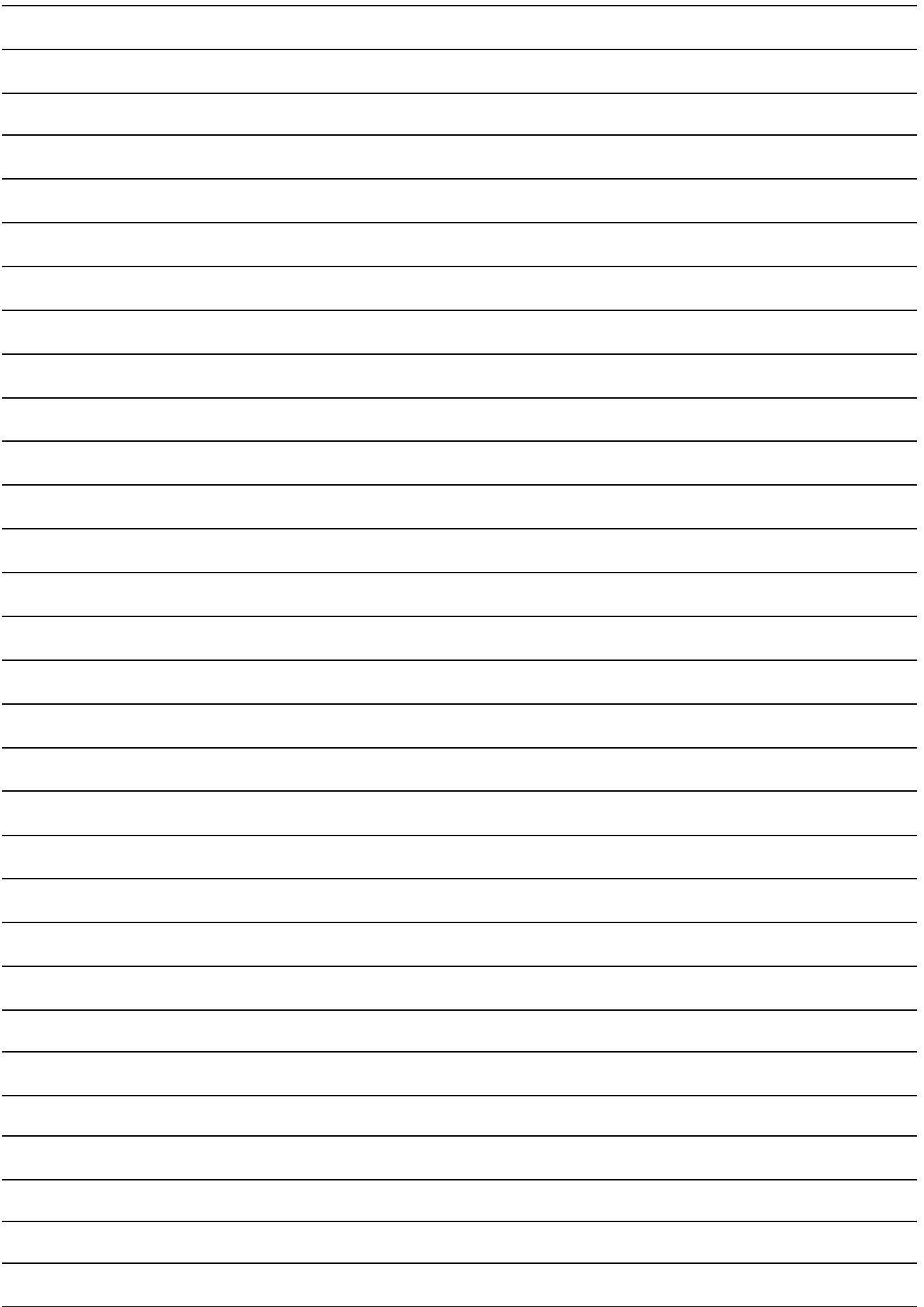


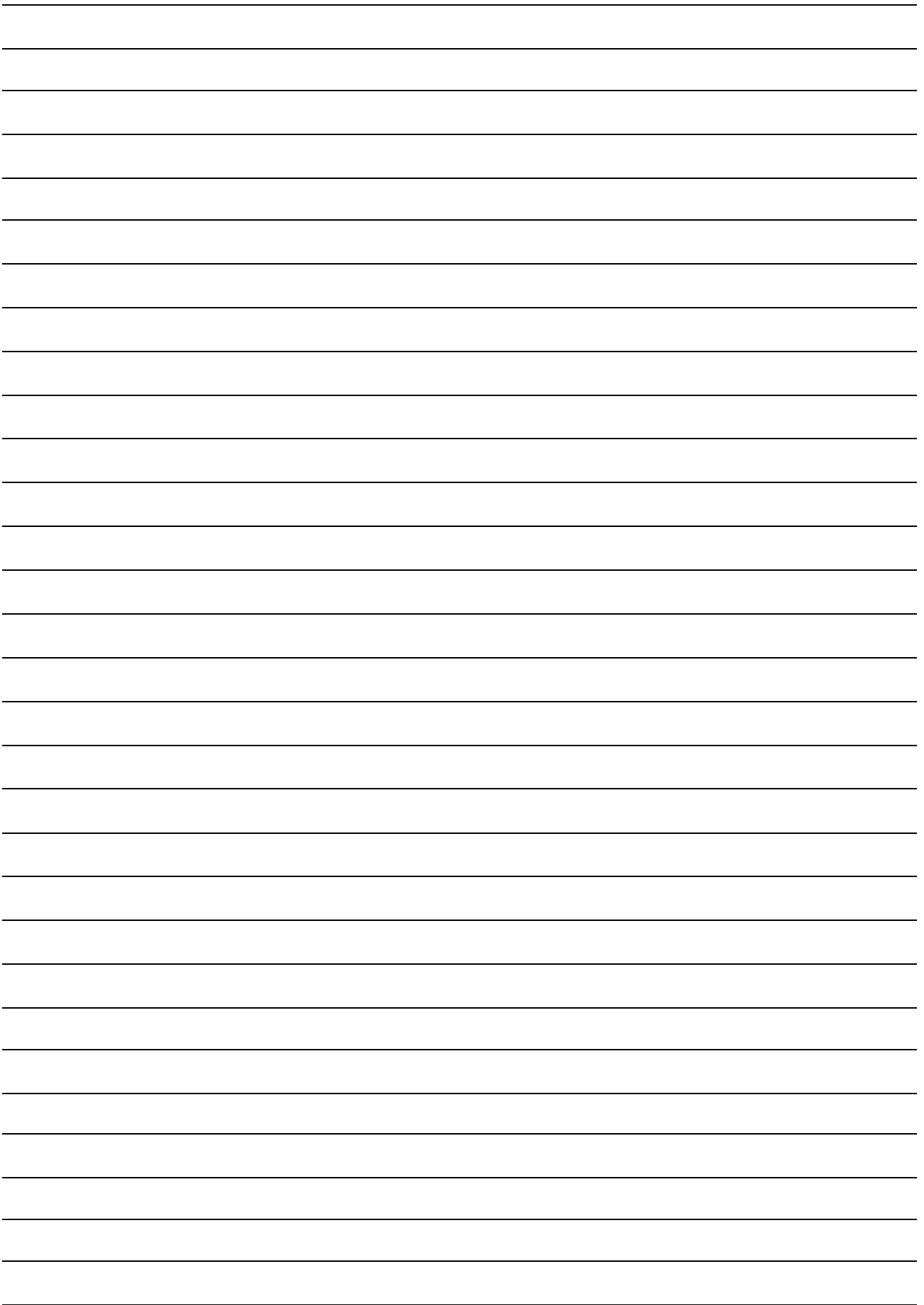


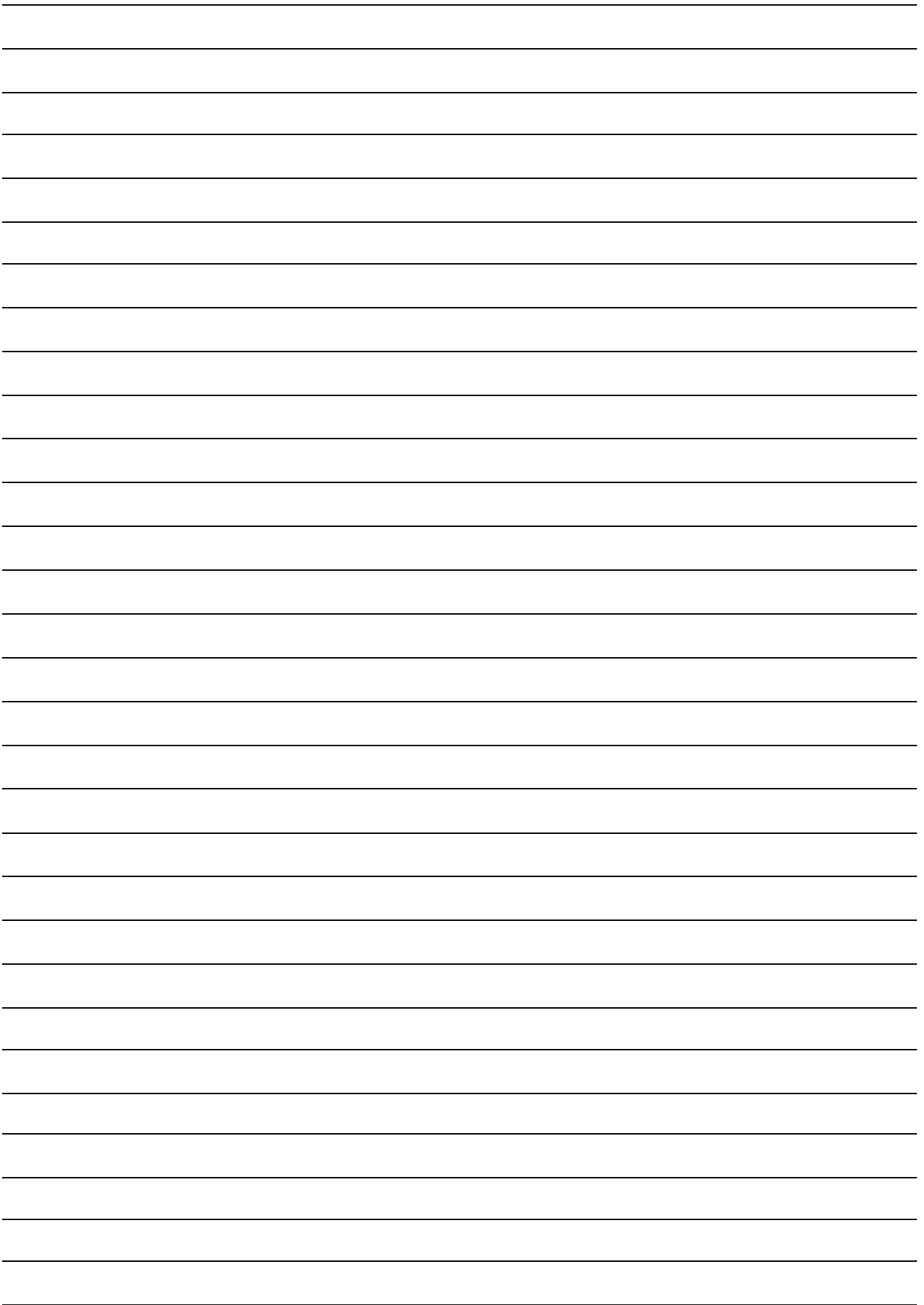


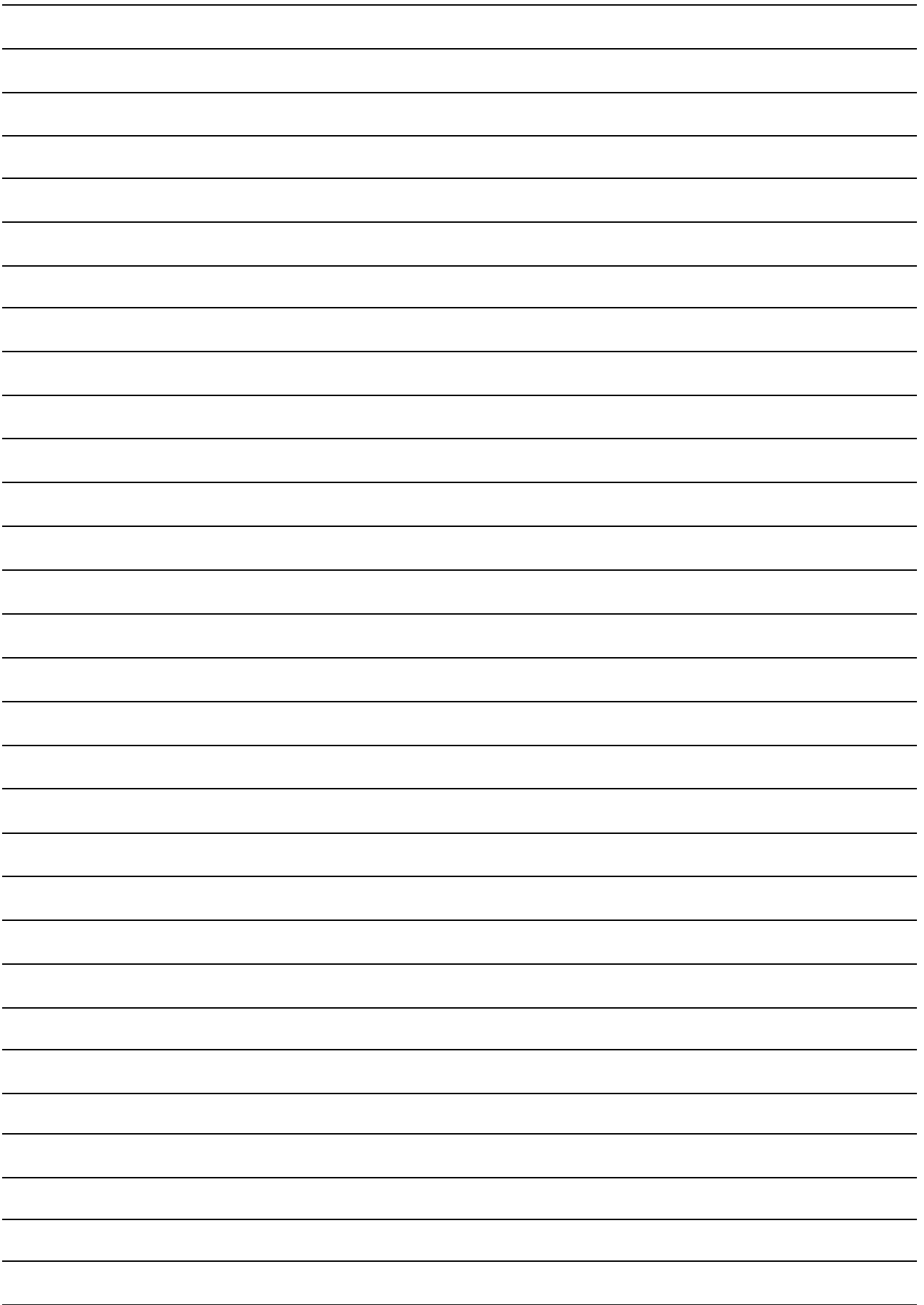


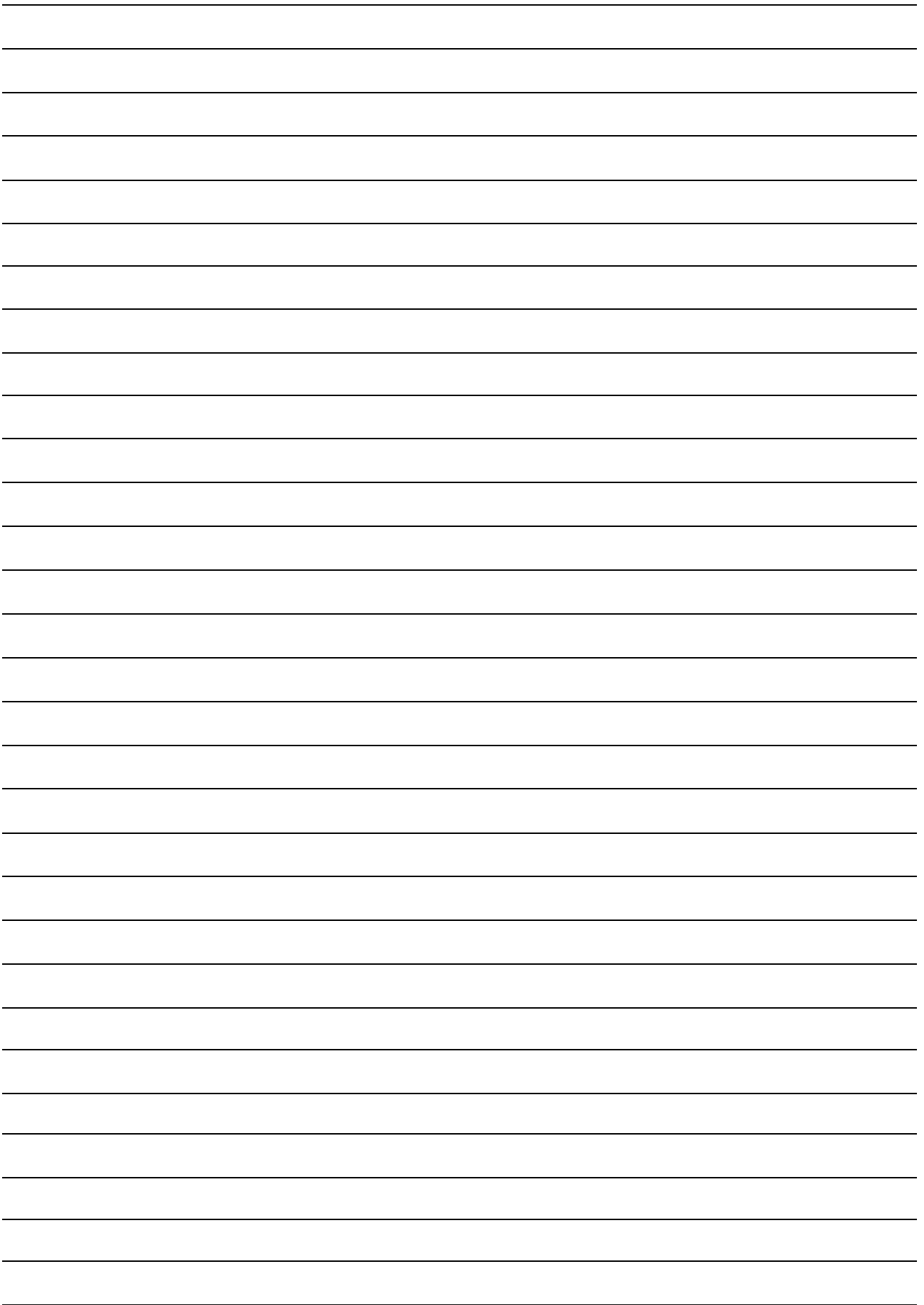


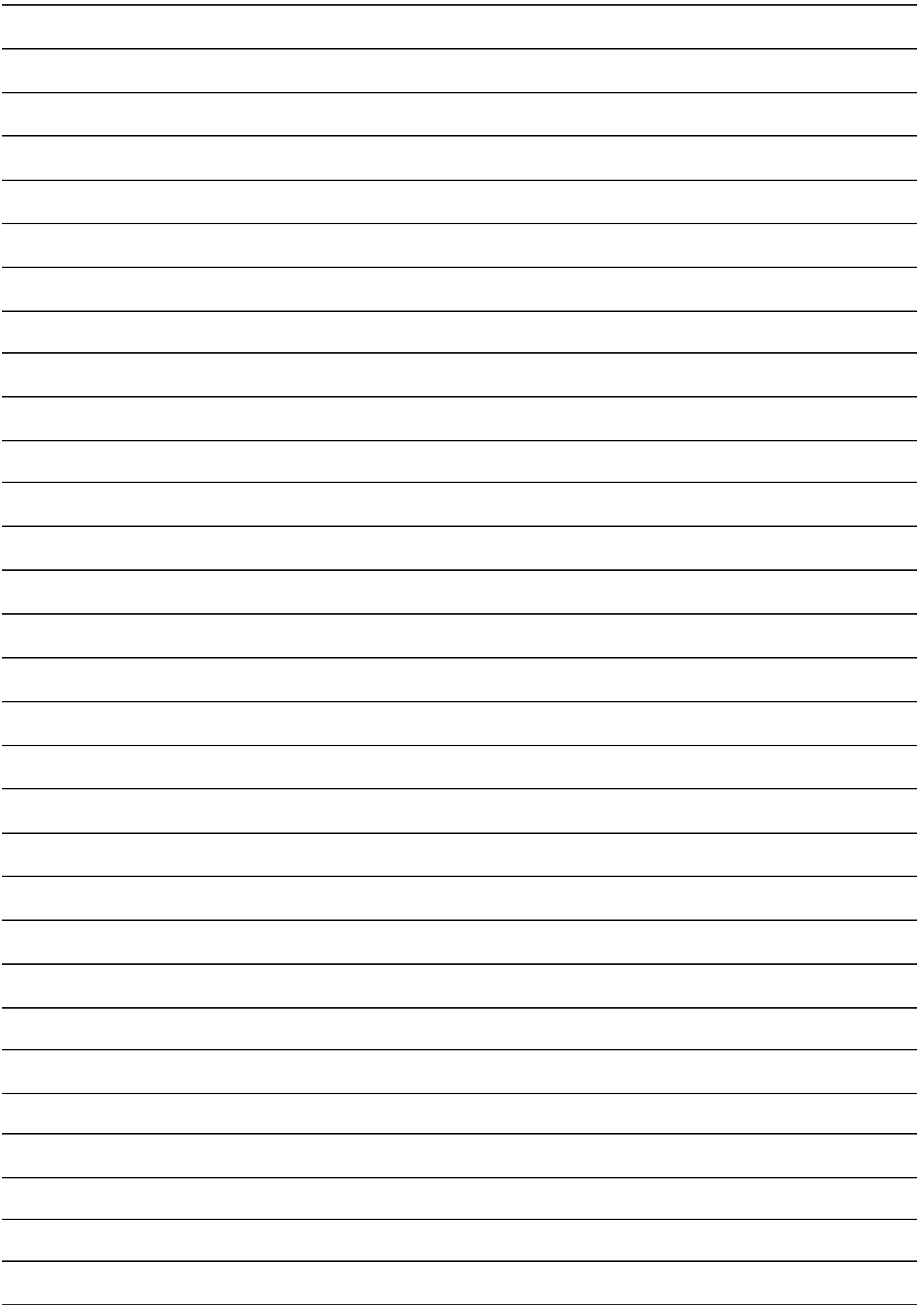


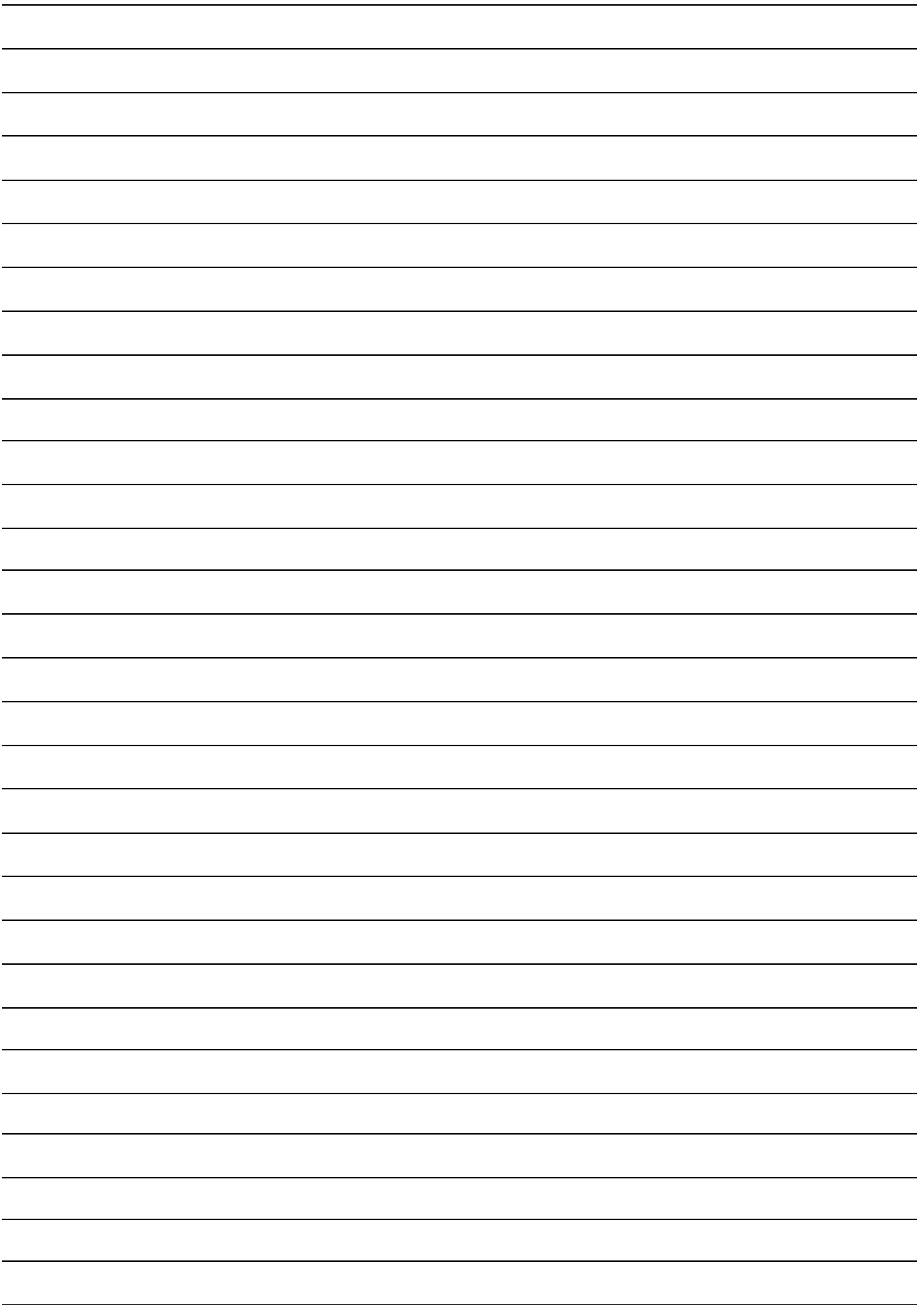


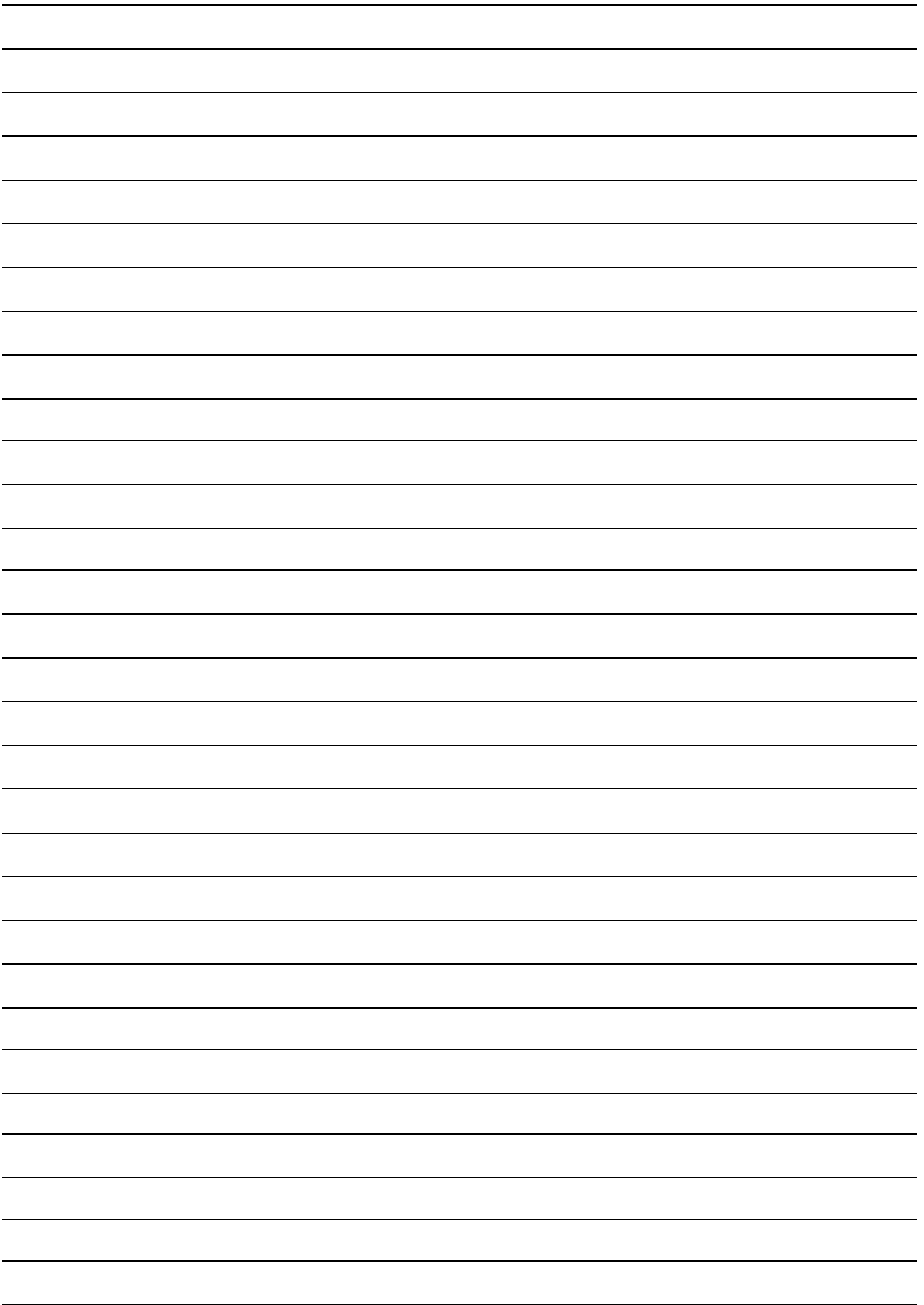












The Mentor Event

at ASSC15 Kyoto by The ASSC Student Committee

The event is organized to help students meet faculty working in their field of interest, and discuss research and career related questions. Each mentor will meet with 2-4 students and lunch will also be provided. This year, the mentor lunch will take place during the scheduled lunch break on 10th June. We have arranged an exceptional group of mentors this year including: Ralph Adolphs, Roy Baumeister, Tristan Bekinschtein, Ned Block, Melanie Boly, Olivia Carter, Robert Hampton, Nichols Humphrey, Fiona Macpherson, Tetsuro Matsuzawa, Thomas Metzinger, Tony Ro, Shinsuke Shimojo and Naotsugu Tsuchiya.

Satellite symposiums

1. Social Neuroscience Satellite

Genetic, cellular, and cognitive approaches to understanding social behavior

-A joint Tamagawa University-Caltech Lecture Course-

Dates: 7th and 8th, June 2011

Venue: Kyoto University Clock Tower Centennial Hall

2. Social Neuroscience Satellite

Metacognition and Consciousness: from animals to humans

Date: Wednesday 8th (9am - 5pm), June 2011

Venue: Large Conference Room on 3rd Floor of Inamori Center at Kyoto University

3. Social Neuroscience Satellite

Neurophysiology of Attention and Awareness

Date: Monday 13th (9:30am - 4:10pm), June 2011

Venue: The Clock tower at Kyoto University

The photo exhibition of the wild chimpanzees at Bossout

Date: From May 30th till June 27th

Place: The clock tower 1st floor, University Lounge (see page2)

The life of wild chimpanzees at Bossou

Welcome to our photo exhibition documenting the lives of wild chimpanzees at Bossou. The small village of Bossou is located near Mount Nimba, West Africa's largest mountain range designated by UNESCO as a natural World Heritage Site. A small group of chimpanzees inhabit the forests surrounding Bossou. An international team coordinated by the Primate Research Institute of Kyoto University has carried out long-running research here since 1976. Bossou chimpanzees are well known for their use of various kinds of tools. For example, they use a pair of stones to crack open oil-palm nuts in order to access the nutritious kernel. In 2011, we published the book "The chimpanzees of Bossou and Nimba" (Springer), which provides a unique overview of our research team's collective efforts over the decades. To celebrate the book's publication, we decided to organize this photo exhibition. Two British photographers, Anup Shah and Fiona Rogers, visited Bossou between December 2010 and February 2011. They took many photos illustrating the daily lives of chimpanzees at Bossou. Please take a look and enjoy the charm and beauty of wild chimpanzees and their surroundings. The photos can also be viewed on the photographers' website at <http://www.shahrogersphotography.com/>

Tetsuro Matsuzawa

Primate Research Institute, Kyoto University



The exhibition of the Ai Project

Date: From June 6th till 27th

Place: The clock tower 1st floor, Historical Exhibition Room (see page2)

Introduction to the Ai Project

Welcome to the Ai Project exhibition! The Ai project is a long-running scientific endeavor that aims to illuminate the mind of the chimpanzee. The project was named after the chimpanzee Ai, the principal research partner. On April 15th, 1978, Ai touched a computer keyboard for the first time. Since then, she – along with her fellow chimpanzees at the Primate Research Institute – has helped many researchers study various aspects of the chimpanzee mind, such as perception, memory, language, imitation, cooperation, and so forth. Since 1986, we have also been studying a group of wild chimpanzees at Bossou, Guinea, West Africa. Members of this community use various kinds of tools, including a pair of stones to crack open oil-palm nuts. Based on the long-term relationship between mother and infant, there is a unique chimpanzee way of learning called “education by master-apprenticeship”. In the year 2000, three chimpanzee mothers at the Institute gave birth within a few months of each other. We developed a novel approach based on participant observation to study cognitive development in infant chimpanzees: although the PRI infants were being raised by their biological mothers, we tried to be closely involved in many aspects of their daily lives. In 2010, we also launched cognitive studies of wild bonobos, another species of chimpanzee living in the Congo Basin. Thus, we have made parallel efforts in the laboratory and in the wild, in order to take a holistic approach to understanding the minds of chimpanzees, our evolutionary neighbors. The key question for us is: what is uniquely human? Where did such uniqueness come from? How did we become what we are today? Please enjoy browsing through our past and present efforts in uncovering the evolutionary basis of the human mind.

Tetsuro Matsuzawa

Primate Research Institute, Kyoto University



Visit to Temples, Shrines, and Gardens in Kyoto

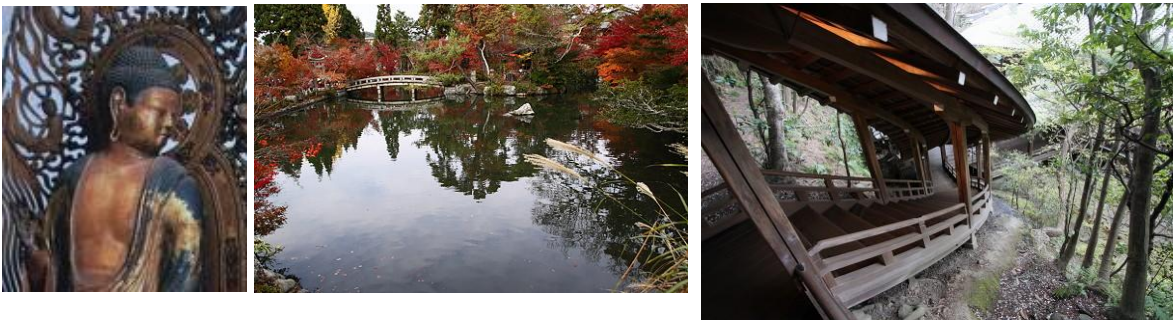
Kyoto was the capital of Japan for more than 1000 years. There are so many Buddhism temples, Shinto shrines, and gardens. We picked up several ones near the university campus. Please touch the past and the essential part of Japanese culture, beauty, and wisdom. Thank you.

Yoshida-yama, Shrine, and Shinnyodo

The small hill you can see from the campus is called Yoshida-yama. There is a shrine there. It is only 5 min walk from the campus. Please go through the hill, you can see the beautiful tower of Shinnyodo temple.



Eikando temple



Kiyomizu temple



There are, of course, a lot more places to see. Please go to the ASSC15 reception desk to get the information about these facilities and for instructions on how to get there. The temples are usually open from the morning till the evening every day. There are some cases of opening the temples in the night: You can enjoy the night view. Both temples and shrines are the religious places. Please keep it in your mind. Please bring this program to the places. This may help you get back to the conference place of the ASSC15 meeting. Thank you.

Visit to Honen-In temple

Honen-In temple is one of the most elegant temples in Kyoto. It was founded in 1680 in its present location. A 20-minute walk from the university campus will take you to Honen-In. The temple is usually open to the public only twice a year, for a total of just two weeks: April 1st - 7th and November 1st - 7th. Thanks to the head monk, Mr. Shinsho KAJITA, who is interested in the scientific approach to the human mind and consciousness, we are pleased to inform you this special offer. You are invited to visit inside the temple, to spend some quiet moments viewing its beautiful gardens and Buddha. Please go to the ASSC15 reception desk to collect your special permit to visit the temple and for instructions on how to get there. The temple is open to us on the 9th, 10th, and 12th, for a limited time (please confirm these visiting times with the reception desk). Please bring this program to the temple to verify that you are a participant of the ASSC15 meeting. Thank you.



Hōnen (May 13, 1133 - February 29, 1212) was a religious reformer and founder of the first independent branch of Japanese [Pure Land Buddhism](#) called “[Jōdo shū](#)”, meaning "The Pure Land School". Next year, 2012, will commemorate the 800th anniversary of his death. In one of his most famous teachings, he advised: “Only repeat the name of Amida with all your heart. Whether walking or standing, sitting or lying, never cease the practice of it even for a moment.”

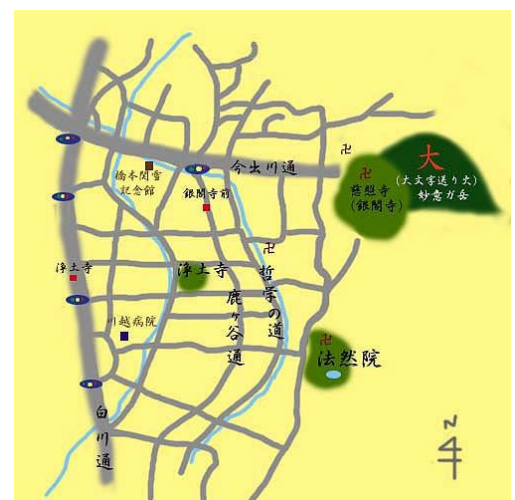


Photo of the front cover:
Young male chimpanzee named Jeje
(photo: Tetsuro matsuzawa, edit: Ikuma Adachi)

Photo of the back cover:
Stone tool use by wild chimpanzees at Bossou
(photo: Etsuko Nogami)



The 15th Annual Meeting
of
The Association for the Scientific Study of Consciousness
(June 9-12, 2011, Kyoto)

Sponsored by
the Priamte Research Institute, Kyoto University

