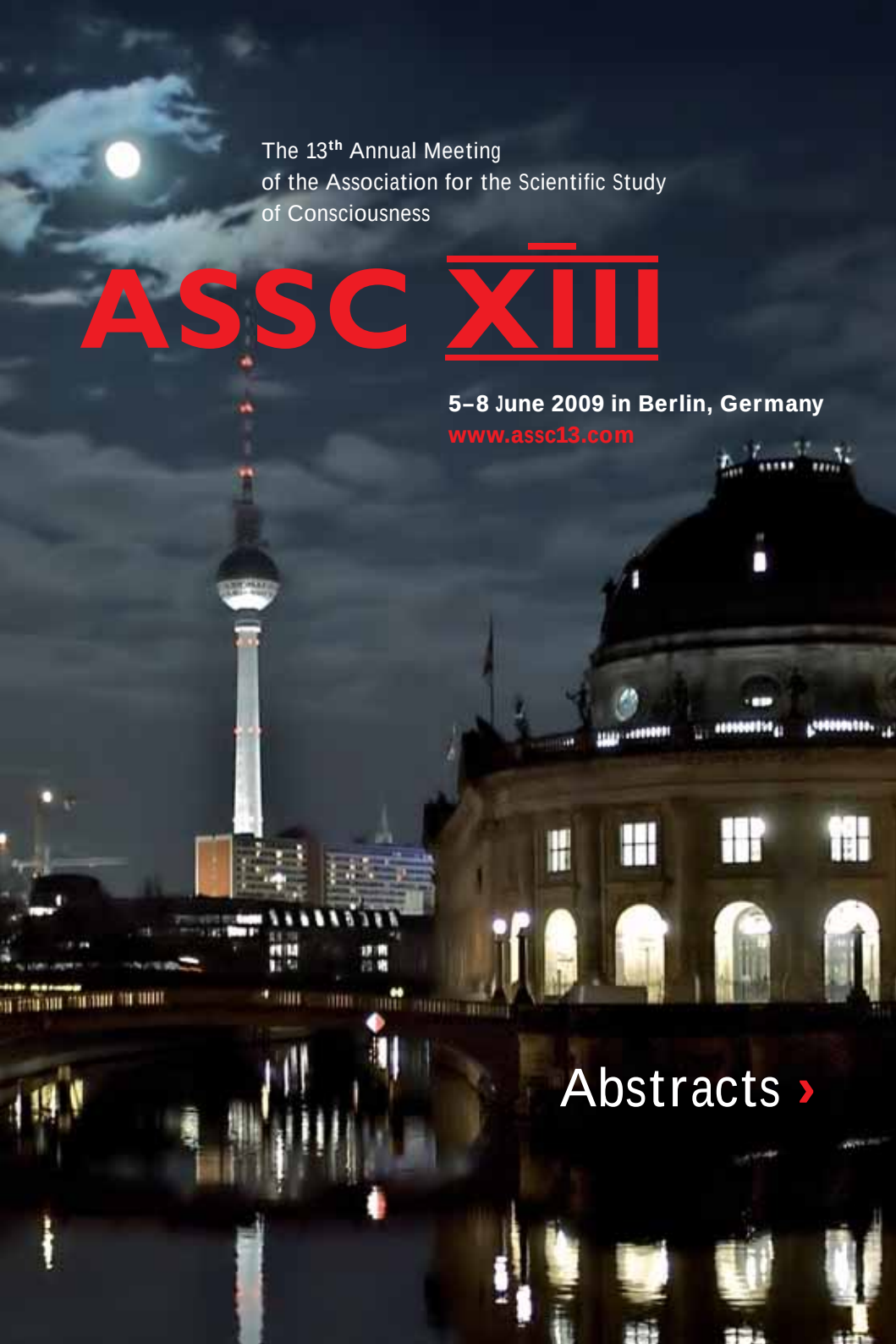

The 13th Annual Meeting
of the Association for the Scientific Study
of Consciousness

ASSC XIII

5–8 June 2009 in Berlin, Germany
www.assc13.com

Abstracts ›

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IMPRINT

Editor Patrick Wilken

Design and Production Sebastian Lehnert, Munich (www.deskism.com)

Printing Biedermann Offsetdruck, Parsdorf

EDITORIAL

Welcome to the 13th Annual Meeting of the Association for the Scientific Study of Consciousness

The annual ASSC conferences provide a forum where the most recent developments in the empirical and conceptual study of consciousness are presented and discussed. The vast bulk of the program comes from member presentations. We received just over 300 proposals for talks and posters for this year's meeting – an increase of about 30% over Oxford – making the final selection of 36 talks and 140 posters particularly difficult. The shear depth and quality of the proposals, evident in the abstracts in this book, is testimony to the vitality and breadth of this field.

Over 40% of attendees at the conference are students. So it is fitting that the student committee of the ASSC – Chien-Hui Chiu, Joel Parthemore, Sundeep Teki, along with the tireless local help of Kati Hennig – have once again been very active on their constituents behalf. In addition to organizing a mentoring program to link up more "senior" attendees with students, the committee has organized a special "student party for students" on the Saturday night, to allow students to meet up and exchange information with each other in a relaxed environment. The student committee has also organized a prize for best student poster presentation in philosophy. On behalf of the students we would like to thank all those who agreed to take the time to judge this prize. At the time of writing these include: Ned Block, Robert Clowes, Uriah Kriegel, Tobias Schlicht, and Michael Tye.

The conference has benefited from the help of many individuals and institutions.

A special thanks is owed to Annette Winkelmann, the managing director of the Berlin School of Mind and Brain, who has worked tirelessly to help make this conference a success. Organizing the meeting would have been a far more trying and difficult process without her constant and generous support.

We are indebted to the Berlin-Brandenburgische Akademie der Wissenschaften, and its President Günter Stock, for their gracious support, and for kindly allowing us to hold our meeting in such an elegant venue.

We would like to thank the following institutions for their generous financial assistance of the conference: Deutsche Forschungsgemeinschaft (DFG), Berlin School of Mind and Brain, Bernstein Center for Computational Neuroscience Berlin, Carl und Max Schneider-Stiftung, and the Mind-Science Foundation.

Many thanks are owed to the members of the Program Committee – Kathleen Akins, Axel Cleeremans, Frédérique de Vignemont, Christof Koch and Vincent Walsh – who guided the selection of all academic content. In addition, we would like to thank the many people who helped at the local end to make this meeting a success: Katja Crone, Kati Hennig, Boris Kaloff, Isabel Kranz, Sigrun Laws, Sebastian Lehnert, Bryan Miller, Ulrike Roßberg, Michael Schütte, and Kathrin Trauer. We thank all these individuals for making the job of organizing this meeting, both scientifically and administratively, a relatively painless, and dare we say it, enjoyable experience, and without whose involvement the success of the meeting would be far less assured.

On behalf of the organizing committees and the ASSC Board,
JOHN-DYLAN HAYNES, MICHAEL PAUEN, and PATRICK WILKEN
Humboldt-Universität zu Berlin

Overview ›

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University of Memphis, Memphis

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M2 *Manipulating Perception: Misdirection, Magic and Consciousness*
Amory Faber, Gustav Kuhn, and David Edelman

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Uriah Kriegel

M4 *Synesthesia*
Noam Sagiv

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A3 *Neurocognitive Theories of Consciousness*
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Zoltan Dienes
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Abstracts ›

A

Perception of Sharpness is Illusory in Peripheral Vision.

AUTHORS **Felipe Aedo Jury**[1], Delphine Pins[1]
AFFILIATIONS 1 lnfp-cnrs umr8160

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 25

ABSTRACT Visual performance decreases with eccentricity. However, our conscious perception is homogeneous across the visual field and we are unaware of the decrease in our visual sensitivity. An explanation for this phenomenon is that the brain fills in the missing information, probably through iconic memory from saccades, giving rise to the impression of homogeneity across the visual field. As a consequence of this fill-in process misperceptions of sharpness at large eccentricities might occur. Here we test whether perception is veridical or illusory at different eccentricities. Low-pass filtered, 10 cycles per degree (cpd), pictures of faces and buildings were presented to subjects in central vision for 100 ms. After a delay (1000–1500 ms) a second stimuli was presented for 100 ms at variable eccentricities (0°–48°), whose sharpness was varied through different low-pass filters (3 and 30 cpd). The subject's task was to judge whether the second picture was "sharper" or "more blurred" than the first one. The results showed that for pictures of faces as well as for buildings, subjects rate them as sharper than they actually were. This misperception of sharpness increases as eccentricity increase. Our results then provide further evidence that sense of sharpness in peripheral vision stems from an illusion. To test whether the duration of the second stimuli affects the perception of sharpness we systematically varied its duration (13–300ms). Increasing the duration of the second stimuli leads to a more veridical perception, but this effect interacts with eccentricity. Thus, larger eccentricities require longer stimulus duration to lead to veridical perception. To test whether attention modulates this phenomenon we manipulate spatial

attention. Validly cued trials led to veridical perception whereas invalidly cued trials led to the same misperception of sharpness previously found. Perception of sharpness in peripheral vision is illusory when time pressures are set on the visual system, but they can be overcome when stimulus duration is increased or attention is spatially directed.

How Do We Learn to See the World? On the Development of Conscious Perception

AUTHORS **Thorsten Albrecht**[1], Susan Klapötke[2], Uwe Mattler[2]

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 15

ABSTRACT Backward masking is a technique that is often used in visual science to prevent participants from becoming aware of stimuli. Individual differences in masking effects are often deemed undesirable complications but we think that they might be used to study perceptual learning and the development of conscious perception. We report the spontaneous development of stable individual differences in a metacontrast masking paradigm. Participants performed a discrimination task on targets that were followed by a mask after different stimulus onset asynchronies (SOA). After two days of training two groups of participants could be distinguished: In one group performance increased with increasing SOA, in the other group performance decreased with increasing SOA. Although the difference between groups was negligible at the beginning of the experiment it became successively clear over the course of training, and remained unchanged after several weeks

without training. Findings suggest that participants differ in directing selective attention to one of two aspects of the stimulus display to extract information required to do the task. We think this top-down guidance determines the level in the physiological hierarchy of visual operations where perceptual learning takes place, which might lead to a development of stimulus awareness.

When Seeing Outweighs Feeling: Integration of Somatic and Visual Information in Affective Blindsight

AUTHOR **Silke Anders**
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TYPE Concurrent Session 2
TIME Saturday, 16:30–17:00
PLACE Room 3096, HU

ABSTRACT Affective neuroscience has been strongly influenced by the view that a feeling is the perception of somatic changes and has often neglected the neural mechanisms that underlie the integration of somatic and other information in affective experience. We investigated affective processing in nine cortically blind patients. In these patients, unilateral postgeniculate lesions prevent primary cortical visual processing in one part of the visual field which, as a result, becomes subjectively blind. Residual subcortical processing of visual information, however, is assumed to take place in the entire visual field. These patients show significant startle reflex potentiation when a threat-related visual stimulus is shown in their blind visual field. This is associated with an increase of brain activity in somatosensory-related areas, and an increase in self-reported negative affect. However, when the visual stimulus is presented in their sighted visual field the patients show a remarkable dissociation of somatic response and phenomenal experience of affect: Despite the fact that startle reflex

potentiation was similar when the visual stimulus was shown in the blind or sighted visual field, patients reported significant less negative affect during stimulation of the sighted visual field. This decoupling of phenomenal affective experience and somatic changes was associated with an increase of activity in left ventrolateral prefrontal cortex (VLPFC) and a decrease of affect-related somatosensory activity. These findings demonstrate that similar affective somatic changes can be associated with different phenomenal experiences of affect depending on the level of cortical processing. Tentatively, we suggest that this decoupling of somatic responses and experienced affect and the reduction of negative phenomenal experience observed can be explained by a context-dependent VLPFC-mediated inhibition of affect-related somatosensory activity.

How Can We Experimentally Measure and Induce Emotional Feelings?

AUTHORS **Silke Anders**[1], Raffael Kalisch[2]
AFFILIATIONS 1 Department of Neurology and Neuroimage Nord, University of Lübeck, 2 Department of Systems Neuroscience, University Medical Center Hamburg-Eppendorf
CONTACT silkeanders@gmx.net

TYPE Tutorial A1
TIME Friday, 14:00–17:00
PLACE Room 1, BBAW

ABSTRACT Phenomenal experience of affect is one of the most vivid aspects of consciousness. The study of neural correlates of different kinds of phenomenal experience has made great progress during recent years, but there are relatively few studies that have investigated the neural correlates of affective experience. Affective experiences differ from all other experiences in that they have a valence (they are perceived as positive or negative). At the neurophysiological level, affective experi-

ences might be associated with neural activity in a much more distributed network than phenomenal perception of external events. In this workshop we will first discuss what makes an emotion an emotion and how emotions (and particularly phenomenal emotional experience) can be assessed. This will be followed by a brief review of neuroscientific studies that have attempted to induce and to measure emotional feelings. One focus of this review will be on the experimental paradigms used in these studies and whether they are suited to induce "real" emotional feelings. The second focus will be on the question how we can best relate phenomenal affective experiences to brain processes. Finally, we will (with the help of the participants) ask how neuroscientific research into the neural correlates of emotional feelings can contribute to our general understanding of the neural correlates of phenomenal experience.

Vision and Perceived Simultaneity

AUTHOR Valtteri Arstila
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TYPE Symposium 3: Talk 3
TIME Monday, 10:30–12:30
PLACE Leibniz-Saal, BBAW

ABSTRACT The simultaneity of external events does not imply that these events are perceived as simultaneous. Likewise, events that are perceived as simultaneous do not necessarily occur simultaneously. On the other hand, when two stimuli are not perceived as simultaneous, one would assume that their temporal order can be determined. Yet this is not the case. In this talk, we consider these issues in the context of vision. It will be argued that this visual simultaneity is due to mechanisms that are largely independent of mechanisms related to temporal

order judgments. Visual simultaneity is nevertheless a transitive relation: if events A and B are perceived as simultaneous and events B and C are perceived as simultaneous then A and C must also be perceived as simultaneous. This latter claim has been challenged by some philosophers and by recent work in cognitive neuroscience.

Out-of-Body Touch: Multisensory Mechanisms of Self-consciousness

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TYPE Concurrent Session 4
TIME Sunday, 16:30–17:00
PLACE Room 2097, HU

ABSTRACT The spatial unity between self and body can be disrupted by employing conflicting visual-somatosensory bodily input, thereby bringing neurological observations on bodily self-consciousness under scientific scrutiny. Here we designed a novel paradigm linking the study of bodily self-consciousness to the spatial representation of visuo-tactile stimuli by measuring crossmodal congruency effects (CCEs) for the full body. The crossmodal congruency task has been employed in a number of studies (e.g. Spence et al., 2004; Pavani et al., 2000) to investigate multisensory spatial representations, e.g. it has been used to assess the influence of mirrors, tools and rubber hands on the representation of visuo-tactile space. In the most commonly used design, foam blocks are held in the hands, and vibrator-light (LED) pairs are placed near the thumbs and index fingers of both hands. Subjects make speeded elevation (up/down) judgments of the vibrotactile stimuli while ignoring light stimuli. Subjects perform worse when the light is presented at an incongruent elevation to the vibration and this effect is larger

when the stimuli are closer to each other in space. Here we measured full body CCEs by attaching the four vibrator-LED pairs to the trunks (backs) of subjects who viewed their bodies from behind via a camera and a head mounted display (HMD) (as in Lenggenhager et al., 2007). To modulate self-identification for the seen body subjects were stroked on their backs with a stick and the felt stroking was either synchronous or asynchronous with the stroking that could be seen via the HMD. We found that (1) tactile stimuli were mislocalized towards the seen body, (2) CCEs were modulated systematically during visual-somatosensory conflict when subjects viewed their body but not when they viewed a body-sized object, i.e. CCEs were larger during synchronous than during asynchronous stroking of the body and (3) these changes in the mapping of tactile stimuli were related to predictable changes in bodily self-consciousness. These data reveal that systematic alterations in the mapping of tactile stimuli occur in the full body illusion and thus establish CCE magnitude as an online performance proxy for subjective changes in global bodily self-consciousness.

What Matters for Perceptual Consciousness? A (Non) Empirical Question

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 46

ABSTRACT Some philosophers endorse the traditional view that nothing outside the brain is part of the minimal substrate of perceptual experience (Block, 2005). Others philosophers claim that perceptual experience depends on outside-the-brain factors (Noë, 2004, 2007).

There are two main ways in which this dependency between non-neural processes and experience can be understood. Only one of them is actually an (extended) alternative to the traditional view. According to the radical reading, the specific fine-grained details ofn organism's body and the characteristic ways in which she interacts with objects and properties, are said to be a constraint on perceptual experiences. It follows from this that perceptual experiences of differently embodied organisms with different sensorimotor routines cannot be identical to our own. According to a moderate reading, however, the fine-grained details of an organism's body are not a constraint on perceptual experience. Perceptual experience ultimately depends on representations and computational processes that are insensitive to details of implementation. Thus, differently embodied organisms could in principle have the same perceptual experience, as long as they have access to the same gross information and then can form the same internal representations.
It is an open empirical question whether every difference in embodiment makes a difference to the content and character of any conscious perceptual experience that ensues. According to the moderate view, the defender of the radical (extended) alternative is not offering any evidence to decide the empirical question. The radical conclusion (that differently embodied organisms necessarily inhabit different perceptual worlds) is not proven. My goal here is to show that there is no possibility of deciding this debate empirically. As the debate is introduced in Clark (2008), it seems that what he calls an open empirical question is not a possible empirical goal for the radical defender. With the aid of an empirical illustration (the case of tactile-visual sensory substitution, Bach y Rita & Kercel, 2003), I will conclude that the allegedly empirical question is, in fact, not empirical at all: no empirical evidence could possibly refute the moderate reading because she already assumes that experience is multiply realizable.

B A New Method Convenient for Studying NCC-dn as Different from NCC-n, As Disentangled from Attention

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TYPE Concurrent Session 1
TIME Saturday, 14:30–15:00
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ABSTRACT The nasty obstacles for productive research on NCC include (i) confounds of attention and awareness effects, (ii) confounds of subjetive awareness variability with objective stimulus variability, (iii) anisochrony or temporal uncertainty of NCC signatures of awareness-necessary brain processes with regard to the corresponding direct phenomenal experiences in real time, (iv) spatial overlap between the target stimuli for measurement of their awareness and the interfering stimuli used to cause variation in target awareness (e.g., as in masking, attentional blink, binocular rivalry). The best methods so far free from some of these shortcomings are continuous flash suppression in rivalry, standing wave illusion of invisibility, motion-induced blindness, and visual afterimages (e.g., Lou, Tsuchiya, Koch, Blake, Bonneh, et al.). Here, I present a new method that is free of all the above mentioned problems and demonstrate it on screen. Subjects adapt to different coloured objects; afterimages are created. At the onset of the otherwise blank display used as a background for afterimages experience, a word signifying a target colour is presented right near the continuously visible fixation dot. While continuing to keep visual fixation, subjects have to report whether the target-coloured afterimage object disappeared before other objects or not. Spatially attended target-coloured afterimages tended to disappear first more often than other afterimage-objects when compared to the theoretically expected chance frequency. Thus phenomenal experiences counteracting attention, free of direct presence of the objective sensory input, spatially separated for convenient selec-

tive brain-scanning of cortical activity from the corresponding receptive field, and clearly markeable in terms of phenomenal onset and offset, are brought about. Importantly, this method is a little step forward in helping to distinguish between NCC that could reflect necessary prerequisites for awareness, but uncertain in terms of direct timing of the emergence and disappearance of phenomenal experiences (NCC-n) and NCC-dn that could be a sign of necessary prerequisites for awareness and also bear one-to-one correspondence with phenomenology in real time.

Implicit Learning of Likes and Dislikes

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 113

ABSTRACT Evalautive conditioning (EC) is a process of changing the evaluation of initially neutral stimulus (conditioned stimulus – CS) due to its repeated pairing with either positive or negative stimulus (unconditioned stimulus – US). As such it is regarded as a basic learning process that results in forming attitudes and preferences. Conscious awareness impact on EC is now a question of considerable debate. Specifically, there is no consensus whether EC requires subject's awareness of CS-US contingencies as well as awareness of stimuli themleves. The presented research examines whether EC is possible without perceptal and contingency awareness. During conditioning phase CS-US pairings were presented to subjects with either CS (Experiment 1) or US (Experiment 2) presented subliminally to check whether perceptual awareness facilitates EC. EC effect was present in both direct and indirect evaluations of conditioned stimuli. In Experiment 3 both CS and US

were presented subliminally. Again, the EC effect was detected both in direct and indirect evaluations. Those results indicated that perceptual awareness is not a necessary condition to acquire evaluative responses. In Experiment 4 attentional resources were manipulated by applying secondary task in conditioning phase. The data showed intact EC suggesting that the process is fairly independent of conscious attention. In conclusion, we argue that evaluative conditioning is a form of implicit learning that does not require neither conscious awareness of what is being conditioned nor attentional resources devoted to change human preferences and evalauations.

Representationalism and the Structure of Conscious Experience

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 31

ABSTRACT In this paper I present a novel argument in favour of representationalism. Representationalism is the thesis that the phenomenal character of all mental states is determined by, or supervenes on their representational properties. The debate about representationalism is important because once we show that representationalism is true, we have very good reasons to believe that the specific way we consciously experience our various mental states can be explained by an adequate theory of representational content. My argument starts from the observation that our conscious mental states are epistemically significant for us in virtue of having a specific phenomenal character. More specifically, any two phenomenally different mental states have different epistemic significance. To argue for this core idea I make use

of two sorts of facts: 1. facts about the complex evaluative and comparative abilities that we, subjects of experience, have with respect to the phenomenal character of our own mental states, and 2. facts about the structure that our conscious experience exhibits. This enables me to make more precise what it means for a mental state to be epistemically significant in virtue of having a specific phenomenal character, and to show subsequently that differences in epistemic significance of this kind just amount to differences in representational content of a specific form. As a result, the paper not only establishes the representationalist thesis, but also shows which kind of theory of content can explain the specific phenomenal character of our various conscious mental states.

What Unconscious Pain Tells Us About Consciousness

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 48

ABSTRACT Nociceptive input and algic experience are relatively independent phenomena and together with unconscious pain belong to the phenomenology of pain. To demonstrate it, it is necessary to integrate different perspectives as phenomenological theories on subjective experience of pain, analytical remarks about epistemology of pain, and research findings on neuronal correlates of conscious and unconscious pain. It is important to clarify whether those approaches may shed further light on the nature and function of the consciousness. Research on pain stresses the value of subjective experience. On the other hand, objective damage to tissues is the starting point for an

empiric approach to pain. Furthermore, an important element of pain is considered its verbalization. The subjective experience of pain and its verbalization are separable phenomena. If we identify conscious pain with "what it is like to be" (Nagel 1975) in that state, what answer is possible to give to the question: What is pain without its subjective experience? Clinical and neuropsychological studies have yielded to the surprising result of the existence of unconscious pain. "An injured soldier and athletes can deny that they are in pain without qualifications or acknowledgment that they might be apprised of considerations that would lead them to change their mind" (Hill 2006). Thus we need other parameters to define the algic experience. We must take into consideration the neuronal bases of pain. The somatosensory brain areas s1 and s2, the posterior parietal cortex, the insula and the anterior cingulate cortex constitute the "pain matrix" (Melzack 1999) and can influence phenomena of selection, integration and evaluation on which consciousness relies. In the first part of this paper, I wish to describe a model of phenomenal consciousness, by referring to previous models of phenomenal consciousness. In the second part, I wish to redefine this model, by showing that the concept of "unconscious pain", far from questioning the subjective character of the algic experience, is useful for deciphering the factors that influence the algic experience, which that are at the basis of our ability to fell it.

Qualia and Introspection

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TYPE Concurrent Session 4
TIME Sunday, 16:00–16:30
PLACE Room 3075, HU

ABSTRACT The claim that behaviourally undetectable inverted spectra are possible has been endorsed by many physicalists. I explain why this starting point rules out the standard form of scientific explanation, for qualia. The modern 'phenomenal concept strategy' is an updated way of defending such problematic intuitions as the inverted spectrum. However, I show that the phenomenal concept strategy cannot help to restore the possibility of such standard scientific explanation. I argue that it follows that Chalmers is right: we should accept the falsity of physicalism if we accept this problematic starting point. But we have a dubious basis, at best, for endorsing this costly starting point. This is because, I will argue, endorsing this starting point amounts to at least implicitly endorsing certain theoretical claims about the nature of introspection. I therefore suggest that we allow ourselves to be guided, in our quest to understand qualia, by whatever independently plausible theories of introspection we have. In order to achieve this, I propose that we adopt a more moderate definition of qualia, as those introspectible properties which cannot be fully specified simply by specifying (any number of) the non-controversially introspectible 'propositional attitude' mental states (including seeing x, experiencing x, and so on, where x is a specification of a potentially public state of affairs). I argue that properties fitting this definition may well exist, and be found within the properties introspectible on an independently plausible, naturalisable account of introspection. I argue that such properties have the potential to explain, rather than explain away, the problematic intuitions discussed in the earlier part of the paper. This more moderate approach holds out the hope of an integration of our understanding of qualia with the rest of science.

Neural Signature of the Conscious Processing of Auditory Regularities

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 136

ABSTRACT Can conscious processing be inferred from neurophysiological measurements? Some models stipulate that the active maintenance of perceptual representations across time requires consciousness. Capitalizing on this assumption, we designed an auditory paradigm that evaluates cerebral responses to violations of temporal regularities that are either local in time or global across several seconds. Local violations led to an early response in auditory cortex, independent of attention or the presence of a concurrent visual task, whereas global violations led to a late and spatially distributed response that was only present when subjects were attentive and aware of the violations. We could detect the global effect in individual subjects using functional MRI and both scalp and intracerebral event-related potentials. Recordings from 8 noncommunicating patients with disorders of consciousness confirmed that only conscious individuals presented a global effect. Taken together these observations suggest that the presence of the global effect is a signature of conscious processing, although it can be absent in conscious subjects who are not aware of the global auditory regularities. This simple electrophysiological marker could thus serve as a useful clinical tool.

Into the Scanner, Out of the Body, Neural Correlates of Ketamine-Induced Alterations in Body Perception

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TYPE Concurrent Session 2

TIME Saturday, 16:30–17:00

PLACE Room 2097, HU

ABSTRACT In humans, the N-methyl-D-aspartate (NMDA) receptor antagonist ketamine produces anaesthesia at high doses, while at lower doses it causes profound alterations in consciousness. These may include changes of space and time perception, depersonalisation, derealisation, altered affect and cognition as well as hallucinatory phenomena. Alterations in body perception are also commonly reported; these may range from "floating" sensations to pronounced body distortions or the subjective experience of the self being located outside the body. Such alterations and their neural underpinnings were the focus of the present analysis. We examined the effects of an intravenous subanaesthetic dose of (S)-ketamine on subjective experience and regional cerebral blood flow (rCBF) in 30 healthy human volunteers. Positron-emission tomography (PET) was used to measure rCBF as an index of brain activity. The 5D-ABZ questionnaire (Dittrich, Lamparter and Maurer, 1999), a visual-analog rating scale for characterizing altered states of consciousness, was used to assess subjective experience. We extracted three questions from the 5D-ABZ which explicitly address alterations or loss of body perception and which refer to subjective events commonly reported during out-of-body experiences (OBEs): 1) the feeling of being body-less, 2) the feeling of being located outside of one's own body, 3) the feeling of floating. Scores on these three items were summed and correlated with rCBF. We found a significant correlation between cortical activity in the right temporoparietal junction (TPJ) and the magnitude of alterations of body perception. This finding is in line with previous reports

implicating the TPJ in out-of-body experiences and suggests a central role for this region in mediating the experience of the self and body in space. Furthermore our result supports an involvement of NMDA receptors and glutaminergic neurotransmission in OBEs. a "ketamine model of the OBE" is well compatible with the hypothesis of "disintegration at the TPJ" (Blanke et al., 2002) and also the dissociational theory (Irwin, 2000) of out-of-body experiences.

Neurocognition and Temperament in Depersonalization Disorder

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 90

ABSTRACT Background: Dissociation is a disruption in the usually integrated functions of consciousness, memory, identity, or perception. Depersonalization Disorder (DPD) is a dissociative disorder characterized by a persistent or recurrent feeling of being detached from one's mental processes or body, accompanied by intact reality testing. Their alterations in consciousness center around a sense of unfamiliarity/unreality and hypo-emotionality. Objective: Explore the neurocognitive and temperament profile of DPD patients to better understand their underlying neurobiology and to gain insights into the neural basis of dissociation. Methods: 19 DPD patients and 22 matched healthy controls (HCs) were given a comprehensive neuropsychological battery (CANTAB), the Iowa Gambling Task, a time perception task, and questionnaires of impulsivity, temperament, emotion, and frontal behavior (measures

orbitofrontal cortex (OFC) dysfunction). Results: Compared to HCs, DPD patients performed significantly better on the Intra-Extra Dimensional Set Shift task (IED) (an analogue of the Wisconsin Card Sorting test) and did no worse on any other cognitive task. However, they did have a significantly faster subjective sense of time (overestimated and underproduced 10–90 seconds time intervals), and their long-term time estimation positively correlated with their attentional impulsivity. DPD patients experienced more childhood trauma (physical and emotional abuse and neglect), negative emotions, and dissociation, and were more impulsive, neurotic, and harm avoidant and less extraverted, agreeable, conscientiousness, and self-directed. DPD patients also had more frontal behaviors which positively correlated with their emotionality, neuroticism, and childhood trauma. Conclusions: Dorsolateral prefrontal cortex (DLPFC) hyperactivation may explain DPD patients' enhanced IED performance, a task sensitive to DLPFC function. Memory suppression and emotional regulation has been associated with increased DLPFC and reduced limbic activation. DLFC inhibition of limbic structures may mediate DPD patients' ability to dissociate and their hypo-emotionality. However, OFC dysfunction (measured by frontal behaviors) appears to be related to their other problems, such as their time perception deficits, negative emotions, neuroticism, impulsivity, and childhood trauma. Further investigation is needed to determine how this "splitting of consciousness" relates to the NCC. Integration of various cortical and subcortical areas may be necessary for cohesive conscious experience. Dissociation may involve disruption of cortico-cortical, thalamo-cortical, or limbic-cortical connectivity.

Function and Dysfunction of Phenomenal States: Exemplified in Affective Disorders

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 127

ABSTRACT Drawing on current theories of consciousness, a model will be proposed that focuses on phenomenal states. According to the model, phenomenal states result from integrating multimodal internal and external inputs. This integration process is characterized by selection and appraisal with regard to self-relevance and provides a coherent percept even in complex situations. This percept provides the basis for further cognitive processes and advantageous responses. The model will be confronted with clinical-phenomenological, neuropsychological and neuroimaging findings in patients with affective disorders. It is suggested that these patients show a fundamental alteration in the generation of phenomenal states (in the sense of the proposed model). This alteration is characterized by a mood-congruent bias in the integration process and may provide the basis for various emotional, cognitive and behavioral symptoms and deficits. These considerations (1) have heuristic value for understanding affective disorders and (2) support models of consciousness that suggest a functional role of phenomenal states.

Can We Blink Without Masking? Evidence from the Spatial Attentional Blink

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 7

ABSTRACT The Attentional Blink (ab) is a well-known rsvp paradigm in which two visual targets (t1 and t2) are embedded in a stream a distractors. In this paradigm, performance on t2 is largely impaired when it appears briefly after t1 (i.e. within 200–500ms). This paradigm is thought to reveal the time course of attention (Raymond, Shapiro, & Arnell, 1992). An important feature of the ab paradigm concerns the necessity of a light masking of the two targets (e.g. Brehaut, Enns, & Di Lollo, 1999). Thus, although the classical interpretation of the ab effect refers to the limited capacity of attentional resources, this interpretation is not straightforward since masking t2 also contributes to its impaired visibility at short lags. Here, by contrast, we demonstrate that the attentional blink can occur without masking. Using a spatial variant of the paradigm in which stimuli appeared without being followed by masks but instead at different locations on the screen, we report a standard attentional blink effect. This effect was more pronounced at the shortest lag and positively related to the spatial distance between t1 and t2. These results support a clear capacity limited account of the ab effect without any consideration on masking and call for more consideration of the role of temporal attention in theories of the ab.

Merging Cognitive Neuroscience with Virtual Reality to Study Self-consciousness

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TYPE Symposium 2: Talk 3
TIME Sunday, 10:30–12:30
PLACE Leibniz-Saal, BBAW

ABSTRACT I will present three lines of research investigating brain correlates of the bodily self-consciousness. (1) Pathological states of self location, first-person perspective, and self-identification (such as out-of-body experiences and autoscopic hallucinations) due to disturbed multisensory integration after focal brain damage to temporo-parietal cortex and extrastriate cortex in neurological patients. (2) The experimental manipulation of bodily self-consciousness in healthy subjects using multisensory visuo-tactile conflict and virtual reality technology. (3) Neuroimaging data during experimentally altered states of self-location and self-identification using an exciting new research platform (linking virtual reality and high resolution EEG). I will conclude by describing a philosophically-informed neurobiological model of self consciousness.

Different Effects of Within- and Across-Experiment Variation of Auditory and Visual Stimulus Intensity

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 86

ABSTRACT It is known that variation of physical stimulus parameters within experiments and across experiments can have different effects on both neuronal processing and conscious perception (Boenke et al. 2009). In multisensory temporal-order perception, it is well established that the perceived temporal order depends on the physical intensities of the stimuli involved. For example, Neumann et al. (1992) demonstrated effects of both variation of the auditory stimulus intensity and variation of the visual intensity on the point of subjective simultaneity (PSS) by combining 3 light intensities and 3 tone intensities. However, Roufs (1963), when performing a series of experiments in each of which the auditory intensity was held constant and only the visual intensity was varied, and then compared across this series of experiments, found only an effect of the light intensity but not of the auditory intensity on the PSS. To test whether the effect of intensity variation of a given sensory modality in a multisensory stimulus on the conscious perception of temporal order depends on whether it is held constant or is independently varied in an experiment, we have conducted 5 experiments. In experiment 1, using two sound intensities (Alow, Ahigh) and two light intensities (Vlow, Vhigh), we could replicate the findings of Neumann et al. (1992). In experiments 2 (Alow, Vlow, Vhigh) and 3 (Ahigh, Vlow, Vhigh) we only varied the light intensity and held the sound intensity constant. In experiments 4 and 5 we set the light intensity to a constant low or high value, respectively, and only varied auditory intensities. In experiments 2 and 3 we found a similar result as Roufs (1963),

namely that varying the sound intensities across experiments did not affect the PSS. In experiments 4 and 5 we found that the variation of light intensities across experiments was similar to variation within an experiment (cf. experiment 1). In conclusion, these data imply a difference in the ability of the auditory and visual sensory system to compensate intensity variation of their adequate modality in an audiovisual compound stimulus.

Differential Encoding of Mechanisms for Human Decision Making

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 70

ABSTRACT Object identity is known to be encoded in distributed activity patterns in human lateral occipital cortex (LOC). Sufficient visual input to LOC is important for guiding perceptual decision making (Williams et al., 2007). Consistent with this, we found that decisions about object categories could be predicted from precuneus, but not LOC, if stimuli were rendered nearly invisible (Bode & Haynes, in prep.). Precuneus as well as anterior medial prefrontal cortex also encoded free decisions even in the abscence of visual tasks (Soon et al., 2008). In the present study, we aimed to disentangle the contribution of decision-related brain regions for different types of decisions.We directly com-

pared (a) decisions in perceptual decision making using highly visible objects, (b) perceptual decisions made with insufficient visual input and (c) free decisions for objects. Multivariate pattern classification was used to predict the decision outcomes, thereby allowing us to compare the underlying patterns of the neural resonses (Haynes & Rees, 2006). We found perceptual decisions about highly visible objects encoded in bilateral visual cortex and LOC. Perceptual decisions with insufficient visual input, however, were encoded in the precuneus only. Free decisions could be decoded from medial prefrontal cortex. Interestingly, precuneus also showed a tendency to encode free decisions, which was confirmed by cross-condition pattern classification. Our results support the assumtion that different networks are involved in different kinds of object related decisions. By removing visual information, subjects were forced to make pure guesses, in which case the precuneus encoded the decision outcome rather than visual areas. The precuneus was also a key region for free, internal decisions, supporting the notion that guessing could be regarded as an internal decision here. Anterior medial prefrontal cortex, however, was uniquely involved when decisions were intended to be internal and might therefore be exclusively important for free decisions made without an external frame of reference.

Resting State fMRI Connectivity Reflects the Level of Consciousness During Anesthesia

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B

TYPE Concurrent Session 2
TIME Saturday, 16:00–16:30
PLACE Room 2097, HU

ABSTRACT Introduction: Mechanisms of anesthesia-induced loss of consciousness remain poorly understood. Our hypothesis was that anesthesia-induced loss of consciousness would be reflected in resting state fMRI connectivity impairment in higher order associative networks (the default mode network or DMN, and the paired left and right executive control networks or ECNs), compared to a relative preservation of connectivity in low level sensory cortices. Methods: Here we measured low-frequency spontaneous BOLD fluctuations during wakefulness, mild sedation, deep sedation with clinical unconsciousness, and subsequent recovery of consciousness in 12 healthy subjects. Data analysis investigated resting state fMRI connectivity in the DMN, the bilateral ECNs, and the auditory and visual networks using two different types of analyses, i.e. correlation analysis and independent component analysis. Group-level comparisons between normal wakefulness and sedation stages were performed using random effects analyses. Results were thresholded at $p<0.05$ corrected for multiple comparisons using false discovery rate. Results: We show that anesthesia-induced loss of consciousness correlates with a global decrease in connectivity in fronto-parietal networks – i.e. the DMN and ECNs – linked with a loss of thalamo-cortical connectivity in these networks. For both the DMN and ECNs, the most consistent finding linking connectivity and consciousness was the involvement of the thalamus in these networks. Anticorrelations between the DMN and lateral fronto-parietal cortices also decreased proportionally with the loss of consciousness across sedation stages. In contrast, even during deep sedation, we found globally preserved connectivity in low-level sensory cortices – the auditory and visual networks – along with preserved thalamo-cortical connectivity in these networks. Waning consciousness was, however, associated with a loss of cross-modal interactions between the visual and auditory networks – suggesting a loss of top-down control. Conclusions: Our

results shed light on the functional significance of fluctuations in spontaneous brain activity observed in fMRI. They suggest that anesthesia-induced loss of consciousness could be linked to a breakdown of cerebral temporal architecture, which modifies both within- and between-network connectivity. They also emphasize the importance of thalamo-cortical connectivity in higher order associative networks in the genesis of conscious perception.

Cued Masks in the Change Blindness Experiment: Evidence for Overflow or Hyperillusion?

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TYPE Concurrent Session 3
TIME Sunday, 14:30–15:00
PLACE Room 3096, HU

ABSTRACT In defending (and also qualifying) the idea that phenomenal consciousness is independent of access consciousness, Ned Block argues that mental states that are phenomenally conscious need not be present in the global workspace. Some information that is near the threshold of entering the workspace, but still requires amplification by mechanisms of attention may also be phenomenally conscious, Block argues. Thus in some experiments where the subjects have the impression that they see more than what they can report, a broader range of mental states is phenomenally conscious than what is present in the global workspace. In this sense, phenomenal consciousness overflows access consciousness. A rival hypothesis by S. Dehaene et al. is that in such cases there arises a hyperillusion: it seems to the subject that she is phenomenally conscious of certain objects and properties whereas in fact she is not. We ran a version of the change blindness experiment

which included pairs of pictures differing in some detail, but the part making the difference in a given pair was also embedded in a Fourier mask that flashed between the members of the pair. Mask onset time and contrast of the embedded cue were varied. We took it that if the embedded cue helped subjects to spot the difference (by reducing the number of repetitions needed for the correct response) without the subjects noticing it (and subsequently being able to report it), then we would have preliminary evidence for phenomenal consciousness without the phenomenally conscious item being present in global workspace. However, we found that the embedded cues speeded up subjects' responses when and only when they indicated noticing them at the end of the experiment. Cues that went unnoticed did not help, which appears to support the hyperillusion hypothesis. Another possibility is that subjects did fixate on the critical part of some of the pictures and these parts also became phenomenally conscious, but they exited working memory before being compared to the corresponding part of the other picture. Following up this experiment by eye-movement tracking can help choosing between these hypotheses as we shall argue.

Bistable Perception: A Twofold Dependence on History

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 4

ABSTRACT Bistable perception is one of the most striking examples for fluctuations of visual awareness. Theoretical analyses of its dynamics offer unexpected insights into the nature of the underlying neural representation. For instance, bistable perception seems poised at a par-

ticular point in state space, namely, the very boundary between oscillatory and bistable regimes (see Pastukhov et al., ASSC 09). Moreover, reversals of perceptual dominance seem to reflect stochastic integration over multiple populations that are independently multi-stable (see Gigante et al., ASSC09). These insights are founded on the empirical observation of a twofold dependence on historday, in the short run, the dominance of a percept acts to destabilize this percept (and to stabilize the alternative percept) whereas, in the long run, the dominance of a percept acts to stabilize this percept (and to destabilize its alternative). Here we demonstrate both effects simultaneously in one experiment. Observers viewed a bistable display (kinetic-depth effect) and reported perceptual experience continuously. The display was interrupted either immediately after the first reported reversal or immediately after the second reported reversal. After a blank period of 8 seconds, the experiment was resumed. To evaluate the results, we computed a cumulative history for each percept, by convolving all preceding dominance intervals with an exponential decay. Carrying out this computation with different decay constants, we obtained either short histories or long histories for each point in time. We find that the duration of first percepts (after the blank) correlates positively with their long history. The maximal correlation is obtained for a build-up constant of 0.2–0.4 Tdom and a decay constant of 20–40 Tdom (where Tdom is the mean dominance period). Simultaneously, the duration of second percepts correlates negatively with their short history. In this case, the maximal correlation is obtained with a decay constant of 0.4–0.7 Tdom during stimulation intervals and a decay constant of 2–10 Tdom during blank intervals. Although both correlations are highly significant, their strength is moderate (correlation coefficients 0.15 and –0.25 for long and short histories respectively), implying largely noise-driven transitions.

Perception vs. Motor Matching of Slope: Unconscious Overestimates

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 22

ABSTRACT Slope perception can measure the interaction between objective reality and perception. Previous studies of slope estimation have used relatively long distances. Due to physiological evidence showing that some neurons in premotor and parietal cortex respond only to objects within arm's reach, this study was designed to compare verbal and proprioceptive estimates of slopes in near and far space. Observers stood on a real hill on the U. of Ca. Santa Cruz campus and estimated slopes between themselves and a series of traffic cones at distances up to 16m. The proprioceptive measure was the posture of the right forearm held parallel to the slope, photographed with a digital camera. Verbal estimates in degrees greatly overestimated slopes, and the overestimates increased with distance by a log function. Proprioceptive estimates were more accurate at all ranges, but also increased with distance by a log function. When observers walk up and down the hill to be estimated before making their judgments, they continue to overestimate slopes just as much as non-walkers, despite experiencing more accurate slope perception at near distance on every part of the slope; appearance trumps experience. In a further experiment, a 1m segment at 16m from the observers was estimated to be steeper than a 1m segment at the observers' feet, showing that distance from the observer, not length of segment, is the origin of the length/slope effect. The results can be understood as an implicit slope previously measured in darkness, modulated by depth cues available at near distances.

Anarchic Limbs, Anarchic Bodies: Hostility in the Breakdown of Corporeal Awareness

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TYPE Symposium 2: Talk 2
TIME Sunday, 10:30–12:30
PLACE Leibniz-Saal, BBAW

ABSTRACT While "alien" limbs are characterized by the sense of non-belonging to the own body, the sign of the "anarchic limb" involves the loss of control over intentional, goal-directed motor behaviour. Anarchism against the own self ranges from the mildly queer (one hand hinders the other) to highly embarrassing acts (e.g. masturbation in public). Often, self-destructive tendencies are obvious (pinching one's nipples, attempts at strangling or drowning oneself). The view of a smooth transition from the personification of single limbs to heautoscopy, i.e. the encounter with a second self, or doppelganger, would predict that similar forms of self-destruction can also be observed between a patient and his or her phantom double. The present talk provides an overview of different manifestations of anarchic behaviour displayed by doppelgangers, both as described in the belletristic literature and in neuropsychiatric case reports. The role of the right hemisphere in mediating hostility is specifically addressed.

Memory and Consciousness: Trace Distincitveness

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 109

ABSTRACT In multiple trace theory of memory, the memory trace emerges by the activation and the integration of sensorimotor dimensions. In this view, it would be necessary for the trace to be sufficiently integrated and distinctive than others memory trace in order to be explicitly retrieved. The aim of this study is to show that manipulating the memory trace distinctiveness (through an isolation paradigm) can influence the feeling of recollection but not the familiarity, and also can influence the production of false recognition. Classically, works on isolation paradigm established that isolated materials are systematically associated to a better recall. Here, we have manipulated two kinds of isolation. First, items (words) were perceptually isolated (object word which typically referred to a noise, e.g. motor, or not, e.g. knife). Second, items (words) were conceptually isolated (two kinds of words which referred to "living category" or to "artefact category"). In our study, the isolation paradigm was followed by a recognition associated to a confidence degree for each "yes/no" subject's response. The results showed that the two kinds of isolation yield to the same effect on recognition times (old responses) whereas only the conceptually manipulation yielded an effect on confidence degree (old and new responses). In particular, we obtained a principal effect on the latencies for the two kinds of isolation (isolated items are recognized faster than other items) and an interaction on the confidence degree: for the conceptual isolation, isolated items were associated to a better confidence degree than other items whereas for perceptual isolation, they were not. Moreover, the results showed that the production of false recognition was due to the manipu-

lation of isolation, in particular for non-isolated items. For us, the faster recognition times for isolated items were due to the familiarity process whereas the modulation of confidence degree by the conceptual isolation was due to the recollection process. The fact that conceptual isolation also produced an effect on recognition times supports the uni-process theory idea that what is at stake for the feeling of recollection is the memory trace.

How Conscious Are Minimally Conscious State Patients? A PET Study of Residual Brain Metabolism

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 129

ABSTRACT Objectives: Patients in a minimally conscious state (MCS) show restricted signs of awareness but are unable to communicate consistently and reliably[1]. We here tested the hypothesis that this heterogeneous clinical entity can be subcategorized in low-MCS (i.e., patients showing movements to command) and high-MCS (i.e., patients only showing non-reflex behavior such as visual fixation or pursuit or localization of noxious stimuli), each characterized by its own specific residual cerebral brain function. Methods: Using FDG-PET, we assessed

regional cerebral glucose metabolism (rCMRGlu) in 16 low-MCS (10 men; mean age 46 [SD 19] years; 5 traumatic) and 21 high-MCS (16 men; mean age 39 [SD 15] years; 11 traumatic). Data were preprocessed and analyzed by means of statistical parametric mapping (SPM5). Results were thresholded for significance at $p<0.05$ corrected for multiple comparisons. Results: Compared to low-MCS, high-MCS patients showed higher rCMRGlu in Broca's and Wernicke's regions (areas 44 & 45, peak voxel x y z stereotaxic coordinates –42 12 4 mm; T value=2.50). Other identified areas were premotor postcentral and precentral cortices (areas 6, 3 and 4; coordinates –8 –6 66 mm; T=3.62). Conclusion: The differences in brain metabolism between high- and low-MCS was not identified in widespread frontoparietal "consciousness areas" but in language, sensorimotor and premotor areas. These findings suggest that the main difference between these two subcategories of MCS, clinically separated by the presence of command-following, is their ability to express consciousness (verbally or non-verbally) rather than their level of consciousness per se.

Reference: [1] Giacino et al, The minimally conscious state: definition and diagnostic criteria, Neurology. 2002.

Visual Perception Across Short Time Scales

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TYPE Symposium 3: Introduction
TIME Monday, 10:30–12:30
PLACE Leibniz-Saal

ABSTRACT Perception that unfolds over short timescales (lasting a few hundred milliseconds or less) exhibits a number of interesting

temporal phenomena. Such phenomena include temporal illusions such as the wagon wheel illusion, the flash lag illusion and coincidence (or fusion) thresholds, which presumably illustrate the constraints of underlying neural processes. The neural basis of these temporal phenomena has received increased attention in recent years but we are still some way from fully understanding their underlying causes. Most of this research has been done with visual stimuli, and only lately have studies begun to look at the occurrence of these phenomena in other sensory systems and at crossmodal stimuli. This symposium will explore three themes relating to visual perception over short timescales, by focusing on the following topics: the discreteness of visual perception, temporal illusions and, the perception of simultaneity.

C The Development of a Theory of Mind: A Tutorial

AUTHOR **Susan Carey**
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TYPE Keynote Lecture
TIME Monday, 15:00–16:00
PLACE Leibniz-Saal, BBAW

ABSTRACT On some accounts of consciousness, higher order thought is required for consciousness. Representations of mental states, including concepts of mental states, are deemed necessary for consciousness. Depending upon the facts about non-human animals and prelinguistic infants, these views may have the consequence that animals and infants cannot be conscious. I will not comment on the higher order theory of consciousness, but rather give a tutorial on the current state of the art concerning the evolution and ontogenesis of representations of mental states.

› Organizational Closure Through Neuronal Signal Regeneration as a Possible Basis for Conscious Awareness

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 99

ABSTRACT We outline a new kind of theory for the neural requisites of conscious awareness and its contents. Our philosophy is a modernized Aristotelian hylomorphism in which mind is the informational organization of the brain, and awareness is a necessary (but epiphenomenal) concomitant of (regenerative) organizations of neuronal activity. The structure of awareness supervenes on that of neuronal informational processes both in terms of states of consciousness and specific contents of experience. Every experiential dimension has a corresponding neural coding dimension (psychoneural isomorphism). We hypothesize that the neuronal, organizational requisite of unified, continuous awareness is an autopoiesis of neuronal signals. Analogous to autocatalytic networks in the theory of life that regenerate material components and relations (autopoiesis = self-production), we envision sets of mutually-amplifying and reinforcing neuronal signals that actively regenerate themselves in recurrent circuits. Those mutually-compatible signal sets that exceed a threshold signal-to-background level evoke concomitant changes in awareness. The maintained coherence of signals may be necessary for their successful regeneration in recurrent circuits, such that conscious awareness can be disrupted not only by suppression of neural activity, but also by "scrambling" of signals. Thus, even as neuronal activity persists under general anesthesia and seizure, the forms of the neural signals may be disrupted in a manner that renders them incapable of regeneration. The framework may explain why ignition and self-sustained activity in recurrent/re-entrant circuits is necessary for awareness. However, unlike other systems-based explanations, this theory posits that the necessary and sufficient basis for awareness is a "circular causal" cybernetic organizational closure of signals rather than an information-complexity threshold per se (e.g. Basar's effective dimensionality metric or Tononi's Phi measure). While these latter measures usefully quantify the complexity of the contents of awareness, by themselves they lack the dynamic organizational sustainability criterion that regenerative processes satisfy. In analogy to life, ability to regenerate organization rather than attain static complex states is what distinguishes a living (albeit simple) organism from a nonliving (albeit complex) material system. In similar fashion, regenerative organizational closure may distinguish conscious from non-

conscious systems. The hypothesis is empirically testable once central neural codes are identified.

C

Deduction Without Awareness

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 10

ABSTRACT We investigated whether two basic deductive inferences, namely *modus ponens* and disjunctive syllogisms, are automatic processing steps carried out even in the absence of awareness. We used an exhaustive set of conditional and disjunctive problems concerning numbers, with a subliminal second premise, followed by a target number. Participants evaluated whether the target number was odd or even. The target number could match, or not match a valid conclusion endorsed in the previous problem. We found that evaluations of target numbers matching the conclusion of a modus ponens were faster than the evaluations of numbers following all other types of problems. This finding suggests that unlike disjunctive syllogisms, *modus ponens* is automatic, can be triggered by subliminal stimuli and can be performed without awareness. The finding extends the range of high-level cognitive activities that can be carried out unconsciously to include critical deductive inference schemata.

Is the Body Schema Sufficient for the Sense of Embodiment? An Alternative to de Vignemont's Model

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 37

ABSTRACT De Vignemont argues that the sense of ownership comes from the localization of bodily sensation on a map of the body that is part of the body schema. This model should be taken as a model of the sense of embodiment. I argue that the body schema lacks the theoretical resources needed to explain this phenomenology. Furthermore, there is some reason to think that a deficient sense of embodiment is not associated with a deficient body schema. The data de Vignemont uses to argue that the body image does not underlie the sense of embodiment does not rule out the possibility that part of the body image I call 'offline representations' underlies the sense of embodiment. An alternative model of the sense of embodiment in terms of offline representations of the body is presented.

Suffering: A Complex Adaptive Systems Approach

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
C
PLACE Poster No. 125

ABSTRACT People experiencing sustained pain, depression, loss, ostracism or a traumatic event experience negative affect, cognitive difficulties, fatigue, disturbed sleep, diminished appetite and libido, along with many problems of physical discomfort and dysfunction. The literature on stress addresses these disorders but does not provide a comprehensive account of how these problems arise, the physiological mechanisms of the disorders and their relationship to mental processes, or what would constitute a curative intervention versus symptom control. This presentation advances a complex adaptive systems view of stress in which physical, mental or social trauma generates a complex, normally adaptive stress response. This response extends beyond the nervous system to involve endocrine and immune systems, and the combined effect of responses across these systems contributes to the subjective experience of emotion and bodily awareness. Through a common chemical language comprising neurotransmitters, peptides, endocannabinoids, cytokines and hormones, an ensemble of interdependent nervous, endocrine, and immune processes operates in concert to cope with the stressor. These processes act as a single agent and thus comprise a supersystem. Regulation within the supersystem depends upon negative feedback loops, and the supersystem's resources for coping with threat depend upon positive feedback processes. Emotional distress, physical disorders, disturbed biorhythms and fatigue result from unresolved dysregulation within the supersystem. Social stressors can compound the stress resulting from a physical injury or depression, or they an act alone to dysregulate the supersystem. When components of the supersystem fall into dysregulation, health, function and sense of well-being deteriorate, and the person experiences suffering. Many of the multi-system disorders that resist conventional medical treatment are the product of supersystem dysregulation. Individuals vary in their vulnerability to dysregulation and to dysfunction in particular organ systems due to the unique interactions of genetic, epigenetic and environmental factors, as well as the unique past experiences that characterize each person. The

presentation covers several ways to quantify supersystem dysregulation. Other key constructs are stress, allostasis, and hormesis. a key feature of this framework is the psychophysiological systems interdependence of brain activity, endocrine system, immune system and autonomic nervous system.

The Dilemma of Inverted Spectrum Thought Experiment

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 60

ABSTRACT 'Inverted spectrum' is a thought experiment used to argue against functionalism. In the case of inverted spectrum, a person's color vision is systematically inverted relative to our color vision. For example, this person's color experience of seeing a red apple is identical with our color experience of seeing green grass, while his experience of seeing green grass is identical with our experience of seeing a red apple. Despite such inversion, there is no functional or behavioral difference between this person and us. Thus, this case is a counterexample of functionalism, according to which functionally identical mental states are identical in all aspects, including their phenomenal characters. If the case of inverted spectrum is possible, then functionalism is proved to be wrong. In this paper, I will argue that, according to psychological and neurophysiological researches of color vision, the case of inverted spectrum is impossible. Because our phenomenal color space and biological color space are asymmetrical, it is impossible to invert experiential states without making any difference. Furthermore, there

are specific associations of our emotional reactions to colors. Based on the asymmetry of our color space and the color-emotion association, it is implausible for color experiences to be inverted while maintaining our functions and behaviors unchanged. Furthermore, if the inverted spectrum is possible, then color experiences are epiphenomenal. Because the only way to keep the functions and behaviors unchanged while having inverted spectrum is to admit that color experiences have no causal powers and are not participating in the causal chain of our response to colors. The case of inverted spectrum then becomes no more threat to functionalism.

Qualia: Realism Without Cartesianism

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 45

ABSTRACT Some argue that in order to take consciousness seriously, one must acknowledge the existence of qualia, and this amounts to admitting the existence of states that are 1) ineffable, intrinsic, private, and immediate (Dennett); or that are 2) not implied by the non-phenomenal facts (Chalmers). The only other possible position is thought to be some kind of anti-realism or fictionalism: denial of the existence of such states. If there are no things that have the properties attributed in 1) or 2), then the term "qualia" should go the way of the alchemical term "phlogiston", and be eliminated from scientific discourse. The only options seem to be Cartesianism or eliminativism. This talk offers a middle way for those who find both of these extreme positions unpalatable. It is argued that all one need do to be

a phenomenal realist, and thus be taking consciousness seriously, is to acknowledge that terms like "qualia" do, unlike "phlogiston", refer. But one can do this without committing oneself to the claim that there are things that are ineffable, intrinsic, private, and immediate, or which are not implied by the non-phenomenal facts. This is because it may be that the term "qualia", like "gold", has its reference fixed not by description (e.g., having the properties mentioned in 1) and 2)), but by causal relations between the term/concept "qualia" and whatever caused it to be introduced in the first place, and/or whatever conditions resulted in it being a useful term. Just as showing that the beliefs the ancients had about gold were false did not amount to showing that there is no such thing as gold, so also does showing that there is nothing that meets conditions 1) and 2) fall short of establishing that qualia do not exist. Of course, it *may* turn out that "qualia" *is* like "phlogiston": it so poorly maps to anything actual that there will be no place even for a successor concept of qualia in a future science of the mind. The point is that this should be decided empirically/experientially; it is not the place of philosophy to prejudge the issue.

Early EEG Signals Predict "Free" Decisions Several Seconds Before They Are Made

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 79

ABSTRACT To which degree unconscious brain processes influence or even cause our conscious decisions is a question of immense interest. For simple movements, the perceived onset of the "will" to move is

preceded by a deflection in the human EEG (Libet 1985). This so called readiness potential begins up to 500 ms before the will to move reaches awareness and it can show lateralization for left and right hand movements (Haggard and Eimer 1999). Recently, we demonstrated that the outcome of a free decision can be predicted from fMRI signals even up to 7 s before it enters awareness (Soon et al. 2008). Here, we probe this early information content of medial prefrontal cortex using electrophysiological data. While observing a rotating clock healthy subjects decided freely at a time of their own choice to press the right or the left button. After each button press, they judged the time of their conscious decision using an adjustable clock. Standard 64-Channel EEG data was recorded, preprocessed and introduced into a infomax independent component decomposition. Single trial independent component time courses were then utilized in combination with a support vector classification algorithm to decode the subjects' choices. In all subjects, the offset of the awareness of will to move relative to the button press did not exceed one second. Importantly, we successfully extracted information about the forthcoming button press from recordings obtained as early as five seconds before the button press. Our findings provide further evidence that brain activity carries predictive information about a person's decisions several second before their decision is consciously made, thus confirming previous fMRI studies (Soon et al. 2008). This implies that this early predictive information is not restricted to the hemodynamic domain, since we can now identify similar information sources in EEG signals using powerful analysis methods. Thus, conscious decisions are presumably at least partially determined by unconscious decision processes.

To Think or Not to Think? A Critique and Reappraisal of "Unconscious Thought Theory"

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TYPE Concurrent Session 1
TIME Saturday, 14:00–14:30
PLACE Room 3096, HU

ABSTRACT Recent findings (i.e.,Dijksterhuis et al., Science, 2006) that complex normative decisions (e.g., choosing a car or an apartment) are best made without conscious deliberation have led to the idea that "unconscious thought" not only exists, but also often results in superior information processing, specifically when the required decisions involve the processing of many attributes. Here, we take issue both with the theoretical claims that underpin Dijksterhuis' "Unconscious Thought Theory" and with the relevant empirical findings. We report on five experiments (n=529) inspired from the original design, in which participants were asked (1) to process information about cars by learning about their different attributes (e.g.,"The Hatsun has a powerful engine"), and (2) to choose the best car after given a chance to engage in deliberate, conscious thinking about the cars ("conscious thought" condition) or after being distracted through performing an anagram solving task ("unconscious thought" condition). Experiments 1, 2, and 3 respectively offered conceptual, identical, and methodologically improved replications of Dijksterhuis et al. (2006). We failed to find any evidence that decisions made after a period of distraction are better than after a period of conscious consideration. Experiment 4 showed that a majority of participants had in fact determined their attitudes towards each car before they engaged in the deliberation or distraction tasks; a finding that may explain the previous null results. Experiments 5 shed

further light on the role that decision timing plays in decision quality, and suggested that conscious, deliberate decisions are more efficient than decisions made immediately or after a period of distraction when attitudes are not determined before engaging in the deliberation or distraction tasks. Taken together, these results simply suggest, contrary to previous claims, that conscious thinking tends to produce better decisions, a conclusion that should come as no surprise. While not denying that complex unconscious information processing exists, we conclude that it is not as powerful as previously claimed and that there is in fact no evidence for the idea that one can "think" without awareness.

The Red Inside Your Head: Decoding Seen Colour from Activity in Human Visual Cortex

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 137

ABSTRACT Recent studies employing multivariate pattern classification (MVPC) have shown that the orientation of spatial image structure and the direction of image motion can be decoded from primary visual cortex of the human brain. The success of MVPC in these instances has been attributed to biased sampling by the voxel array of an orderly representation of the relevant visual attribute across the cortical surface. Here, we used MVPC to investigate the representation of colour in human visual cortex. The existence of a systematic spatial mapping of chromatic selectivity across the surface of primate visual cortex is less well established than for orientation and motion. Furthermore, the cortical mecha-

nisms of colour vision in humans have not been as well characterised as those in subcortical areas. We used MVPC to ask where in human visual cortex we could find evidence of a representation of colour that transforms signals from subcortical inputs. We used fMRI at 3T (1.5mm cubic voxels; TR = 3s) to test for higher order cortical representations of colour capable of classifying stimuli that cannot be distinguished by the postulated red–green (L–M) and blue–yellow (S–(L+M)) subcortical opponent channels. Subjects (n=5) viewed each of two plaid patterns modulating in colour between orange-cyan or lime-magenta. Multivariate pattern classifiers restricted to each of several visual areas (V1, V2, V3, V3A/B, hV4, VO, MT+) were trained to discriminate the two patterns. The classifiers were trained on signals from 9 trials and tested on a tenth; this procedure was repeated 10 times. Classifiers performed significantly better than chance as early as V1. The success of the classifiers implies that subcortical chromatic channels are recombined early in cortical processing to form novel representations of colour. It also suggests a possible systematicity in the spatial mapping of colour onto the cortical surface. Work is now ongoing to extend this approach to the decoding of purely subjective colour from the brains of synaesthetic observers.

Sleep in Disorders of Consciousness

AUTHORS **Victor Cologan**[1], Manuel Schabus[2], Pierre Maquet[2], Steven Laureys[3]

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 106

ABSTRACT From a behavioural as well as neurobiological point of view, the sleep-wake system and consciousness are intimately connected. Therefore, a better characterization of sleep timing and architecture in patients suffering from clinical disorders of consciousness (DOC) might improve our understanding of the neural correlates of consciousness. From research on sleep in DOC (coma, vegetative state, locked-in syndrome), it is known that a wide spectrum of sleep disturbances – ranging from almost normal patterns to severe changes in sleep architecture and quantity – can be present under these conditions. Interestingly, some sleep features even appear to have diagnostic and prognostic value. However, defining sleep in severely brain injured patients is problematic. As their behavioural and electrophysiological signs of wake and sleep differ in many ways from healthy individuals, the applicability of standard scoring criteria is object of debate. Here we present first data from patients in a vegetative state (VS; n=9) and, for the first time, the minimally conscious state (MCS; n=9) using bedside 24H polysomnography after completing the behavioural Coma Recovery Scale-Revised (CRS-R, 2004). In MCS, epochs of higher muscular, eye and heart activity, probably indicating wake, alternates with epochs of predominant delta activity, muscular atonia and heart-rate decrease, probably indicating sleep. On the other hand, most VS showed more iso-electric recordings with few epochs of sleep-like activity. We aim to discuss these recordings from an exploratory point of view, compare the two clinical entities and critically assess the applicability of standard sleep criteria in these patients.

"I Am a Cursor": First and Third Person Accounts of Operating Brain-Computer Interfaces

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TYPE Concurrent Session 3
TIME Sunday, 14:00–14:30
PLACE Room 2097, HU

ABSTRACT To make matter move just by thinking about it' – yesterday's fiction has been turned into today's science through brain-computer interfaces (BCIs). Here, we survey our experiences of operating the non-invasive EEG-based Berlin BCI (www.bbci.de) which combines human cortical neurophysiology with Machine Learning algorithms to enable effective first-session performances of BCI-naïve subjects. The BBCI principle works in three steps: (1) EEG activity is recorded during a series of pre-defined intended movements. (2) Computer programs extract user- specific 'thought-related' EEG patterns; these algorithms use diverse EEG signs of intended movements, such as slow 'readiness potentials' or the movement-related attenuation of sensorimotor 'idling rhythms'. Notably, studies of long-term arm amputees show that such EEG signs are usually preserved when patients engage to move their 'phantom hand'. (3) These EEG patterns are categorized to control devices like computer cursors, 'mental typewriters', gaming applications, and virtual prostheses. Importantly, the BBCI permits also the single-trial real-time detection of non-motor mental states, e.g., mental rotation (as required when playing a BCI- version of Tetris). While these findings were quantified rigorously constituting a classical scientific 'Third Person Account' of operating a BCI, an elementary collection of qualitative aspects should not be missed representing 'First Person Accounts' reported by subjects who experienced sessions with long

periods of excelling BCI classification accuracies. First, the initial 'limb-focus' of the motor intention could be fading and gradually replaced by the impression to mind-control the particular effector device 'directly'. Second, if such direct, reliable and 'effortless' BCI control was maintained for several minutes, a temporary sense of bodily ownership could develop such that the effector (e.g., a screen cursor) was perceived as belonging to the I-domain of the BCI operator ('I am a cursor'), eventually waning along with EEG nonstationarities. Finally, a BCI operational state could ensue in which a wish to move might be executed prior to its mental completion. In conclusion, pursuing the line of Libet's legacy at this novel mind-brain-computer interface we posit that upcoming, possibly perfect BCIs operating at 'thought-speed' in real-time will require a refined understanding of the neurophysiological underpinnings of will, veto and responsible acting.

D

Signal Detection-Theoretic Model Explains Libet's Awareness of Intention and Attentional Prior Entry

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 68

ABSTRACT Two apparently paradoxical findings in the field of human time perception are considered within a framework of probabilistic signal detection. First, it has been found that spontaneous, self-paced motor actions are preceded by an early preparatory signal (the readiness potential, RP) recordable from scalp and intracranial electroencephalograms up to 1–2 seconds prior to action execution. However, according to Libet's research, subjects only report conscious awareness of the intent to act to be about 200 ms before action execution. Second, psychophysical findings support the principle of attentional prior entry, which states that attended stimuli are perceived faster than unattended stimuli even when occurring simultaneously. However, electrophysiological studies have failed to find corresponding temporal differences between neural signals for attended and unattended stimuli. We suggest that the key to understanding these phenomena is to think of time perception in terms of signal detection theory (SDT). We modeled signal onset perception as a continuous process of signal detection. Given a signal mixed with noise, the brain could determine the onset by performing signal detection at every time point. The probability of detection then depends on both the signal and noise distributions. In our framework, the brain uses a consistent criterion, and gives a positive response when the signal plus noise at the given time point crosses the criterion, and a negative response otherwise. We performed simulations using slow-rising signals with Gaussian noise added, which mimics natural

neural signals such as the RP. According to our model, the statistically optimal criterion for detecting on onset of the RP would be a conservative one. At this conservative criterion, the early part of the signal will not be detected. This accounts for the Libet findings of delayed awareness for action. To explain attentional prior entry, we treated attention as boosting the signal-to-noise ratio relative to the unattended signal. Our simulations showed that this causes the attended signal to be consistently detected earlier than the unattended signal. Both of these results suggest that many aspects of conscious awareness could be explained in terms of signal detection of neural activity.

Biased Partial Awareness: How Partial Information and Contexts Create Complete Conscious Experience

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 1

ABSTRACT Current theories of consciousness often assume that the relevant content of consciousness corresponds to a stimulus taken as a whole. For instance, in several taxonomies of conscious states proposed recently (e.g., subliminal vs. P-consciousness vs. A-consciousness, or subliminal vs. preconscious vs. global access), the question is to determine the conditions for a whole stimulus to reach a certain stage. Similarly, in another debate, deciding whether consciousness is a graded or all-or-none phenomenon is also treated only by considering the stimulus as a whole. Here, I will defend the partial awareness framework, and I will present a rich set of empirical data from our lab supporting the hypothesis that conscious experience reflects an elaborated construct resulting from the interaction between partial information in the

stimulus and contextual factors internal to the subject. I will present several experimental studies (e.g. Sperling-like partial-report experiments, masked face priming, low-level orientation tasks) in support of a "biased partial awareness" state of consciousness. Partial awareness corresponds to a situation in which some of the information in the stimulus is consciously detected, while information at other levels of processing remains non-conscious. In that case, I will provide evidence that a perceptual recovery process occurs to produce a complete conscious percept. This mechanism relies on the stimulus information (only some of which might then become conscious), as well as on contextual factors (e.g. current task and expectations, the set of active representations in the current situation, etc.). Crucially, the "biased partial awareness" paradigms I will present show that conscious perception may not faithfully correspond to the information presented in the stimulus. Finally, I will argue that the notion of partial information may enrich consciousness studies. Relying on the basic but powerful psychological notion of a hierarchy of levels of processing, which has been underestimated in recent debates on consciousness, is crucial for investigating the mechanisms supporting the complex elaboration of conscious experience.

The Feeling of Understanding Consciousness

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 53

ABSTRACT Why can we not solve the hard problem of consciousness? According to David Chalmers (1996) this is due to the fact that phenomenal consciousness cannot be functionally (i.e. causally) ana-

lyzed. As science uses functional explanations, he argues, we need to change science in order to be able to solve the hard problem. On the one hand, we agree with Chalmers that a functional analysis of phenomenal experiences would solve the hard problem. On the other, and contrary to Chalmers, we argue that this can in fact be done and that science needs no revolutionary change of fundamental theories. Using the empirical data provided by Derek Denton et alia (1999), we present a functional analysis of the experience of thirst. Additionally – still following Chalmers' model of explanation – it can be shown how thirst is realized, thereby providing a full explanation, and solving the hard problem of thirst (cf. Hohwy & Frith 2004). Still, many would reject this as an explanation of the experience of thirst. The main reason for not accepting this explanation as an explanation, we argue, is that it does not feel right (Gopnik 1998): the explanation does not generate the feeling of understanding thirst. We show that in general scientific studies of phenomenal consciousness simply lack the right philosophical backing to generate the feeling of understanding consciousness. We aim to offer such a philosophical framework. Our main thesis in this respect is that it is not necessary for science to change in order to generate the feeling of understanding of consciousness, but that it is necessary to change our view of science in order to generate such feeling. That view of science can be traced back to the work of John Dewey (1929) and more recently to the work of Bas van Fraassen (2002), the kernel of which is that the inference from the success of the natural sciences (including the neurosciences) to materialism is not coercive. Accepting this might finally generate in us the feeling of understanding phenomenal consciousness.

Enactivism and Bodily Sensations

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TYPE Concurrent Session 1
TIME Saturday, 14:30–15:00
PLACE Room 3075, HU

ABSTRACT The enactive approach aims at providing a unified account of perceptual experiences in terms of bodily activities. Most enactive arguments come from the analysis of visual experiences (Noë, 2004), but there is one domain of consciousness where the enactive theses seem to be less controversial, namely, bodily sensations. On this view, bodily sensations consist in knowledge of sensorimotor contingencies. For instance, feeling one's arm touched would be equivalent to know that if one presses upon the touching object, the tactile signal will increase. One can contrast the enactive view of bodily sensations with the dominant neuropsychological theory that draws a sharp distinction between the body schema and the body image (Paillard, 1999; Gallagher, 2005). According to the body schema/body image theory, bodily information related to action does not participate to bodily experiences. There are two distinct systems, which can be dissociated in some rare pathological cases like deafferentation and numbsense. It was shown indeed that patients with numbsense do not feel tactile sensations but are still able to point where they have been touched (Rossetti et al., 1995). In contrast, deafferented patients can identify their body part, but have difficulties in reaching it (Paillard, 1999). Here I shall analyse the relationship between bodily experiences and action. I shall show what kind of role action can play in bodily experiences, and what kind of role action cannot play. In order to do so, I shall distinguish between action-orientated and action-grounded body representations.

Workspace and Sensorimotor Theories: Complementary Approaches to Experience

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 49

ABSTRACT A serious difficulty for theories of consciousness is to go beyond mere correlation between physical processes and experience. Currently, neural workspace and sensorimotor contingency theories are among the most promising approaches to make any headway here. In this talk we explore the relation between these two sets of theories. Workspace theories, as proposed by Baars, Deheane, Naccache, Varela and others, build on large-scale activity within the brain. Sensorimotor theories on the other hand include external processes in their explanations, stressing the sensorimotor contingencies that arise from our interaction with the environment, as proposed for example by Hurley, Myin, Noë and O'Regan. Despite the basic differences between the approaches, we argue that workspace and sensorimotor theories are complementary rather than competitive. By combining these theories, a number of problems that hamper these individual theories may be overcome and their strengths combined. We argue that workspace theories have better prospects for explaining how there can be consciousness in the first place, while sensorimotor theories are most promising for making sense of the specific phenomenal character of experiences.

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The Behavioural Quantification of the Resting State

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 18

ABSTRACT Background: Despite neuroimaging evidence that awareness of environment (external) and of self (internal) are anticorrelated, switching their activation at an average rate of 0.06 Hz (Boly et al., 2008, Soddu unpublished data), little is known about the behavioural quantification of the resting state. The present study provides behavioural data on the relationship between external and internal awareness. Methods: 31 healthy volunteers were in a resting condition (i.e. sitting with eyes closed), avoiding structural thinking (e.g. counting). 66 auditory prompts were presented at random intervals via headphones. The participants' task was to rate on a keyboard their external and internal awareness state as it was before the presentation of the prompt on a 4-point scale (0=absent; 1=mild; 2=moderate 3=maximal). The content of awareness was indenti-

fied via thought sampling. Results: At the individual level, 24/31 subjects showed significant anticorrelation between internal and external awareness (1/31 positive correlation, 6/31 no significant correlation, $p<.05$). At the group level, Spearman's r was calculated at –.44, ($p<0.02$ two-tailed). On average, the switching from internal to external occurred at 0.05Hz (range: 0.01–0.1Hz). Self-reports for external awareness included auditory (100% subjects), somesthetic (90%), olfactory (20%) and visual (10%). Self-reports for internal awareness included experiment-related thoughts (80% subjects), autobiographical (65%) and inner speech (20%). Discussion: Our results confirm the predicted anticorrelation between internal and external awareness at the behavioural level. The temporal dynamics of external to internal switch is in line with previous neuroimaging data. Our study bridges the cognitive and physiological characteristics of the brain 'default' resting state activity.

Dissociating Automatic and Conscious Influences in Associative Learning

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 138

ABSTRACT A dissociation between subjective expectancy and motor behavior has been reported in a simple associative learning task (Perruchet, Cleeremans, & Destrebecqz, 2006). According to previous conditioning studies (Clark, Manns, & Squire, 2001), this dissociation is observed when the to-be-associated events co-terminate and thus over-

lap in time (a training regimen called delay conditioning), but not when they are separated by a temporal delay (trace conditioning). In this latter situation indeed, there tends to be a direct relationship between subjective expectancy and behavior. In this study, we further investigated this issue in a series of experiments where conscious and unconscious components of performance have been pit against each other. In Experiments 1–3, subjects performed a simple reaction time task in which a preparatory signal (a tone) either overlapped with or terminated earlier than the imperative stimulus (a visual target presented in 50% of the trials). After each response, subjects also had to state how much they expected the imperative stimulus to be displayed on the next trial. Results indicate that reaction times tend to decrease when the tone is consistently followed by the visual target across successive trials, whereas conscious expectancy for the target decreases at the same time. Importantly, we systematically found that the temporal relationship between the tone and the target failed to influence performance. In a fourth experiment, we examined whether these results extend to a two-choice reaction time task. To our surprise, we observed a direct relationship between subjective expectancies and reaction time in that situation. We nevertheless observed that the introduction of a delay between the tone and the target had, once again, no effect on performance.

Reductive Explanation and A Priori Entailment

D

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 55

ABSTRACT David Chalmers and Frank Jackson (2001) have argued that in order to provide a reductive explanation of consciousness in physical terms, we have to show that microphysical truths entail phenomenal truths a priori. In this paper, I examine their arguments for that conclusion, and I criticize a crucial premise in the argument, namely, the claim that microphysical truths entail ordinary non-phenomenal macroscopic truths a priori, such as 'water covers 60% of the Earth surface'. I focus on the question about the possession conditions of macroscopic concepts, such as WATER or PLANET, and I distinguish two views: a strong view and a weak view. These two views differ over the amount of information that they attribute to competent users of the concepts. According to the strong view, competent users of a concept have the ability to infer truths involving such concept from lower-level truths, whereas according to the weak view, all that is required in order to be a competent user of a concept is to be able to infer truths involving that concept from other truths, which need not be lower-level truths. I argue, firstly, that the strong view is problematic because it trivializes the notion of a priori knowledge; and secondly, that if we endorse the weak view, then it follows that sentences such as 'If the microphysical facts are so and so, then water covers the 60% of the Earth surface' are not a priori true. Therefore, I conclude that Chalmers and Jackson have not presented a convincing case for the claim that physical truths a priori entail ordinary macroscopic truths.

Comfortably Numb: Fusion of Self and Other by Touch

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TYPE Concurrent Session 4
TIME Sunday, 17:00–17:30
PLACE Room 2097, HU

ABSTRACT The experience that our body and its parts belong to us and are not those of other people is a key aspect of the self and has been called bodily ownership (BO). Here we investigated BO in a series of behavioural experiments with a tactile illusion that has the potential to disrupt BO instantly and repeatedly. We also report data from a somatosensory evoked potential (SEP) study during this illusion. The numbness illusion (NI) refers to a peculiar feeling of numbness occurring when one person holds his hand against another person's hand and simultaneously strokes the conjoined index fingers with his opposite hand. In study 1 we confirmed this informal observation using a 2×2 factorial design with naive subjects. Stroking of the fingers was carried out by the experimenter or by the subject (Stroking factor), either synchronously (2 fingers touched at the same time) or asynchronously (one finger after the other) (Synchrony factor). Subjects then rated different sensations on a questionnaire. a significant interaction between both factors was found ($p<0.001$), showing that the NI is maximal in the self-synchronous condition. Study 2 controlled for visual feedback of the hands and expanded the phenomenology of the NI. Viewing of the hands was not found to influence the NI ($p>0.14$). In study 3 and 4, we showed that the NI relies primarily on tactile signals rather than mere proximity of the hands or being the agent of the stroking. Finally, study 5 used SEPs to left median nerve stimulation during the NI, allowing to

investigate the associated brain activation in sensorimotor cortex. Our SEP data shows that an early SEP component at 20ms recorded over the somatosensory cortex controlateral to the stroked hand, is modulated by stroker and synchrony and correlates with the intensity of the illusion. We argue that the NI is a promising paradigm for the study of BO and discuss its neural origin in primary somatosensory cortex. We compare the implication of this structure with respect to neural activations reported with other current methods to manipulate BO and bodily consciousness.

Confidence, Gambling and Control: Dissociating Measure of the Conscious Status of Knowledge

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TYPE Symposium 4: Talk 2
TIME Monday, 16:30–18:30
PLACE Leibniz-Saal, BBAW

ABSTRACT Unconscious knowledge is knowledge we have, and could very well be using, but we are not aware of. The most straightforward method of determining whether a person is aware of knowing is to ask the person after a judgment whether they knew the answer (to some degree) or were guessing (verbal confidence). Confidence can also be measured with gambling, though not with wagering, and also imperfectly by whether the person is willing to base control on the knowledge (Jacoby's process dissociation procedure). Such confidence measures show whether or not the person is aware of knowing the content of the judgment, but not whether the person is aware of what any knowledge was that enabled the judgment. Thus, a distinction is made between judgment and structural knowledge, and it is shown how the conscious status of the latter can also be assessed, which is important for implicit learning research.

I will show empirical dissociations between all these different measures, and on what basis any one of them could take precedence.

Subliminal Behavioral Priming: It is All in the Brain, but Whose Brain?

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 123

ABSTRACT Priming subjects may automatically and unconsciously activate a representation (e.g. the stereotype of aged persons) that lead them to act according to it (e.g. walking slower than usual when exiting the experiment room). In order to explain this effect, some authors suggested the existence of a direct link between perception and behavior, regulating some of the automatic part of our social life. Though this concept seems widespread in the field of social cognition on the one hand, the very idea of subliminal semantic activation remains highly controversial in the field of cognitive psychology on the other hand. In an effort to conciliate these two views, we conducted a series of experiments, all trying to replicate and improve Bargh, Chen, and Burrows' (1996) now classic experiment. To question their results, we introduced more accurate walking speed as well as more throughout awareness measurements. We also manipulated the expectations of the experimenter on primed subjects' behavior in order to assess the effect on walking speed that could result from the experimenter own beliefs.

Imaging Transitions in Consciousness

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 107

ABSTRACT Common categorizations of consciousness distinguish between basal and higher-order aspects of this multifaceted concept. Basal consciousness comprises perceptions and sensations, whereas higher-order consciousness constitutes reflections on these perceptions. In rapid eye movement (REM) sleep, ordinary dreaming comprises only basal aspects of consciousness. There is conscious perception of dream content but higher-order aspects of consciousness are usually absent: The person does not realize that he is dreaming and has no perception of the self as an agent endowed with intentionality and free will. Higher-order consciousness therefore seems to be bound to wakefulness. However, a special type of dreaming – referred to as 'lucid dreaming' – is characterized by full-blown consciousness, including all higher-order aspects: The dreamer is able to reflect on his state of consciousness and realizes that he is dreaming. Using a combined fMRI/EEG approach, we could reveal neural activity related to the genesis of higher-order consciousness by contrasting ordinary REM sleep with physiologically verified lucid REM sleep. We find increased activation in a range of neo-cortical regions, including bilateral precuneus, cuneus and parietal, prefrontal and occipito-temporal cortices, to be related to this categorical shift in consciousness. This activation shows remarkable overlap with neo-cortical regions that have highest expansion in humans relative to non-human primates.

Evaluating the Contribution of Discrete Perceptual Mechanisms to Psychometric Performance

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 23

ABSTRACT What are the brain mechanisms underlying perception? It has been suggested that attention and/or perception could operate discretely, or that attention could relay information to perception discretely, i.e. in successive cycles. The most telling manifestation of a periodic sampling process is temporal aliasing, by which a periodic stimulus evolving in one direction can be interpreted in the opposite direction. In a typical psychophysical task subjects can be asked to judge the direction of a periodic stimulus, and their performance can be recorded as a function of the stimulus temporal frequency: aliasing would predict some oscillations in the resulting performance function. However, the quest for aliasing in a variety of tasks is subject to some pitfalls. One pitfall is the presence of non-periodically sampled (i.e. continuous) processes which could also contribute to perception and thus cover the tracks of any underlying periodic process. Another one is that the rate at which samples are taken may slightly vary across subjects, as well as across trials for a single subject. In addition, the appearance of oscillations in a given performance function could sometimes be artifactually induced by measurement noise. How does one then extract evidence for aliasing in psychophysical data, and how does one quantify it? The general method that we introduce here is based on modeling the performance that would be expected from the respective contributions of a periodically sampled process and a non-sampled (continuous) process to perception; the sampled process depicts an oscillation, characterized by its sampling frequency and variability, whereas the non-sampled process

is reflected by a more classical psychometric function characterized by its threshold and slope. Each subject's performance can be fitted within such a model. To assess significance, the contribution of the sampled process to perception and the corresponding sampling frequency can be compared, within and across subjects, to surrogate values obtained under the null hypothesis of a classical psychometric function with additive measurement noise. We illustrate this new analysis method on a psychophysical task involving motion perception, which has previously been proposed to support temporal aliasing (cf. the continuous Wagon-Wheel Illusion).

Mentalistic Metatheory and Methodology

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 94

ABSTRACT When ASSC convenes near the birthplace of psychology as a science of consciousness, I especially want to outline for clarity and discussion what I believe to be a metatheory and methodology for a most productive science of consciousness. On mentalistic metatheory, consciousness is not a "system" or "space"; it is a set of mental states interrelated by nonconscious neural operations within mental episodes to be theoretically analyzed. Conscious states carry symbols, functionally specified that represent past, present, and future events out there and in our own consciousness, in the enormous range of significant mental activities, now widely recognized and investigated but with too little analysis of mental episodes interrelating conscious states. The metatheory and the theories it generates should then focus on what

consciousness explains rather than on the explanation of consciousness, an explanation that emerges with recognition of the adaptive value of consciousness in carrying those symbols in those significant mental activities. Neural correlates can have value by enriching the theoretical networks, to the degree the brain imaging meets certain standards, but neither correlate can be 'explained'; by correlation alone. A conscious state lies at the intersection of a set of variables: agency, mode, and content, each of which can be assessed. Mental contents may be 'identity symbols' or only "literal symbols" that precede and surround attentional identity symbols. Mental episodes may be deliberative, interrelating propositional states, or associative-activational ("evocative") interrelating sub-propositional states. Mental episodes occur between transductions of sensory inputs and motor outputs and may activate and be activated by neural memory networks, all of which are non-conscious and non-symbolic. Methodologically, we should seek relations among phenomenal reports of specific conscious states, not as a first person data language, which cannot meet standard data language requirements, but as the most specific indices of conscious states described in first person theory language. Reports as indices of theoretical conscious states must meet certain validity standards: specificity, verbalizability, the memorability required for their higher-order representation. Bayes' theorem, Duhem-Quine thesis, and network theory together provide a methodology of competitive support for a theory and further validation of reports-as briefly illustrated.

E Probing the Phyletic Boundaries of Consciousness: Cephalopod Psychophysics

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TYPE Concurrent Session 4
TIME Sunday, 17:00–17:30
PLACE Room 3096, HU

ABSTRACT Psychophysical experiments generally rely on the ability of conscious individuals to give accurate verbal reports of what they are experiencing, and therefore usually involve human subjects. In most non-human animals, percepts or sensations cannot be assessed directly through verbal report, and psychophysical experiments are therefore quite difficult to perform. Nevertheless, it is possible to exploit non-verbal, behavioral channels to investigate phenomenal experience in non-human animals. Here, we present a psychophysical experimental approach for assessing perceptual capacities of the cephalopod mollusc *Octopus vulgaris* that may be consistent with conscious states. In our experiments, sequences of visual data were shown to free behaving octopuses via a submersible organic light-emitting diode (OLED) video display. We presented rapid serial sequences of stimuli via the OLED display at rates impossible to achieve through manual presentation to explore the temporal properties of visual perception and sensory integration in *O. vulgaris*. We employed the 'attentional blink' paradigm, in which a target secondary visual stimulus is presented 200–500 ms after a primary stimulus within a rapid serial stream of stimuli. When shown such a visual stream, human subjects remain unaware of the secondary 'blink' stimulus as long as the interval between presentation of the first and second stimulus does not exceed 500ms. If the interval exceeds 500 ms, the human subject becomes aware of the blink stimulus. In these experiments, serial stimuli presented in video sequences were chosen for their particular salience for the octopuses. These

stimuli included both images of objects with ecological salience i.e., crabs or other octopuses and images of objects immediately relevant to the octopuses' everyday laboratory experiences i.e., white plastic balls associated with positive experiences (fish) or red plastic balls associated with negative experiences (mild electrical shock). Changes in components of octopus body patterning (i.e., chromatic, textural, postural, locomotor) were considered to be forms of behavioral report. The absence of any change during presentation of a 'blink' stimulus known to otherwise induce specific patterning shifts indicated that a subject was unaware of that stimulus. We discuss our results and the possibility of functionally convergent properties of cephalopod and vertebrate perception.

Measuring Consciousness Through Neural Coherence

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TYPE Symposium 4: Talk 3
TIME Monday, 16:30–18:30
PLACE Leibniz-Saal, BBAW

ABSTRACT It has been proposed that synchronization of neural signals may be involved in several processes indispensable for awareness, including arousal, perceptual integration, attentional selection, and working memory. Indeed, recent evidence from both animal and human studies demonstrates specific changes in neuronal coherence and, moreover, the emergence of fast oscillations with frequencies in the gamma-range during these processes. These results suggest that assessing neuronal coherence may be of critical importance for "measuring consciousness". The presentation will focus on changes

of coherence under anesthesia and in bistable stimulus paradigms. While the former suggests that neural coherence may provide an important variable for measuring changes in levels of consciousness, the latter indicates that it may also be useful for predicting changes in the contents of conscious states.

F Manipulating Perception: Misdirection, Magic and Consciousness

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TYPE Tutorial M2
TIME Friday, 9:30–12:30
PLACE Room 2, BBAW

ABSTRACT Recently, it has been suggested that magic techniques could be adopted as valuable research tools for cognitive science (Kuhn et al., 2008, Macknik et al., 2008). In particular, common magic techniques such as misdirection and illusions could be exploited to gain new insights into the inner workings of conscious perception. Our challenge is to find ways of incorporating these techniques into the scientific study of consciousness. It has been suggested that attention and conscious perception may sometimes constitute two distinct cognitive processes (O'Regan et al., 2000; Lamme, 2003; Koch, 2006). Through the use of misdirection, magicians manipulate these constituent processes of the perceptual chain. In the field of visual attention, studies have been published in which special magic tricks were developed and deployed as stimuli (e.g. Kuhn and Tatler, 2005; Kuhn and Land, 2006). Others have used magic tricks to investigate the neural correlates of causality (Parris et al., in press). However, these methodological tools are still in their infancy. In this tutorial, we will present experimental designs built around a variety of magic techniques and share some preliminary results that bear on the nature of consciousness. We will discuss the findings of three different research groups, each taking a distinctly novel approach. Three main topics will be covered: (1) Misdirection of attention: How can we investigate misdirection in the lab, and what can it tell us about attention and awareness? (Kuhn); (2) A working definition

of misdirection: From methodology to theory; misdirection as an interdependent signaling process (Edelman); (3) Developing a battery of magic stimuli: Problems and pitfalls (Faber). To unpack these topics, several mini-talks and practical demonstrations of magic tricks will be embedded: Mark Mitton (magician): a practical demonstration of a deception model ; Thomas Fraps (magician): The Blind Spot – Filling-in mechanisms and perceptual illusions.

F

Unconscious Priming Through Gaze-Contingent Substitution

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 3

ABSTRACT We present a new paradigm called "gaze-contingent substitution" which aims at characterizing unconscious processes under conditions of inattention. This method offers the advantage of bypassing the limiting factors encountered in paradigms which use masking or the attentional blink, where the subliminal stimuli are presented very briefly, as well as in the interocular suppression method, in which the unreportable stimuli are suppressed very early on by the visual system (i.e. in subcortical pathways). Here, using an Eye-tracker, we presented stimuli that were long-lasting (e.g. the prime displayed for one second or more) but, crucially, as soon as the gaze diverged towards them from another distracting stimulus (the target), they were substituted by fillers. Unconscious influences were investigated by manipulating the prime-target relation and measuring priming effects. We report two studies, one using either congruent vs. incongruent arrows to measure

sensori-motor priming, and the other using repeated vs. unrelated faces to measure perceptual priming. In both cases, we report robust priming under condition where the unattended stimuli remained impossible to identify. These results are interpreted in the theoretical framework of preconscious perception of supraliminal but unattended stimuli developed by Dehaene et al. (2006).

Subjective Versus Objective Simultaneity: A Magnetoencephalography (MEG) Study

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 19

ABSTRACT Magnetoencephalography (MEG) is a non-invasive brain imaging technique that records magnetic fields associated with synaptic transmission in the human brain. MEG has good spatial resolution and extremely high temporal resolution. We used event-related MEG to examine the brain correlates of simultaneity perception in healthy adults. The objective of the current study was to test if the brain processes apparent simultaneity induced by non-simultaneous stimuli like objective simultaneity or like objective non-simultaneity. Two horizontal bars were presented simultaneously (onset and offset), or non-simultaneously employing two different onset delay conditions. The short delay separating the two bars was 17 ms, which is below the subjective visual simultaneity threshold (i.e. apparent simultaneity), and the long delay was 117 ms, which is well above the threshold (i.e. clearly non-

simultaneous). All measurements were taken using a Neuromag-306 VectorViewTM system, providing a helmet-shaped array of 102 pairs of gradiometers. The responses were averaged separately for physically simultaneous stimuli and non-simultaneous stimuli in the two delay conditions. Significant differences between the evoked responses were sought using a time-dependent measure that takes into account the data from all sensors. As a general pattern in all three conditions we found more event-related MEG activity in the right hemisphere from a latency of about 300 ms onwards, which was particularly confined to the parietal cortex in the case of non-simultaneity, but more distributed towards prefrontal and temporal areas in the simultaneity and apparent simultaneity conditions. These findings are broadly consistent with suggestions of a right hemispheric 'when' pathway. a widely distributed long-latency activation was apparent in the simultaneity condition but attenuated in the apparent simultaneity condition from about 600 ms onwards which suggests a difference in the processing of real and apparent simultaneity. Our results indicate a difference between conscious and non-conscious processing of temporal information.

The Neuroanatomical Case Against Consciousness in Fish: Hard Evidence and Theoretical Speculations

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TYPE Concurrent Session 4

TIME Sunday, 16:30–17:00

PLACE Room 3096, HU

ABSTRACT Can fish suffer? That is, can they consciously experience pain – or for that matter, any other sensation? In this paper, I argue that the neuroanatomical evidence is surprisingly unequivocal: fish

brains lack anything like the right kind of structure for supporting the dynamic, multisensory feature binding that is essential for consciousness. In mammals, the diffusely-projecting structures of the intrathalamic nuclei and thalamic reticular nucleus are necessary for sensory awareness, and a lesion of either results in a permanent loss of consciousness. In fish these structures are absent, and importantly, no other structure is situated to perform the relevant functions. If we take the leading neural models of consciousness seriously, this alone should be sufficient to disqualify fish as bearers of consciousness – though there is also strong converging evidence from ablation studies and from comparative anatomy. My aim here is not to pursue any particular grudge against ichthyans, nor to make excuses for eating them (I don't). Rather, in previous work I have argued that taking ourselves seriously as theorists of consciousness must mean taking our theories seriously even – or especially – when they have consequences which are morally troubling. In my experience, many people (including neuroscientists) are particularly uncomfortable with the idea of using neural theories of consciousness to make claims about its absence. In this paper, then, my goal is to lay out the evidence and then focus on the questions surrounding this sort of judgment: Is it anthropocentric? Is it putting too much confidence in our theories? Are there alternative standards which are more suitable for making judgments about the moral status of non-human animals? I will argue that, in each case, the answer is no.

Functional Connectivity Within the Default Mode Network in a Patient in Vegetative State

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 132

F

ABSTRACT Introduction: Vegetative State (VS) is a clinical condition characterized by the maintenance of the arousal in absence of awareness. There have been several attempts of characterize the neural correlates of vegetative state and other disorders of consciousness. Early metabolic studies using positron emission tomography (PET) have shown dysfunctions and functional disconnections in fronto-parietal associative areas known as being part of the "default mode network" in VS patients. Methods: a patient with traumatic brain injury was scanned twice. The first scanner was performed 33 days after the injury when the patient was in VS. The second scanner was performed when the patient had recovered the consciousness at 13 months of evolution. We used resting-state functional connectivity magnetic resonance imaging analysis to study the changes in the default mode network that accompanied the recovery of the consciousness. SPM5 running in Matlab 6.5 was applied to detect brain regions showing a pattern of spontaneous fluctuation in blood oxygen level-dependent signal that correlated with the pattern of activity in the precuneus. Results: The analysis of the first fMRI dataset revealed a pattern of functional connectivity limited to two small regions in the left parietal lobe (Brodmann areas 7 and 40). The analysis of the second fMRI acquisition revealed a restored pattern of functional connectivity comprising most of the areas reported as being part of the default mode network: precuneus and left parietal regions, bilateral dorso-lateral and medial prefrontal regions, bilateral medial temporal regions as well as the left thalamus. Conclusions: Our results give further evidence of the alteration of the cortical and thalamo-cortical connectivity in VS patients and the importance of the functional restoration of this network for the emergence of the consciousness.

Out of the Body, Out of the Mind? Embodiment, Experience and Sensory Substitution Research

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 43

ABSTRACT The contribution of the body for cognition can only be understood by assessing the organism's dynamic relations to the 'affordable' patterns of its environment. In my presentation, I propose a 'constitutive embodiment thesis' that focuses on the role of goal-driven bodily motor engagement in setting up perceptual experience. My thesis can be separated from a weaker thesis that bodily mediation merely causally triggers conscious episodes. On my account, the body is defined as enabling specific feedback loops that are constitutive for the qualitative experience an organism undergoes in establishing 'ecological control' (Clark 2008). At the heart of an enactive/embodied account of perceptual consciousness lies the claim that the intrinsic character of neurological events does not provide the means to explain experiential quality: 'What determines and controls the character of conscious experience is not the associated neural activity." (No. 2009) Rather, its proponents refer to the larger setting in which those experiences occur and take seriously the coupling of the organism with the environment. Thus the alterable machinery of conscious experience is extended to bodily and environmental elements. On the basis of this assumption I oppose claims (e.g. Prinz 2009) that so far no elements outside the brain have been found that 'co-vary with conscious states in content and time-course". Such claims, I argue, in limiting the scope of analysis to 'internal' events merely beg the question. In order to defend the 'constititutive embodiment thesis' and to establish a notion of sensorimotor identity, I draw on research on sensory substitution (Bach y Rita & Kercel 2003).

This research supports the claim that goal-driven motor engagement constitutes specific conscious experience. Furthermore, it allows us to detach contributions of bodily and worldly elements. This, I argue, can be established by focusing on the organism's mechanisms of regulating the boundary conditions and by examining measurable shifts between the position of visual and auditory ego-centers. Evaluating new research on (minimal) TVSS and experiments done with a tactile third-eye positioned at the hand can help us to understand the specific role of the body in determining the intermodal differences and intramodal changes in perceptual experience.

Consciousness in a Natural World: From Biological Function to the Meanings of Life

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TYPE Tutorial A2
TIME Friday, 14:00–17:00
PLACE Room 2, BBAW

ABSTRACT Darwinist theory plus neuroscience are considered by many to present a disenchanting conception of the human person (in Max Weber's sense). We call this disenchantment neuro-existentialism. If we are just animals (smart but animals nonetheless) and if (as neuroscience assumes as a regulative ideal a la Kant) that there is a naturalistic explanation for consciousness and for our subjective experiences, then our significance as human persons, the meaning of our lives, are deflated. The workshop will discuss the history and current status of the conflict between (W. Sellars') the manifest and the scientific images as they pertain to the scientific study of consciousness. The naturalistic

framework we adopt does in fact disallow for super-natural elements (immaterial soul, irreducible mental properties) into the ontology of consciousness and personhood. But we'll argue that this does not steal away from our existential significance as persons, in a multi-layered pluralistic epistemic view of consciousness and agency we embrace. To the contrary, this is the only way to do justice to the proper understanding of ourselves as both biological organisms shaped by our evolutionary history and sentient rational subjects and autonomous agents in our social and cultural world. We'll wrap up the workshop with a broader discussion looking at the ties the history of consciousness studies has to cultural studies, sociology and history of science, and even popular understanding of science.

Mindwandering Under Load

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 14

ABSTRACT Perceptual load has been established as a key determinant of the processing of task-irrelevant external information (e.g., Lavie, 2005). Here we present a series of experiments examining the effect of perceptual load on the processing of task-irrelevant internally-generated information: task-unrelated thoughts (TUTs or 'mind-wandering'). The frequency with which TUTs were reported during a visual-search task decreased as the task's perceptual load was increased. These effects were demonstrated on unintentional TUTs and in paradigms ruling out alternative accounts in terms of increased motivation or demands

on responses or verbal working memory. In addition, a correlation was found between individual differences in load effects on internal (TUTS) and external (response-competition) distractors. These results suggest that exhausting attentional capacity in task-relevant processing under high perceptual load can reduce processing of task-irrelevant information from external and internal sources alike.

F

Learning to Be Social Through Dynamic Systems Control

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 117

ABSTRACT This research aims to demonstrate how our capacity at social interaction can be acquired over time through an implicit process of reinforcement learning. As far back as 1954, Rotter wrote that the "consequences of one's behavior have an impact on one's motivation to engage in that behavior – we perform certain social actions that we hope will in turn cause other people to act in a desired way, such as smiling in order to get a smile in return." Recently, Wolpert et al. (2000, 2003) coined this process as a Social Feedback Loop, whereby an agent uses social feedback from the environment to adjust its internal forward model. Indeed, for a newborn, learning social interaction essentially comes down to learning links between its own behavior and the behavior of the mother in reaction to this, which essentially is reinforcement learning. Therefore we use the Dynamic Systems Control (DSC) paradigm, which

is a form of reinforcement learning. In DSC tasks, participants manipulate one or more input values over a number of trials in order to obtain a target outcome value, while on each trial receiving (through the output) feedback on the efficacy of their manipulations. Berry & Broadbent (1984) used DSC to demonstrate a dissociation between performance and verbalizable knowledge, as participants typically optimize their task performance without being able to explain how they did so. In a number of experiments based on Berry & Broadbent's "person interaction" DSC paradigm, participants have to keep an artificial agent in a desired emotional state (e.g., "friendly"), by providing inputs and observing their effect on the agent. The first experiment, in which participants provided emotional states as input, showed that participants indeed learn how to interact with an artificial agent. However, this paradigm didn't allow conclusions about whether learning was implicit. a new experiment disentangles implicit and explicit contributions by means of Process Dissociation Procedure (Jacoby, 1992), and renders learning more complex and ecologically valid by having participants learn how initially neutral actions, such as throwing a ball, influence the agent's emotional state. Results of this last experiment will be presented at the conference.

Computational Nonlinear Dynamics Model of Cognitive Bistability for Simulating Interrupted Stimulus

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 98

ABSTRACT Computational Nonlinear Dynamics Model of Cognitive Bistability for Simulating Interrupted Stimulus and Long Range Correlations. Simulation results of bistable perception due to ambiguous visu-

al stimuli are presented which are obtained with a nonlinear dynamics model using delayed perception-attention-memory (PAM) coupling. Like the related Synergetic model of Ditzinger & Haken (1989) the present approach is based on attention fatigue within a perception-attention loop. In addition, however it includes a feedback delay time of 40 ms in agreement with Lamme (2003) in order to obtain estimates of absolute time scales. Percept reversals are induced by attention fatigue with an adaptive attention bias which balances the relative percept duration. The recursive PAM equations may be mapped to corresponding reentrant Thalamo-Cortical-Hippocampal loops representing the attentional top-down modulation according to Itty & Koch (2001) and memory effects. Periodic stimulus simulations as a function of stimulus off-time yields the reversal rate variation in surprisingly good quantitative agreement with classical experimental results of Orbach et.al. (1966) when selecting a fatigue time constant of 1–2 s. Coupling of the attention bias to the perception state introduces memory effects if the bias time constant < 20 s. They are quantified through the Hurst parameter H, exhibiting significant long range correlations (H > 0.5), i.e.the fractal character of the reversal time series (Fürstenau 2007, 2009) in agreement with recent experimental results of Gao et.al. (2006). Transition times of 150–200 ms between conscious perception states, mean percept dwell times of 3–5 s and the dwell time statistics (standard deviation/mean ca. = 0.5) exhibit good agreement with experimental values reported in the literature (e.g. Lamme (2003), Borsellino et.al. (1972), Levelt (1967), Ito et al. (2003)).

G How Unconscious Effect Information Modulates the Sense of Agency: an ERP Study

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 75

ABSTRACT The sense of agency refers to the experience of control over one's actions and their sensory effects and is assumed to be generated by a comparison between predicted and actual action effects. It has been suggested that an internal forward model computes these predictions on the basis of efferent information which can be used to attenuate sensory effects of self-produced movements and in this way distinguish them from externally generated effects. On another view we infer the experience of control from observing covariances between thoughts and sensory events and independent of the efference copy of the motor command. Even though there is evidence for both accounts, their interrelation is so far poorly understood. We aimed at studying whether externally induced modulation of the experience of control over sensory effects does also rely on a sensory attenuation mechanism even though the effect representation was in fact independent of the motor system's execution commands. To this end we used event-related potentials to measure attenuation of self- versus externally generated sensory effects under different conditions of unconscious effect-priming. First results will be presented and their implications for the motor and inferential accounts of voluntary control will be discussed.

Causal Exclusion and Consciousness

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G

TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 38

ABSTRACT State consciousness is that property in virtue of which a mental state, as opposed to a creature, is conscious. If it is not epiphenomenal, the property causally impacts cognition and behavior. There are many questions as to the effects the property might have, the means by which it has those effects, the cases in which it facilitates mental or physical performance, and so on. Yet a theory of "conscious causation" may well be a nonstarter if mental states themselves are causally inert: How can consciousness make mental processing more (or less) efficacious if it is not mental processing, but *neural* processing, that does the causal work? In this paper I examine the issue of conscious efficacy in the context of a more fundamental problem for mental causation known as "causal exclusion". Essentially, the generally accepted notion that physical events are part of a causally closed system entails that every neural event has a sufficient physical cause. So, barring overdetermination, mental events are unable to cause neural events. This result is a step in Jaegwon Kim's Causal Exclusion Argument (CEA). I argue that CEA poses a problem for conscious causation, and furthermore that proposed solutions to it do not necessarily secure the efficacy of state consciousness. For even if conscious mental events can be plausibly "included" in the etiology of neural events and behavior, their efficacy *qua being conscious* is not entailed. Thus, epiphenomenalism about consciousness can prove a more difficult thesis to debunk than epiphenomenalism about mental states in general. My procedure is as follows: First, I explain how the qua problem arises on an ontology that countenances events as causal relata. Next, I discuss CEA and various

ways of preserving mental causation in spite of it, showing how these counterarguments need not establish that state consciousness is efficacious. Lastly, I argue that the qua problem obtains only on a certain kind of theory of consciousness, namely, where the property is construed as *intrinsic* to the mental event that instantiates it.

What Bistability Reveals About the Neural Basis of Perceptual Experience

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 27

ABSTRACT The instability of perception is one of the oldest puzzles in neuroscience. When visual stimulation is even slightly ambiguous, perceptual experience fails to stabilize and alternates perpetually between distinct states. The dynamics of this 'bistable perception' have been studied extensively for decades. We have shown that many aspects of this dynamics are explained naturally by assuming a competitive dynamics among multiple neural populations that are independently meta-stable. Alternative models of bistable perception postulate a single recurrent network with (possibly noisy) oscillatory behavior. The advantage of multiple meta-stable populations is that their collective dynamics is decoupled from single neuron properties. This explains why the mean alternation rates of bistable phenomena range over two orders of magnitude, while the statistical variability of successive dominance periods (i.e., the coefficient of variation) remains essentially the same. We fur-

ther propose that both competing visual inputs and alternative perceptual states are represented in a distributed manner through multiple meta-stable populations. This two-level representation accounts economically for memory effects such as the stabilizing influence of past perceptual states, which becomes particularly evident in intermittent displays. If perceptual experience is indeed based on multiple meta-stable populations, there must be a mechanism for "reading out" the collective activity of these populations and to thereby solve the so-called 'binding problem'. While visual memory could provide such a "read-out" for familiar visual scenes, unfamiliar scenes would require more generic mechanisms such as a saliency map. Accordingly, a theoretical analysis of the dynamics of bistable perception may offer an new perspective onto the nature of perceptual representations and the mechanisms of perceptual binding. Our results complement recent efforts to identify the neural correlates of perceptual experience with physiological approaches. By characterizing the distributed representation that underlies such experience, our analysis bears directly on the interpretation of results of multi-unit recording or functional brain imaging.

Anomalies of Temporal Perception: Evidence from Peri-Saccadic Temporal Order Judgements

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 29

ABSTRACT An essential part of the phenomenon of consciousness is the individual's awareness of time. However, a detailed theory of the neurophysiological mechanisms underlying temporal awareness remains elusive. Various alterations of temporal awareness occur in

altered states of consciousness and are associated with psychopathology, it is estimated that 40–80% of psychiatric inpatients experience secondary comorbid dissociation which for some patients includes alterations in the ordering and flow of events. The authors present evidence of systematic inversion of temporal order judgements when flashed visual stimuli are presented up to 100 msec prior to a saccade. This anomaly of temporal perception was first reported by Morrone et al. 2005. In the current experiments, observers report ordering via a binary forced choice paradigm with randomised presentation of stimuli. As the onset and inter-stimulus interval is altered with reference to saccadic timing, inversions of perception on up to 80% of trials are reproducibly achieved, despite high confidence of judgements. The authors descibe these findings, characterising the typical extent of the effect as well inter-observer variation. a physiological model of the effect using the LATER model provides a description of how the phenomenon may arise from well understood neurophysiological mechanisms. In this model, the temporal inversion arises due to delays in the rise to activation of the percepts that are dependent on their relationship to saccadic timing. The findings are integrated with literature regarding similar temporal dynamics of activation in MT area in macaques (Ibbotson et al. 2006). Further characterisation of the effect with modulation by psychotropics is described (corticosteroids and ketamine). These anolmalies assist our understanding of the underlying processes leading to integrated temporal awareness and can act as a metric for comparing theories of how temporal estimation and ordering of events arise and what neural correlates are involved. The implications of the current research for models including oscillator-accumulator models and state dependent timing networks are discussed as well as implications for the alterations in temporal awareness that occur in psychosis and dissociation.

Internal Consciousness in Very Young Children: Memory, Planning, Self and the Babbling Stream

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 62

ABSTRACT What is it like to be a baby or a very young child? In adults, conscious awareness is often organized in terms of a single, unified, coherent time-line. Adults conceive of a self, an inner observer, autobiographer and CEO who has been the subject of past experiences, as in autobiographical memory, and will be the subject of future experiences, as in prospective memory and planning. This unified, reflective, temporally coherent self has been identified with various types of frontal function and has sometimes been seen as a requirement for consciousness itself. I outline evidence that babies and young children do not have the same sort of coherent time-line. Both autobiographical and prospective memory appear to develop in the preschool years, and even three-year-olds fail to recognize their own past experiences or anticipate future ones. Nevertheless, children clearly have internal experience, though this experience is organized differently than it is in adults. I suggest that the phenomenology of free association, hypnagogic sleep, and certain types of "insight" meditation may give us an adult approximation of preschool experience. Moreover, I suggest that these differing types of phenomenology are associated with different functions. For adults, the central cognitive agenda involves planning and executing future action, for babies and young children it involves exploring the possible ways that the world might be. These developmental data join several other recent developments which suggest that we can dissociate consciousness itself from self-conscious frontal functions.

Finding Correlations Between Subjective and Objective Measures of Awareness Using Masked Words.

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 12

ABSTRACT The current study explores the idea proposed by Marcel (1983) that perceptual analysis can be performed in the absence of conscious awareness. In this experiment, participants were asked to perform two forced choice tasks based on the information gathered from a masked word presented for 50 milliseconds: (1) semantic discrimination in which participants had to choose between a word that was associated in meaning with the masked stimulus and an unrelated alternative, and (2) e-detection where participants responded yes if the masked word contained the letter e, or no if it did not. Performance on both tasks was better than chance, but performance on e-detection (mean % correct 67.2) was slightly better than on semantic discrimination (mean % correct 61.9). This provided an objective measure of partial awareness of the stimuli. For both tasks, participants were asked to rate their confidence after each trial. Confidence ratings ranged from 1 (complete guess), to 5 (identified the masked word), and provided a measure of subjective awareness. Pearson correlations were calculated to find that highly rated items generally constituted more correct responses than low rated ones ($r = 0.549$ for semantic discrimination, and $r = 0.365$ for e-detection). However, these correlations were far from perfect, suggesting that some information is gathered from masked words even when the participants feel that they are simply guessing. Possible mechanisms by which these tasks can be performed when confidence ratings are less than 4 and implications of these findings are discussed.

Abnormal Short Latency Afferent Inhibition in Disorders of Consciousness: Preliminary Findings

AUTHORS **Olivia Gosseries**[1], Natallia Lapitskaya[2], Victor de Pasqua[3], Alain Maertens de Noordhout[3], Jürgen Feldbek Nielsen[4], Gustave Moonen[5], Steven Laureys[6]

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 128

ABSTRACT Objectives: Peripheral input may have an inhibitory effect on motor cortex at short intervals (short latency afferent inhibition, SAI), thought to reflect cholinergic cortical modulation. SAI can be assessed by coupling electrical stimulation of the peripheral nerve with transcranial magnetic stimulation (TMS) of the motor cortex. We here evaluated SAI in patients with disorders of consciousness. Methods: Seven patients (mean 45 years, range 23–76) and nine healthy subjects (mean 32 years, range 23–59) were recruited. Patients had chronic brain injury (mean interval after injury 6 months, range 1–12) of traumatic (n=5) and non-traumatic (n=2) aetiology and met the criteria defining vegetative (n=2) or minimally consciousness state (n=5). SAI of the motor cortex was studied using a paired-pulse stimulation technique: conditioning electrical stimuli were applied to the median nerve at the wrist; test TMS stimuli were applied to the motor cortex. Interstimulus intervals (ISI) were determined relative to the latency of the N20 component of the somatosensory evoked potentials. We investigated ISIs minus 2 ms and plus 14 ms of the obtained N20 component latency (in

steps of 2 ms). The amplitude of the conditioned motor evoked potentials (MEP) was expressed as the percentage of the amplitude of the unconditioned MEP. Results: In one vegetative patient neither sensory nor MEPs could be elicited. In healthy subjects the most prominent SAI was observed at the ISI of N20 plus 2 ms. In patients no inhibition was observed at this ISI compared with controls. Patients also tended to have a high resting motor threshold and less pronounced inhibition at other ISIs, but these differences were not significant. Conclusion: The assessment of motor cortical excitability in vegetative and minimally conscious patients may offer a better understanding of their underlying disordered cortical excitability. The presented pilot data suggest that SAI of the motor cortex, a putative marker of cholinergic cortical activity, is significantly reduced in patients suffering from chronic disorders of consciousness.

A Defense of Perceptual Accounts of Pain

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TYPE Concurrent Session 2
TIME Saturday, 16:30–17:00
PLACE Room 3075, HU

ABSTRACT Perceptual accounts of pain (PAP) are very popular these days. Nonetheless, they are also under heavy attack, because these accounts seem to be vulnerable to certain severe challenges and objections, and incompatible with our commonsense and scientific understanding of pain. Recently, nice versions of these challenges for PAP were presented (Aydede 2006, forthcoming), the initial and the labeling argument. These will be my focus. As I argue, both arguments against PAP are based on a number of premises, which are dispensable

for PAP proponents. Therefore, these objections propose problems for only certain classes of perceptual accounts; as an argument against PAP in general, they fail.They also rely on unfortunate assumptions about the nature of perceptual accounts. These include (a) that perception necessarily ends in conceptual content and belief formation, (b) that genuine perception necessarily involves sensory conceptual components, and (c) that the objects of perception is the feeling of pain. I will end by proposing a strong perceptual account of pain that avoids the mentioned problems and is more compatible with several empirical data. I claim that to be in pain is to be in a complex state. The components of this state include certain sensational components (a number of related qualia), as well as affective attitudes. But these components are not simply additive components. Pain is seen as involving non-psychological as well as psychological components. When subjects experience pain they are in a certain sort of psychological state towards a bodily state or condition. Pain is constituted by the bodily state though, not by the psychological state towards this bodily state. So I argue for a perceptual theory that identifies pain states with parts of our internal representation of our body's physiological condition, a representation that registers physiological imbalance, and potential tissue damage. a perceptual process creates a pain-quale, but the object of the perception is the pain (a bodily state), not the feeling of pain. In other words, I claim that the pain is the object of perception rather than that pain is the experience of the object of perception, in contrast to most PAP accounts.

The Phenomenal Character and Epistemic Status of Unreported Perceptual Stimuli

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TYPE Concurrent Session 3
TIME Sunday, 14:30–15:00
PLACE Room 3075, HU

ABSTRACT The phenomenal character and epistemic status of unreported perceptual stimuli are controversial issues among both philosophers and cognitive psychologists/neuroscienists, though they often take distinctly different approaches to the dispute. There are several reasons why a perceptual stimulus may go unreported (if not unreportable): threshold conditions about the stimulus properties (e.g., low luminosity, brief exposure duration), processing constraints imposed on the perceiver (e.g., attentional load), and, possibly, subject's lack of relevant conceptual resources. These different reasons and conditions sometimes get confounded in the literature. The aim of this presentation is to show how and why such perceptual cases with different etiologies, even if they all yield a similar outcome (unreported stimuli), require different characterizations of phenomenal content and different explanations about their epistemic status. The central disagreement among philosophers is about whether unreported stimuli ever become part of the subject's phenomenal experience, even if they remain hidden from her cognitive access. For example, Dretske maintains that the content of phenomenal consciousness often outstrips what can be accessed or reported and this is a special case of a prevalent phenomenon he calls "non-epistemic seeing", while Dennett claims such experiences, in the absence of cognitive upshot, are merely a "theorist's illusion", with neither any epistemic significance nor scientific utility. In the empirical literature, Mack and Rock call the subject's inability to report such (visual) stimuli "inattentional blindness", implying a failure of (conscious) perception, whereas Wolf claims that their data at best show a failure of recall, not

perception, hence labeling the phenomenon “inattentional amnesia”. Here, the issue is on the functional role of attention vis-à-vis conscious perception and memory. In addition to sorting out the different classes of reasons and conditions that require different explanations in these cases of unreported stimuli, I will also argue that there is differential epistemic significance to various such cases of “unconscious perception” in the absence of phenomenal consciousness, but with important differences from conscious perception. My conclusion is that a detailed examination of what can be accomplished by perceptual processes lacking phenomenal content is essential in understanding the proper functional role of conscious perception, e.g. in the self-initiation, sustenance, and epistemic justification of perceptually-driven voluntary behavior.

H

Human Volition: Towards a Neuroscience of Will

AUTHOR **Patrick Haggard**
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TYPE Keynote Lecture
TIME Monday, 18:30–19:30
PLACE Leibniz-Saal

ABSTRACT The capacity for voluntary action is seen as essential to human nature. Yet neuroscience and behaviourist psychology have traditionally dismissed the topic as unscientific, perhaps because the mechanisms that cause actions have long been unclear. However, new research has identified networks of brain areas, including the pre-supplementary motor area, the anterior prefrontal cortex and the parietal cortex, that underlie voluntary action. These areas generate information for forthcoming actions, and also cause the distinctive conscious experience of intending to act and then controlling one's own actions. Volition consists of a series of decisions regarding whether to act, what action to perform and when to perform it. Neuroscientific accounts of voluntary action may inform debates about the nature of individual responsibility.

Abstraction of Action: The Involvement of the Right Inferior Frontal Gyrus in Action Interpretation

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 78

ABSTRACT Plenty of evidence point to the existence of shared brain mechanisms for language and motor function. This has led to speculations about whether the ability of the human brain to use abstractions has evolved from pre-existing mechanisms dedicated to motor functions, such as action imitation and interpretation. With data from a patient with intracranial electrodes we show that neural processes in the right inferior frontal gyrus (rIFG) distinguished between verbal descriptions of actions and non-actions ("I take the orange" vs. "It's a sunny day"). An overlapping peri-sylvian area distinguished between the observation of meaningful and meaningless acts (grabbing an object vs. grabbing nothing). This was quantified with a linear classifier operating on the power spectrum of the local field potential. The classifier was used to naively probe the data for task-relevant sites, frequency bands and time periods. a classification performance of 93% (cross-validated) was found in the upper beta band (24–28 Hz) for the verbal task. Classification between two non-action sentences at failed. For the observation task (meaningful vs. meaningless actions) the classification performance was 89%, also in the upper beta band. These results show that the rIFG in our patient was involved in verbal description of actions as well as the interpretation of observed actions. This suggests that the rIFG supports a specific mechanism for representing and interpreting actions.

Why Make It Conscious? The Function of Consciousness in Therapeutic Change

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 124

ABSTRACT The function(s) of consciousness discussed in an evolutionary and cognitive/neuroscientific framework suggest that consciousness plays a crucial role in the comprehension of new information, in the learning of new tasks as well as allowing for flexible and non-automatic (voluntary) behavior. Consciousness has been suggested to involve large areas of the brain and may have an integrative function. Applied to theories about therapeutic work these suggestions, summarized by Baars (2002), call for some modifications of claims (or the lack thereof) made about the role of consciousness within different theories on therapy. Therapies influenced by traditional psychoanalytic theories do not seem to differentiate between conscious and self-conscious processes and hence give little attention to the role of the conscious information-processing that is never verbalized or made self-conscious. Consciousness research may also suggest that unconscious processes or material per se must not necessarily be made conscious for change to occur. Therapies stemming from the behaviorist tradition tend to leave out the role of consciousness altogether and do not allow for differences being made between simple fear-conditioning, that may take place without conscious processing, and the learning of more complex tasks that may involve relearning or restructuring of cognitions. Recent mindfulness-based therapies allow for a greater focus on conscious processing but lack clear definitions and do not make great efforts to explain what the functional role of "being present" or conscious might be. Many therapeutic traditions, e.g. anxiety-provoking short-term therapies, have given much weight to anxiety occurring in change processes, but have not made clear the causal role of anxiety.

This paper suggests that the function of anxiety is to trigger and maintain a high degree of conscious processing that provides a unique capacity for integrating information in relearning. Further, the seemingly contradictory anxiety-based and mindfulness-based therapies are suggested to have a common aim, i.e. to give rise to conscious processing. However, anxiety might be an unfortunate but necessary ingredient where cognitive restructuring is necessary to allow for changed behavior. The theory of cognitive dissonance, showing how action-related inconsistencies provokes anxiety, might be of particular importance in this context.

Predictability of Free Decisions: Cognitive Load Limits Our Ability to Make Unpredictable Choices

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 76

ABSTRACT In certain situations humans can have the impression to be "randomly" choosing between several equal options. But previous research has suggested that humans find it very difficult to deliberately produce random behavior. Instead their choices in such unconstrained "free choices" follow characteristic patterns. In this study we were interested in cognitive influences on random behavior. We conducted a series of experiments to evaluate the randomness of choices and how this randomness was affected by a cognitive intervention that distracted subjects between successive choices. 24 healthy subjects generated random sequences of binary choices without any previous explanation of a mathematical definition of randomness. In each of 4 experiments the subjects had to select hundred times one of two identical squares

(right or left). Truly random sequences are defined as there being no relation at all between successive choices. In order to manipulate the interaction between individual choices, we changed the delay duration and a task that had to be performed during the delay between subsequent selections (short pause, long pause, verbal task and calculation task). The sequences produced were tested for randomness by comparing the frequency of occurrence of all possible short sequences of up to 4 choices with the theoretical limit. These deviations were compared to a distribution defined by Monte-Carlo Simulation of the same task, which allowed us to compute the probability of getting an at least as high deviation randomly. The influence of the cognitive tasks was verified using paired Kolmogorov-Smirnov test on the distances and on the probabilities of being random. Only one third (32 of 96) of all sequences passed our test for randomness, i.e. could not be clearly distinguished from a real random sequence. Nevertheless, there was a significant difference in how random the subjects performed between the experiments with short pause without extra task (12 of 24) and the calculation task (4 of 24). Although subjects did try to perform the same random selection task in both conditions, a difficult task inserted between two choices corrupted their ability of behaving unpredictable. Thus, it seems that unpredictable behavior might require conscious deliberation.

Willpower: From Metaphysical Problems to Empirical Challenges

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TYPE Tutorial M1
TIME Friday, 9:30–12:30
PLACE Room 1, BBAW

ABSTRACT Freedom of will continues to be a hotly debated topic. Most discussions concern the question of whether the brain is a deterministic machine and what consequences this has for the concept of personal responsibility. Above and apart from this metaphysical discussion, cognitive neuroscience has begun to investigate volition empirically. In contrast to free will, "willpower" is an emerging concept which is subject to empirical science and can be measured and quantified. Willpower, a quantitative aspect of volition, is the strength of self-regulatory functions that enables people to come to wise decisions on the basis of anticipated future outcomes and to pursue long-term goals in the face of conflict, temptations and distractions. After a brief introduction to the metaphysical problem of willpower, we will present experiments in psychology, neuropsychology and neuroimaging which demonstrate how willpower can be empirically investigated and quantified. We propose to introduce the concept of willpower as a new research topic in cognitive neuroscience. Willpower can also be viewed as the cognitive ability to modulate or inhibit impulsive behavior. Impulsivity (i.e. weakness of will) – the failure to resist an impulse, drive, or temptation that is potentially harmful to oneself or others – is a common clinical problem and a core feature of human behavior. What makes an impulse pathological is an inability to resist it and its expression. In this tutorial we will also discuss what we know about the neurocircuitry of impulse control based on empirical research with brain lesion and psychiatric patients, and how this relates to the scientific study of willpower. This will include a discussion of such disorders of volition as intermittent explosive disorder, kleptomania, pyromania, pathological gambling, and trichotillomania (representing a failure to resist aggressive impulses, and urges to steal, set fires, gamble, and pull one's hair, respectively). Clinical research provides an important tool to expand our knowledge of the neural basis of willpower.

Shared Temporal Accuracy of Action Execution and Sensory Perception

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 73

ABSTRACT Integration of an action and its sensory feedback is important in interacting with an uncertain environment and constructing a consistent model of the world. Studies have shown that the sensorimotor contingency affects our perceived timing of own action and its sensory feedback (Haggard et al., 2002; Tsakiris & Haggard, 2003, Engbert & Wohlschläger, 2007; Moore & Haggard, 2008).
In the course of the flexible interaction with the environment, multisensory data need to be processed, in which audition and vision play important roles. The brain employs a mechanism which modulates the perceived timing of audiovisual stimuli depending on the distance between the perceiver and the source (Kopinska & Harris, 2004). In addition, the subjective simultaneity of audiovisual stimuli is affected by adaptation (Fujisaki et al., 2004), spatial position (Zampini et al., 2003; Zampini et al., 2005) and attention (Zampini et al., 2005). Perception and action both occur in the stream of subjective time, characterized by respective temporal properties. To investigate the relation between the subjective simultaneity of audiovisual stimuli and action, we conducted an experiment in which the subjects' actions affected the temporal patterns of resulting stimuli. Subjects pressed two keys simultaneously with the index fingers of their both hands. One of the keys generated beep, while the other generated flash. The delay between the generated beep and flash depended on the accuracy of the action of key pressing. The task of the subject was to press the two keys simultaneously and judge the simultaneity of beep and flash

that follow. The modes of contingencies between action and stimuli were made variable by changing the relationship between the key pressings and stimuli. We found significant correlations between the accuracies of actions and the "window" of subjective simultaneity among subjects, although their task performances were widely varied. In addition, the correlation patterns were found to depend on the contingency between the key pressing and stimuli. These results suggest that the subjective simultaneity of audiovisual stimuli correlates with the accuracy of execution of action, indicating a common mechanism engaging the perception of subjective simultaneity in sensorimotor integration and action execution.

Phenomenal Variability and Introspective Reliability

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 41

ABSTRACT Introspection is widely thought to be a very reliable guide to our own phenomenology. Recently, Eric Schwitzgebel has provided convincing and surprising evidence that the deliverances of introspection are uncertain and variable. He argues that the best explanation of this evidence is the unreliability of introspection in the domains of emotions and sensations, imagery, visual perception and thought. I discuss how to respond to this challenge to introspection and I use recent cognitive theory and neurobiological findings to suggest an alternative and better explanation of the evidence. On this explanation, it is mostly the phenomenal states themselves that vary, either chronically, or in testing conditions. I demonstrate this in differ-

ent ways for the cases of emotion and sensation, imagery, visual perception, and thought. Thus the surprising evidence can be explained while allowing introspection to be reliable in most conditions. This application of these cognitive theories and empirical findings provides a novel perspective on introspection of phenomenal states.

Temporo-Parietal Cortex and Precuneus Encode Bodily Self-Location: Joining Robotics and fMRI

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 92

ABSTRACT Aspects of bodily self-consciousness such as the conscious experience of where the self is experienced to be (self-location) can be experimentally manipulated by exposing people to conflicting multisensory input. Applying such conflict for body parts (e.g. rubber hand illusion) to the full body, recent experiments in virtual reality suggest that it can be extended to global aspects of self-consciousness (Ehrsson, 2007; Lenggenhager et al., 2007). Premotor, somatosensory, parietal areas and insula are involved in the localization of the illusory body part, but the neural underpinnings of more global illusions are yet to be investigated. Data from neurological patients with disturbed global self processes suggest that the temporo-parietal junction (tpj) plays an important role in this localization process (Blanke et al., 2004). In the present study, we used fMRI and neuroscience robotics to measure the brain activity during experimentally induced changes in illusory global self-location. Subjects saw a video of a stranger's back or an empty room being stroked (visual input) while a robotic device stroked their back (tactile input). Direction and speed of the robotic stroking corresponded to (synchronous) or differed from (asynchronous) that of the video. Each block was composed of videoclips of one of the four conditions according to a 2×2 factorial design with Object (Body, No Body) and Synchrony (Synchronous, Asynchronous) as main factors. To evaluate the self localization, subjects imagined the falling time of a ball they were holding in their hand to

the ground, which they indicated by pressing a button (Lenggenhager et al., in press). With the body videos, response times for the mental ball dropping were significantly longer in the synchronous with respect to the asynchronous stroking condition, suggesting an elevation in self-localization. With "no-body" videos there was no difference between the synchronous and asynchronous conditions. fMRI results showed bilateral activation of TPJ and precuneus with a significantly higher BOLD signal increase in the Synchronous/Body condition with respect to the other conditions. Other activated areas included sensorimotor and supplementary motor areas. These finding suggest an involvement of TPJ and precuneus in the experience of the conscious "I" as embodied and localized in space.

Do Dissociations Work?

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 30

ABSTRACT The basic method used to investigate the boundaries of conscious and unconscious perception is to find dissociations. While single dissociations are typically used to infer the existence of unconscious perception, this research is liable to the problems that face any use of dissociations (Reingold & Merikle, 1988, 1990). In response to this, Snodgrass et al. (2004) argue that there is evidence of a reversed association between direct and indirect measures of consciousness which avoids these problems (Dunn and Kirsner, 1988). However, there are major problems with Snodgrass et al.'s interpretation of the reversed association. Snodgrass et al.'s model of functionally exclusive (inhibitory) sets of conscious and unconscious perceptual influences is not

a model that always holds (in contrast to a model involving functional independence), and the relation of inhibition between perceptual influences necessitates that they are dependent, which contradicts the standard inference of process/system independence. a further problem arises in the use of perceptual 'influences' as effects or end products of perception as the model is essentially a restatement of the empirical findings and adds little of theoretical value. Further problems arise in interpreting dissociations as they provide evidence from which to infer the existence of two (or more) functionally independent systems/modules, yet it is generally assumed that conscious perception is dependent on unconscious perception. The terms 'conscious processing' and 'conscious perception' are often used inappropriately as they attribute consciousness to a process or completion of a task, instead of to a state of a subject. Also, dissociations play a strange role in consciousness research as the categories to be dissociated are pre-defined and are assumed to exist above and below specific thresholds, so empirical results often do not guide theorising. Establishing dissociations in consciousness research is made more difficult as conscious and unconscious perception often rely on the same structures, brain areas, and often perform the same functions. It therefore appears that dissociation logic is of limited use in the context of unconscious perception research, and some implications for the science of consciousness will be drawn.

Trajectory Analysis of Search Behavior in Visual One-Shot Learning

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 119

ABSTRACT Among the varied phases of human cognition, the very moment when an idea flashes into one's mind is one of the most dramatic instances of conscious experience. Throughout human history, there has been a rich accumulation of episodes of such insightful moments. For instance, the anecdote of Archimedes exclaiming "Eureka!" while he was taking a bath and found a new principle is well known (Vitruvius, ca. 27 B.C.). These are special cases of learning where the learning process occurs suddenly and is completed in a very short time (one-shot learning). In the field of visual perception, the perception of "Mooney" faces (Mooney, 1957), i.e high-contrast monochrome pictures of a human face, is a fascinating example of visual one-shot learning. When the subjects realize what is in the figure, synchronous activities have been found to spread over a wide area in the brain which correlate with the subject's perception (Varela et al, 1999). From a more general perspective, various kinds of objects can be hidden in bi-level quantised images in a similar way. Famous examples such as "Dallenbach's cow" (Dallenbach, 1951) and "the Dalmatian" (Gregory, 1970) are real puzzlers where subjects find it difficult to see what is in the figure. Here we study the cognitive process of visual one-shot learning in the interactive domain. The stimuli were two dimensional representations of 3-D objects designed in such a way that they were difficult to perceive from some angles, while easier to perceive from others. The subjects were presented with images from several different angles, and were asked to rotate them and search for the "correct" direction. By comparing with control tasks in which the same hidden figures were presented from the optimum direction, we clarify the importance of the intentional actions to get the epiphany. Analysis of temporalities involved reveals the nature of underlying dynamics of the phenomenon. We discuss the data in the context of hidden figure perception as a matching between the top-down and bottom-up processes, and explore the implications for the cognitive processes in general, conscious or otherwise.

J

Phenomenological Intentionality and Success

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 39

ABSTRACT There has been a recent growth in interest in developing a theory of intentionality that derives from phenomenological features of experience. We'll call such a view Phenomenological Theory of Intentionality (PI). PI theory represents a radical shift in the philosophical attitude to theorizing both about the nature of intentionality and consciousness. The usual approach is to divide and conquer each subject separately or, as representationalists do, to derive properties of consciousness from properties about representation. Theories concerning the fundamental representational properties of mental states have been pursued in terms of reductive naturalistic theories that posit some kind of naturalistically kosher relation between thinker and environment. PI theorist subvert this latter approach and attempt to give a derive a notion of intentionality, the so-called aboutness of mental states, out of a notion of phenomenology which concerns subjectively felt and intrinsically specified aspects of experience. Though the PI theorist has attempted to account for traditional features of mental representations, like reference and the contribution external factors play in the determination content, it's unclear whether she can genuinely explain them. The objection I want to press is in this vein but concerns a somewhat deeper explanatory goal of the theory of intentionality, one that, I claim, PI theorists lose sight of: they cannot account for success. One of the fundamental reasons we're concerned with intentionality is that it explains the coordination between the content of our beliefs and desires: true belief generally lead to the satisfaction of our desires. I argue that PI theorists simply don't have the resources to account for this basic explanatory goal of the theory of intentionality.

Conscious Expectancies vs. Automatic Adjustments in a Stroop Task

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 122

ABSTRACT Congruency effects such as those found in a typical Stroop task are subject to a sequential modulation: they are larger after a congruent trial than after an incongruent trial. Egner (2007) has recently pointed to three potential factors affecting these sequence congruency effects: (1) conflict-driven adjustments in cognitive control, (2) episodic repetition effects, and (3) conscious expectancies. Although there is some evidence indicating that only consciously detected conflicts may result in an adaptation effect over the next trial (Kunde, 2003), other results suggest that control can be exerted without a conscious feeling of effort (Naccache et al. 2005). In the present study, we adapt a procedure first developed by Perruchet et al. (2006) to dissociate automatic vs. strategic effects, and we apply this method to dissociate the effects of adaptation to conflict from those of conscious expectancies. By assessing expectancies after several runs of congruent or incongruent trials, we found that participants expectancy follows the gambler fallacy, thus expecting a change after a large run of either congruent or incongruent trials. However, even though participants declare to be expecting an incongruent trial after a series of congruent trials, yet the difference in RT in favor of congruent trials yields its maximum value in this case, as predicted by an automatic conflict-adaptation account. In contrast, after a series of incongruent trials, when participants declare to be expecting the next one to be a congruent trial, responding to another incongruent trial results in only a minimum cost. In a series of follow-up experiments we manipulated the proportion of transitions between congruent and incongruent trials, by

favoring either the repetitions of the same type of trial of the alternation between them. We found that these manipulations do not alter the conflict adaptation effects as observed in RT performance, but they alter the expectancies in accordance with the training schedule. These results are interpreted as showing that even though conscious expectancies can arise from training in this task, conflict-driven adjustments are better thought of as adjustments produced automatically in response to previous trials.

The Forward-Looking Nature of Consciousness as a Basis for Embodied Communication

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 91

ABSTRACT Recent research indicates (1) actions are consciously planned in terms of the distal effects they are to produce, and (2) planning and perception share common neural resources. As a result, perceiving the effects of an action (e.g., hearing the tones produced by striking a piano key) activates the pre-motor cortical centers one would use while consciously planning to produce such effects oneself. In short, conscious perception takes place within an intentional context that emerges from the action-effect contingencies one learns over the life course (Jordan, in press; Kinsbourne & Jordan, in press). Given this notion of intentional contexts, the present talk will present experiments that do the following: (1) support the assertion that perception is altered in a forward-looking manner as one learns action-effect contingencies, (2) examine the conditions that allow one to develop intentional contexts, and (3) examine how one's own conscious perceptions are

altered as one learns to cooperatively generate an intentional context with another (e.g., play a video game). The experiments to be presented examine intentional contexts in spatial perception. Specifically, research indicates participants perceive the vanishing point of a moving stimulus beyond the actual vanishing point. Jordan and Hunsinger (2008) found that those who have experience controlling the stimulus' movements perceive the stimulus to vanish further ahead than those who do not. Also, one can learn the action-effect contingencies that give rise to such forward displacements (FD) by simply observing another control the stimulus. However, larger FD only occurs if one perceives the effects of the model's actions, as well as the actions themselves. Finally, Jordan and Knoblich (2004) found that FD increases as one attempts to control the movements of the stimulus co-operatively with another participant. These data support the assertion that body consciousness and perception entail forward-looking, intentional content derived from planning. They further imply that as agents continuously generate distal effects together (e.g., play a video game), the resultant group effect (i.e., the changes in the game produced by their collective actions) becomes part of one's own action-effect contingencies (i.e., one's own intentional context) (Knoblich & Jordan, 2003).

K

No Virtual Mind in the Chinese Room

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 95

ABSTRACT The Chinese room thought experiment of John Searle militates against strong artificial intelligence, illustrating his claim that syntactical knowledge by itself is neither constitutive nor sufficient for semantic understanding as found in human minds. This thought experiment was put to a behavioural test, concerning the syntax of a finite algebraic field. Input, rules and output were presented with letters instead of numbers. The set of rules was first presented as a table but finally internalized by the participants. Quite in line with Searle's argument, uninformed participants mastered the syntax but did not explicitly report semantic knowledge. In order to test the virtual mind reply to the Chinese room argument, the reaction time pattern of the participants was compared to that of an informed control group. The correlation was quite high but could be traced back to memory load and response priming, i.e. to syntactical factors. No trace of tacit semantic knowledge of the task could be found in the experimental group.

Decoding the Expected Value of Multi-attribute Objects from the Human Brain

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 80

ABSTRACT People are permanently faced with situations in which they have to choose between different options and actions. How do people decide between different alternatives? Economic theories and reinforcement learning theory assume that subjects choose that option with the highest expected value. On the other hand, it has been suggested, that conscious deliberation or unconscious deliberation are two fundamental different modes of decision. Previous research has shown that each mode can be superior depending on the complexity of the decision problem at hand. Conscious deliberation seems to be better for decisions about simple objects whereas unconscious deliberation is more efficient for decisions about complex, multi-featured objects (Dijksterhuis et al. 2006). Here, in a first step we used fMRI and multivariate pattern analyses to uncover the representation of the expected value of complex, multi-attributed objects. Prior to scanning subjects learned the association between different attributes and reward. During fMRI acquisition subjects saw multi-attribute objects and reported the integrated value of these objects. Distributed patterns of activity in the ventromedial prefrontal cortex (vmpfc) and the amygdala predicted the integrated reward value of multi-attribute objects. Functional connectivity analyses revealed an increased functional coupling between both regions during object presentation. During the rating phase, however, functional connectivity between vmpfc and supplementary

motor cortex increased relative to the stimulus phase. These results suggest that the expected value of multi-attribute objects is represented in the vmpfc and amygdala and used by the vmpfc to guide decisions. In next experiments, we plan to compare the neural representation of expected value while subjects use different decision modes to make their choice.

Perceived Timing, Transients and Feature Binding

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TYPE Symposium 3: Talk 2
TIME Monday, 10:30–12:30
PLACE Leibniz-Saal, BBAW

ABSTRACT Visual illusions such as the flash-lag effect and asynchronous feature processing revealed our perception of temporal relationship of events could be dissociated from physical input. In this talk, I discuss that tokenization of an event – a process of constructing an object-surface representation to which features are bound – takes an additional time to complete and results in a delay in perceived timing. I present experiments showing that perceived timing of a visual event is delayed when it is defined as an appearance of a new object, whereas feature changes are updated instantaneously. The delay for tokenization offers an explanation to various visual illusions of time as well as impairments in temporal processing observed in parietal patients. On the other hand, perceived duration of an event is determined by an initial onset transient, which is processed unconsciously before the tokenization.

Conscious Monitoring of Motor Performance During Locomotion in a Virtual Reality Setting

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 64

ABSTRACT Recent research (Lenggenhager 2007, Ehrsson 2007) suggests that awareness for one's entire body (ownership) and ownership for one's body parts rely on similar multisensory mechanisms. In the present setup we extended this line of research in order to investigate motor contributions to the awareness of the entire body during locomotion (motor awareness). In study 1, we asked 9 participants to walk towards 4 different target positions while their body movements were tracked via optical motion capture. Movements were mapped to a virtual body and played back, in real-time, on a projection screen. The body movement and position of the virtual character could systematically be deviated from the participants' movements by ±5°, ±10°, ±15°, or ±30°. Motor Performance (MP) and Motor Awareness (MA) were measured. Results show that participants are unaware of angular biases of ~10° (MA defined as the point of subjective ambiguity) despite participants' motor behaviour (significantly deviated walking paths in the direction opposite to the deviation; $p < 0.001$). In study 2 ($N = 14$) we investigated the influence of a) the virtual body's orientation (upright/inverted) and b) its walking direction (back/front) on MP and MA. We further analysed the relationship between MA and MP describing the likelihood of errors in MA with respect to MP (Motor Awareness Index, MAI). We found a significant orientation x direction interaction for MP ($p = 0.016$). MA was at 13.8–15.8° but not significantly different across conditions

(p>0.18). Analysis of the MAI revealed that participants were more likely to make MA errors in the inverted conditions (p=0.016). These data confirms that full-body MA depends on angular deviation as well as orientational incongruency (inversion) between physical and virtual body. These data illustrate that humans consciously monitor the position of their full-body and its locomotion with a high degree of uncertainty and that the degree of uncertainty can be manipulated experimentally. This extends previous data on MA for arm movements to the moving full-body that are associated with distinct functional consequences – our setup displaces the participant's centre of conscious experience in space by up to 10∫;.

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Predicting Visual Unconscious Processes from EEG Single Trial Analysis

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 134

ABSTRACT Previous electrophysiological studies have produced evidence for specialized cortical regions involved in the processing of different object categories, specially between animals and tools (Kiefer, 2001). In all these studies the results have been obtained by averaging the physiological signals coming from many trials across subjects. To investigate the neural signatures of conscious and unconscious perceptual categories by analyzing EEG single trials we used algorithms developed for categorizing epochs based on the spectrum of the EEG signal (Dalponte, 2005), data mining techniques and a support vector machine. In the first experiment with visible (unmasked) stimuli we

were able to predict what class of object-animals or tools-participants had seen on each trial with an accuracy that ranged from 73% to 86%. In the second experiment, we used Continuous Flash Suppression (CFS: Tsuchiya, 2005) to present pictures of animals or tools to our subjects while they undergo two conditions: a visible condition -in which objects are consciously perceived- and an invisible condition -in which participants are not aware of the presence nor the identity of the suppressed stimuli. Our first results show that on the conscious conditions we could correctly classify meaningful images from their scrambled counterparts (74% accuracy, n=2, $p<0.001$) and animals images versus tool images (59% accuracy, n=3, $p<0.001$). On the unconscious conditions we could separate the meaningful targets from the control images (57% accuracy, n=2, $p<0.001$) but we obtained no significant results for the unseen animals versus unseen tools (52% accuracy, n=3, $p=0.10$). The goal of this project is to accurately predict whether a subject has unconsciously seen either a meaningful image or a meaningless one by analyzing EEG single trials data.

References: Dalponte, Michele (2005). Sistema innovative per l'analisi e la classificazione di segnali EEG per applicazioni di Brain-Computer interface. Tesi di Laurea. Markus Kiefer (2001). Perceptual and semantic sources of category-specific effects in object categorization: Event-related potentials during picture and word categorization. Memory and Cognition, 29(1):100–116. Tsuchiya, N., and Koch, C (2005). Continuous flash suppression reduces negative afterimages. Nat Neurosci. 8, 1096–1101.

Finding McGurk: Localisation of the Source of the McGurk-Effect and Related Oscillatory Activity

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 85

ABSTRACT The McGurk-effect is a perceptual illusion, which demonstrates an interaction between auditory and visual sensory systems in the perception of speech. If a mismatch between the perception of a sound and the accompanying visual input occurs, it has been observed that the unified perception of both modalities fuses to a novel percept that neither exactly matches the sound nor the sight. a number of studies reported, that this illusion does not appear in every trial, but rather in a proportion of trials (~60–70%). The present study was designed to shed light onto the conditions under which this effect occurs and the identification of cerebral sources associated with it. Specifically we are interested in the potential influence of ongoing ("background') brain oscillations associated with varying perception. In the present study, videos of an actor articulating a series of syllables (e.g. 'aba') were dubbed with the audio tracks of different syllables (e.g. 'aga'). The subjects thus were presented with a sequence of 390 videos, part of which contained the original audio tracks and part of which contained mismatching tracks. As an indicator of the perception, the subjects had to report via button press what syllable they had perceived. In this way, trials containing a novel perception could be contrasted with trials containing the original perception. MEG was used to record event related and oscillatory activity during this stimulation. Previous studies have shown an increase in gamma band activity related to incongruent stimuli. FMRI-studies have shown an involvement of supe-

rior temporal gyrus in speech perception. We thus firstly propose that the source of the McGurk-effect lies within the supratemporal auditory cortex and could be reflected by increased gamma oscillations. Moreover, further analysis will scrutinize the question regarding interareal synchronization particularly between auditory and visual areas. We hypothesize an increased long-range synchronization between these areas to reflect the crossmodal interaction.

Armchair Reflections on Consciousness and the Science of Consciousness

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TYPE Keynote Lecture
TIME Sunday, 9:00–10:00
PLACE Leibniz-Saal, BBAW

ABSTRACT There are two principal philosophical questions about consciousness and the science of consciousness. The first, well-known and by-now a bit boring, is this: Is it possible to give a neuroscientific explanation, or account, of consciousness? The second question, less widely discussed, is the converse of the first: Does, or can, consciousness itself play a theoretical-explanatory role in neuroscience? Concerning the first question, the British Emergentists, like C.D. Broad and C. Lloyd Morgan, had their views about what such an explanation would require. Briefly, their idea was that an explanation of consciousness required the deduction of truths about consciousness from the truths (including laws) about neural/biological facts. I believe that this idea, which I believe enjoys much intuitive plausibility, survives in the works of some contemporary writers – for example, in the idea of "a priori physicalism" advocated by David Chalmers and Frank Jackson. I will try to show that in spite of the initial plausibility, this approach involves certain complexi-

ties and difficulties, and even a possible incoherence. As regards the second question about the theoretical-explanatory role of consciousness, the ongoing debates over the causal efficacy of consciousness is directly relevant. I will briefly sketch the well known exclusion argument. What the argument presumptively shows is that unless consciousness is physically reduced, it cannot be credited with causal powers to affect the course events in the physical world. Physical reducibility of consciousness is closely related to the first question above regarding its explainability within brain science. I believe that a near-consensus opinion is that such reduction is not possible, and that consciousness, though grounded in neural processes, is not itself a neural process. If the exclusion argument is in the right ballpark, the physical irreducibility of consciousness will make consciousness an epiphenomenon – a phenomenon with no powers to causally affect anything else, at least in the physical domain. From my armchair, it looks as though brain scientists indeed accept this epiphenomenalist implication in their research practices – that is, they appear to practice what may be called "methodological epiphenomenalism"- That is, consciousness, as a phenomenon distinct from neural processes, has no theoretical-explanatory role to play in neural science; whether or not it is explainable in terms of neural processes, it itself does not enter into explanation, or prediction, of neural phenomena with its own causal-explanatory power. Finally, these reflections point to yet another question. If a given group of phenomena are epiphenomenal, with no powers to cause anything else, including readings on measuring instruments, how is it possible to investigate them scientifically? If consciousness is without causal powers to affect physical phenomena (including the investigator's sensory systems, brain-scanning devices, etc.), how is a "science" of consciousness possible? Are the working scientists engaged in consciousness research all closet physicalist reductionists? Or perhaps what they are investigating is not consciousness but something else? If consciousness has no physical effects, how can the multi-colored, pulsating images shown on the television monitor hooked up to an fMRI process be relevant to a scientific study of consciousness?

Understanding Libet's Urge

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 74

ABSTRACT In the famous experimental paradigm of Libet et al (1983), aiming at demonstrating the unconscious source of motor intentions, participants are asked to move their finger by letting 'the urge to act appear on its own at any time". However, the motor cognition literature never explicitly investigated what this sensation might in fact reflect. In this poster, the author demonstrates the ambiguity of "urge" by highlighting its implicit assumptions among the addiction, tic disorder models and motor cognition literature. Two main aspects are proposed: a prediction sensation and an inclination experience. These two concepts are then considered from a phenomenological approach to a neuro-cognitive perspective. The specific roles of the Supplementary Motor Area (SMA) and the parietal cortex appear to be importantly related to the former feature, whereas the latter seems to relate to dompaminergic pathways, action selection and inhibition mechanisms, notably implemented by the prefrontal cortex and the basal ganglia. Finally several research directions are suggested, with a special emphasis on the need of cross studies comparing drug addiction, tic disorders (TD) and motor cognition neuro-physiological, cognitive and behavioural data and models.

A Solution to the Puzzle of Temporal Experience

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 51

ABSTRACT The temporal dimension of conscious experience raises an important challenge. As Sean Kelly puts it, "How is it possible for us to have experiences as of continuous, dynamic, temporally structured, unified events given that we start with (what at least seems to be) a sequence of independent and static snapshots of the world at a time?" Kelly claims that the only significant attempt at a solution is found in the retention theory of Edmund Husserl. Husserl argues that the contents of past experiences are retained in a kind of short-term memory, where they play a role in determining the content of a present experience. Kelly faults this model on phenomenological grounds. He observes that experiences don't present the contents of past experiences. If they did, listening to a melody would produce a successively more complex chord; similarly, a visual experience of a moving object would present a trail. Since experience normally does not present things in that way, Kelly argues that the retention account must be rejected. I argue that the mechanism responsible for experiencing temporal extension is something very much like Husserl's retention model, and that Kelly's argument rests on the controversial premise that all mental states are conscious. Husserl's notion of retention can be accounted for in terms of unconscious mental states. On the view proposed, temporal experience is comprised of (1) a mental state that's conscious in virtue of the individual's being aware of it in a suitable way and (2) the retention process, which is conscious in virtue of the individual's having a distinct awareness of that very process. The mental states that constitute the retention process are not themselves contents of the awareness of the

process. As such, the process does not contribute to the experience as one is aware of it, and so does not produce the unusual phenomenology Kelly argues the retention theory implies. Arguably, mental states are conscious in virtue of the individual having a higher-order thought about them. On this view, the mental states constituting the retention process are not contents of the relevant higher-order thoughts.

On the Relationship Between the IIT of Consciousness and the Search for the NCC

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TYPE Concurrent Session 1

TIME Saturday, 14:00–14:30

PLACE Room 2097, HU

ABSTRACT Integrated Information Theory (IIT) (Tononi 2004; Balduzzi & Tononi 2008) posits that consciousness is the irreducible property of complex networks of causally interacted components. IIT defines a fundamental quantity, integrated information Φ (expressed in bits), which captures precisely to what extent a system is more than a collection of parts. To that extent, it constitutes a complex, which by definition cannot be reduced to a set of independent modules. Φ can also be thought of as a measure of interconnectedness of a system. IIT provides a principled way of characterizing a quale, a particular conscious experience: the set of informational relationships that are simultaneously available within a complex when its mechanism is in a given state. Over the last two decades, brain scientists have initiated an empirical program based on searching for the Neuronal Correlates of Consciousness (NCC), the minimal set of neuronal mechanisms jointly sufficient for

any one conscious experience (Crick & Koch 1995; Koch 2004; Tononi & Koch 2008). IIT emphasizes global properties of the brain while the NCC stresses local properties, such as particular neuro-anatomical connections or firing states. In this talk, we emphasize that these two different approaches are complementary rather than conflicting. In particular, we discuss the relationship between activity in specific brain regions (e.g. visual cortex) and the quale as defined by IIT, and how the meaning of any one consciously perceived stimulus will be affected by the loss of specific neuronal populations. Finally, we will discuss certain extensions to the way Φ can be computed and approximated for realistic biological networks.

Conscious Detection Under Different Types of Load

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 108

ABSTRACT It is an established finding that high perceptual load reduces the processing of task-irrelevant stimuli. Recently, Macdonald & Lavie (2008) demonstrated that high perceptual load reduces detection sensitivity for task-irrelevant stimuli, demonstrating a phenomenon of Load Induced Blindness. Here we report a series of experiments examining the effects of visual short-term memory (VSTM) load on detection of task-irrelevant stimuli, and comparing these effects to those of perceptual load and verbal working memory load. Subjects searched for designated target letters while also asked to detect the presence or absence of a critical stimulus (CS; a contrast increment) in

the periphery. This task was performed during the retention interval of either a delayed-matched-to sample VSTM task or a verbal working memory task. We varied the level of either perceptual load in the visual search task (by varying the search set size), or VSTM load or working memory load (by varying the memory set size). CS detection sensitivity (d') was consistently reduced under high, compared to low, VSTM load and perceptual load but was unaffected by the level of working memory load. In subsequent experiments we demonstrate a significant negative correlation between memory capacity (measured with Cowan's K) and detection sensitivity. The clear trade-off between VSTM capacity and detection sensitivity indicates shared resources between VSTM and detection. We discuss these findings in relation to neural and behavioral evidence that VSTM and conscious perception are intimately linked and utilize common sensory cortices whereas working memory draws on frontal cortices associated with cognitive control.

The Explanatory Gap Problem: How Neuroscience Might Contribute to Its Solution

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 44

ABSTRACT According to explanatory gap problem there is an unbridgeable gap in our understanding of consciousness, because, it has been argued, of leaving out the qualia from any kind of empirical explanation of consciousness. This claim has been corroborated by arguments according to which if phenomenal properties were possibly causally or functionally inert (if they were not causally or function-

ally co-varying with the neurobiological properties in a counterfactual scenario) then it is taken as strong evidence that they are not functionalizable-cannot have functional roles within an empirical theory of consciousness (Chalmers 1996; Jackson 1982; Kripke 1972; Levine 1983, 2001; etc). However, if phenomenal properties were causally or functionally inert, as proposed by the explanatory gap argument, then a nomological connection between them and physical properties cannot be established, i. e. empirical evidence for psychophysical laws could not be verified, they cannot be detected from the third person perspective. Furthermore, if variations of phenomenal properties have no causal or functional consequences altogether, i.e. if they were causally or functionally inert, then they cannot be detected even from the first person perspective (Pauen 2006). If this is so, then anti-functionalization arguments that rely on the causal or functional inertness of phenomenal properties are incoherent. This argument leaves only one option: the explanatory gap does not make sense assuming causal inertness of phenomenal properties, thus phenomenal properties should be considered functionalizable. This option seems very plausible especially taking into account that it implies an empirical commitment of actually showing how this strategy applies to the available results from neurosciences. For example by distinguishing genuine dissociation syndromes of affective and sensory components of pain (Grahek 2007, Hardcastle 1999) or utilizing the quality space model of color vision (Clark 1993). Functionalization in this framework amounts to showing how neurobiological concepts generalize over phenomenal properties, i. e. how phenomenal properties fit into the functional roles within a possible empirical theory of consciousness.

Neurocognitive Theories of Consciousness

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TYPE Tutorial A3
TIME Friday, 14:00–17:00
PLACE Room 3, BBAW

ABSTRACT The two last decades have given rise to a large number of scientific theories of consciousness. The aim of this tutorial will be to provide an overview of the most influential cognitive and neurobiological accounts of consciousness. We will first introduce the difficulty of constructing a scientific theory of consciousness, and the necessity to rely on neural "correlates" rather than "bases" of consciousness. We will then provide a brief historical overview of the precursors to a theory of consciousness, both in philosophy and in early cognitive psychology. We will in turn present several influential cognitive accounts. We will overview theories focusing on the architecture of consciousness (e.g., The Global Workspace theory of Baars, the Multiple Draft theory by Dennett, the Intermediate Level Theory by Jackendoff and extended by Prinz, the Information Integration Theory by Tononi), those focusing on consciousness as a by-product of learning mechanisms (The Sensory Motor theory by O'Regan and Noë, the Radical Plasticity Thesis by Cleeremans, the Higher-Order theory by Rosenthal). We will then turn to the most influential neurobiological theories, depicting them from the most globalists to the most localists accounts of the link between brain structures and conscious contents (The Re-entrant Dynamic Core theory of Edelman & Tononi, the Global Neuronal Workspace theory of Dehaene, the Coalition model of Crick and Koch, the Duplex Vision theory of Milner & Goodale, the Local Recurrence theory of Lamme, the Micro-Consciousness theory of Zeki, etc). We will contrast these theories according to their functionality and explanatory power. We will also discuss how these theories deal with important issues, such as the

existence of a hard problem, the distinction between access and phenomenal consciousness, the link between attention and consciousness, the dissociation between primary and self-consciousness, and the problem of measuring consciousness.

Philosophical Issues Concerning Consciousness and Representation

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TYPE Tutorial M3
TIME Friday, 9:30–12:30
PLACE Room 3, BBAW

ABSTRACT The tutorial will survey current approaches to consciousness in Anglo-American analytic philosophy. It will focus on four approaches, to which I will refer as (1) mysterianism, (2) dualism, (3) representationalism, and (4) higher-order representation theory. With each approach, I will present in order (i) the leading account of consciousness along its line, (ii) the case for the approach, and (iii) the case against the approach. a discussion of the merits and demerits of each approach will follow the presentation of these three aspects. The specific accounts I will cover are McGinn's mysterianism, Chalmers' dualism, Tye's representationalism, and Rosenthal's higher-order theory. The purpose of the tutorial is not to issue a final verdict on any approach, but rather to get a clearer picture of the logical geography of the issue, that is, of the logical interconnections between the various theoretical issues.

Evidence from a PRP-Paradigm Points to a Perceptual Locus of the Negative Compatibility Effect

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 81

ABSTRACT Visual stimuli (primes) that are made invisible by masking can affect motor responses to a subsequent target stimulus. When a prime is followed by a mask which is followed by a target stimulus a negative compatibility effect (NCE, or inverse priming effect) has been found: Responses are slow and frequently incorrect when prime and target stimuli are congruent, and responses are fast and accurate when prime and target stimuli are incongruent. To functionally localize the origins of the NCE, we applied the psychological refractory period (PRP-) paradigm which assumes a perceptual level of stimulus analysis, a central bottleneck of response selection, and a level of motor execution. Two dual-task experiments were run with the PRP-paradigm to localize the NCE relative to the central bottleneck. Results from the locus-of-slack procedure point to a perceptual locus of the NCE, because the NCE disappeared when a tone-task blocked the processing of the visual stimuli before the bottleneck. Results from the effect-propagation procedure point to a perceptual or central locus of the NCE, because the NCE was transferred to the tone-task which had to wait until visual processing had passed the bottleneck. Together, the pattern of results suggests a perceptual locus of the NCE.

Dissociating Intentional Non-Action from Daydreaming by Means of fMRI Pattern Classification

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 77

ABSTRACT Most juridical systems recognize intentional non-action – e.g. the failure to render assistance – as intentional acts by regarding it as in principle culpable. This raises the fundamental question whether intentional non-action can be distinguished from simply not doing anything on the basis of objective evidence. By means of pattern classification on fMRI data we demonstrate that it is possible to distinguish these two mental states on the basis of brain activity. Our results show that not doing anything is best predicted from resting state brain areas; whereas choosing not to act involves a network that is usually associated with motor simulation and motor preparation. Hence our data support the implicit assumption of legal practice that voluntary non-action shares important features with overt voluntary action.

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Somatoparaphrenia and Immunity to Error Through Misidentification

AUTHORS Timothy Lane[1], Caleb Liang[2]
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TYPE Concurrent Session 2
TIME Saturday, 16:00–16:30
PLACE Room 3075, HU

ABSTRACT In reflecting on self-consciousness, many philosophers have argued that there is an important distinction to be made between self-as-object and self-as-subject. The idea is that the distinctive character of self-consciousness is associated with the latter, not the former. It is also widely accepted that the notion of self-as-subject is substantially elucidated by Shoemaker's immunity principle (IEM): when "I" is used as a subject we are "immune to error through misidentification relative to the first-person pronoun" (1968 and 1996). According to IEM, it would be impossible for a person who introspectively knows someone is in pain to be mistaken as to whether it is he who is in pain. In this paper we examine IEM in light of a pathological phenomenon, somatoparaphrenia (e.g. Baier and Karnath 2008; Bottini et al. 2002; Moro et al. 2004, and Vallar and Ronchi 2009). First, we argue that somatoparaphrenia, at least in some cases, involves more than just problems pertaining to ownership of body parts. Adequate description of the pathological phenomenology requires distinguishing between feeling that one owns a body part and feeling that one owns an experience. Second, we argue that some cases of somatoparaphrenia constitute genuine counterexamples to IEM, because they show that the presence of an experience and the sense of ownership of that experience are dissociable. Since the two are dissociable, it would be possible for a person who introspectively knows someone is in pain to be mistaken as to whether it is he who is in pain. Third we assess prior empirical attempts at refuting and defending IEM. Among other things, we argue that the distinction

between agency and ownership proposed by Gallagher (2000, 2004) does not help to save IEM, and that the dual-component view of ownership proposed by Campbell (2002, 2003) is unable to accommodate the experience of somatoparaphrenia. Finally, we consider possibilities for revising IEM so that it might be treated as a substantive empirical hypothesis, one that can actively guide research.

Auditory Capture of Touch and Bodily Self-Consciousness

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 89

ABSTRACT Bodily self-consciousness can be disrupted by employing conflicting visual-somatosensory bodily input (Lenggenhager et al., 2007; Ehrsson, 2007). These behavioural findings were recently linked to the spatial representation of visuotactile stimuli by measuring crossmodal congruency effects (CCEs) for the full body (Aspell et al., 2009). This study revealed that changes in the mapping of tactile stimuli could be associated with predictable changes in bodily self-consciousness. We were interested in whether bodily self-consciousness as indexed by the CCE could also be modified by conflicting auditotactile stimuli, and as a first step here we used the crossmodal congruency task to study audiotactile integration in the bodily space.We presented auditory stimuli behind the backs of subjects either in far or near bodily space, while tactile stimuli were applied to subjects' backs (n=11). On each

trial a target tactile stimulus was presented on the subjects' backs at one of four locations while distractor auditory stimuli were presented at corresponding locations. Subjects had to make speeded elevation discriminations of the tactile targets while ignoring auditory distractors. In visuotactile CCE studies subjects perform worse when the distractors are presented at incongruent elevations (Spence et al., 2004). We did not find audiotactile full-body CCEs with this set-up: congruent and incongruent distractors did not ($p > 0.05$) affect performance differently. In a second study we tested whether also seeing one's body during the experiment would affect audiotactile CCEs. Subjects ($n = 6$) viewed their body (via a camera and head-mounted display) as though two metres in front while audiotactile stimuli were presented as before. This stimulation revealed audiotactile full-body CCEs – i.e. incongruent auditory stimuli impaired performance relative to congruent stimuli ($p < 0.05$). This suggests that audiotactile CCEs are only found when subjects are also able to view their body, even though this visual information is task irrelevant. Audiotactile spatial interactions may therefore be facilitated by vision of one's own body.

Loading Working Memory Can Reduce Inattentional Blindness

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TYPE Concurrent Session 2
TIME Saturday, 17:00–17:30
PLACE Room 3096, HU

ABSTRACT We present a series of experiments testing novel predictions about distractor awareness derived from Load Theory of attention and cognitive control (e.g. Lavie et al., 2004). Load Theory suggests that

working memory (WM) exerts executive control over attention by actively maintaining the prioritisation of relevant information and thus preventing the processing of irrelevant distractors. Loading WM consequently results in greater processing of irrelevant distractors (e.g. DeFockert et al., 2001). This led to the prediction that increasing WM load should increase the rate of distractor intrusions into conscious awareness. Hence loading working memory can reduce (rather than increase, c.f. Marios, et al., 2007) inattentional blindness. We measured distractor awareness using a modified inattentional blindness paradigm. Subjects performed a famous-name classification task (singer/politician) under either high or low WM load. On the final critical trial, a famous response-competing distractor face was presented. Awareness for this distractor significantly increased under high WM load. Additional experiments generalised this result to cases where the distractor faces were entirely task-irrelevant (appearing following a tool-name classification task) and clarified that the effect was confined to faces, regardless of whether they were famous or anonymous (awareness of task-irrelevant familiar buildings was unaffected by the level of WM load). These findings support our hypothesis regarding the role of executive control in suppressing distractors from awareness. Further, the results resolve previous discrepancies regarding the effects of WM load on task irrelevant processing (e.g. Marois, et al., 2007; Yi et al., 2004) in terms of the distracting potency of different task-irrelevant stimuli.

When Do You Detect the A? Perception in Grapheme-Color-Synesthesia on Different Visibility Levels

AUTHORS **Anna Maria Leugner**[1], Corinna Haenschel[1], Notger Müller[2], Wolf Singer[1], Lucia Melloni[1]

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 87

ABSTRACT In this study we investigated whether Synesthetes can detect graphemes earlier and for longer time periods, when aided by color experience, than non-synesthetic subjects. Subjects were instructed to grade the visibility of graphemes embedded in noise via a button press. a letter, a number or a symbol increased to full visibility and then decreased again. Symbols were chosen such that they did not elicit any color experience in the Synesthetes. The Synesthetes and the age and education matched control subjects performed two conditions. In the first condition the stimulus presentation was black and white. In the second condition the background color matched the Synesthete's experience of the letters and numbers. We could show that letters and numbers were more often reported to be fully seen than symbols in both groups. While the visibility of letters or numbers and symbols was not significantly different between groups, the distinction that Synesthetes made between the percept of the two stimulus types was in specific visibility levels bigger than the distinction that controls made. However, the Synesthetes were able to perceive letters or numbers at lower visibility levels than symbols in both cases, when the visibility increased and when it decreased again. Controls did not vary in the detected visibility levels for the two stimulus types. Remarkably, for the Synesthetes the difference in judgment of letters and numbers versus symbols was bigger in the colored condition than in the black and white condition. In Controls no condition effect was found. It can be concluded that the main difference in the synesthetic percept as compared to the non-synesthetic percept is how a stimulus that evokes a synesthetic experience is perceived relative to one that does not elicit a color impression. Synesthetes perceive graphemes that elicit a synesthetic experience earlier and for longer time periods than those which do not. Additionally, we observed that matching the background color to the synesthetic color of the appearing letter or number provides support of the subject's synesthetic abilities.

Asyncronic Comparison of Qualia

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 56

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ABSTRACT Dennett (1988) has presented a dissonance which is caused by our intuition that one is infallible to his own sensory experiences. This dissonance, in particular, is that while we attribute infallibility to one's statement of his current coffee taste, we might nonetheless hesitate to attribute the same infallibility to one's comparison of his coffee taste experiences over time. In other words, the assumption that we have coffee taste qualia is not only helpless but also misleading. Therefore, Dennett suggests, the assumption of qualia should be thrown away. What Dennett has overlooked is that the assumption of the ability to compare qualia simultaneously is different from the assumption of the presence of qualia: while the former should be thrown away, the latter remains useful in the investigation of the mind. This paper on the one hand resorts to the irretrievability of any sensory experience and consequently the impossibility of simultaneous comparison of qualia. On the other hand a hypothesis of the memory of senses is proposed for the asyncronic comparison of qualia. Dennett has raised, contrary to what he was intended, that there is still much to know about experience: if qualia are irretrievable, why we seem to be able to tell the difference between two sensory experiences and why the more one is trained the more detail of distinction one could make? The hypothesis of memory of senses answers to the difficulty of the asyncronic comparison of qualia: for a sensory experience to be memorized and used in later comparison it has to be tagged with a cue or several cues. These cues enable a subject to report the discrepancy or consistency in two sensory experiences even though the comparison is not done, and is

not possible to be done, by recalling the previous experience to compare with the present one.

Reference: Dennett D. C. (1998) "Quining Qualia" in D. Chalmers (ed.) Philosophy of Mind: Classical and Contemporary Readings, Oxford University Press

Neural Mechanisms of Repetition Priming

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 110

ABSTRACT Repetition priming refers to the change in speed, accuracy or bias in processing a stimulus following prior exposure to the same stimulus. It is thought to be a form of unconscious or implicit memory. Recent neuroimaging studies have found that behavioral priming is typically accompanied by reduced neural activity (i.e. repetition suppression, or RS) in several cortical regions (e.g., fusiform gyrus and left prefrontal cortex) and it is hypothesized that RS may be the underlying neural mechanism of behavioral priming. However, it is still under debate whether RS in all these brain regions make similar contributions to behavioral priming. Several recent studies examined the correlation between the magnitudes of behavioral priming and RS across subjects. They generally found that only the RS in the left prefrontal region was correlated with behavioral priming. No strong evidence has been reported yet regarding the correlation between RS in posterior perceptual regions and behavioral priming. This contradicts some classical theories that suggest that priming may rely heavily on the posterior

perceptual cortices. One possible reason for this finding is that studies have only examined conceptual priming tasks which would rely more heavily on the frontal areas but not the posterior perceptual cortices. We hypothesized that if perceptual priming tasks are used we may find a correlation between behavioral priming and RS in posterior brain regions. The present functional magnetic resonance imaging (fMRI) study examined this hypothesis. Participants performed several perceptual tasks (symmetry judgments on pictures of novel shapes or known objects, and picture naming) and conceptual priming tasks (natural or man-made classification). Our results indicated that RS in posterior perceptual regions could indeed be correlated with behavioral priming depending on the tasks used. We also demonstrated that within-subject correlations between RS and behavioral priming are more sensitive to this relationship than between-subject correlation coefficients. Our data suggested that priming may not only rely on the frontal cortices but also on other posterior cortical regions that are related to the specific task used.

Music of the Hemispheres: Correlating Phenomenology and Brain Function Through Data Sonification

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 133

ABSTRACT Consciousness is polyphonic (O'Brien & Opie, 1998), comprising multiple simultaneous, interacting dimensions in only partial registration with immediate sensory/motor environments. This is unsurprising, arising from a variable recurrent dynamical neural system. Yet the science of consciousness tends to be monophonic

and static, highlighting one or few aspects of brain function, tracking a narrow band of experimental conditions, and regarding neural responses as stationary (i.e., similar with each repetition within an experiment; Lloyd, 2002, 2004, in press). Presenting data pictorially implicitly reinforces these limitations. Thus, for presenting neurophenomenology, another sense may be preferred. Hearing is inherently multivariate (discriminating simultaneous intensities at multiple frequencies), temporally sensitive, and specialized for tracking dynamic change. Auditory acuity is especially evident in music perception.
In this presentation, we convert fMRI data into polyphonic, musical sound. Briefly, distributed brain regions are segregated using Independent Component Analysis. Each region is assigned a tone; its loudness changes as regional activation varies over time. The compiled varying tones produce a polyphonic soundtrack for the experiment (which is then accelerated to typical musical tempos, and visualized with animated "piano roll notation", indexing soundtracks with experimental timelines). Many phenomenological saliencies of the fMRI data are audible. In a simulated driving experiment, differing experimental conditions manifest different harmonic keys and tempos, even though no single component corresponds to any specific task condition. Distinctive chords mark condition onsets. In a second experiment, schizophrenia patients and healthy controls can be readily discriminated by sound alone. In both cases, the heard properties correspond to confirmable statistical features of the data. In conclusion, data sonification is recommended as a discovery tool in neurophenomenology.

Note: The talk can be scaled from 20 to 50 minutes. The music is fascinating; this could occur afterhours, in the tradition of ASSC cross-disciplinary entertainment. Lloyd, D. (2002). Functional MRI and the study of human consciousness. J Cogn Neurosci, 14(6), 818–831.(2004). Radiant Cool: a Novel Theory of Consciousness. MIT Press (in press). Through a glass darkly: Schizophrenia and functional brain imaging. Philosophy, Psychiatry, and Psychology. O'Brien, G., & Opie, J. (1998). The Disunity of Consciousness. Australasian J Phil, 76, 378–395.

Functional Connectivity During Propofol-Induced Unconsciousness

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TYPE Concurrent Session 1
TIME Saturday, 15:00–15:30
PLACE Room 2097, HU

ABSTRACT We present a functional magnetic resonance study with 12 normal human volunteers in which we compared functional correlations within a network of human brain areas before and during propofol-induced unconsciousness. We focus on functional connectivity between brain regions implicated in the 'default mode' network. Due to the association of these regions with self-representation, episodic memory processes and consciousness, we hypothesize this network to be strongly affected by anesthesia. The fMRI study was conducted at the Max-Planck-Institute for Human Cognitive and Brain Sciences, Leipzig, Germany, in collaboration with the Department of Anaesthesia and Intensive Medicine of the University of Leipzig (Heinke et al. 2004, British Journal of Anaesthesia, 92:641–650). The experiment consisted of three blocks lasting 10 minutes each during which normal sentences and pseudo-word sentences were presented in random order. Subjects were instructed to give a yes/no button-press response to indicate whether a sentence was made up of pseudo-words or not. Block 1 was the awake state and served as the control state. During block 2, anaesthesia was induced with 3 mg kg^{-1} propofol administered over a period of 10 minutes in order to achieve a slow transition from

wakefulness to unconsciousness. In block 3, anaesthesia was maintained with 3 mg $kg^{-1}h^{-1}$. During the second block, all subjects ceased responding, and remained unresponsive during the third block. We compared functional connectivities during the first and the third block of the experiment (before and during anaesthesia) in six manually defined regions of interest (ROIs), namely precuneus, retrosplenial cortex, temporoparietal junction, thalamus, hippocampus, and the anterior frontomedian cortex. We extracted low-frequency components from the fMRI data and computed pairwise correlations among the ROIs. We applied Wilcoxon's test for matched pairs to test for differences in correlations between blocks 1 and 3. We found that during unconsciousness functional correlations between areas of the association cortex were largely preserved while thalamocortical and hippocampal correlations were significantly reduced. Since the hippocampal network is known to be vital for memory processes, we conclude that it may be possible that subjects still maintain self-representation but are unable to integrate it into their episodic memory.

Do Vestibular Signals Influence Illusory Self-Attribution of a Rubber Hand?

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 66

ABSTRACT The vestibular contribution to bodily self-consciousness is suggested by neurological observations. Artificial stimulations of the peripheral vestibular system may modify the experience of phantom

limb sensations in amputees and may also alter self-attribution of body parts in neurological patients suffering from somatoparaphrenia. In the present study, we investigated whether galvanic vestibular stimulation (GVS) – that evoke an illusory sensation of self- and/or environment motion – interferes with the mechanisms underlying body part localization and self-attribution in healthy participants using the so-called rubber hand illusion. The (unseen) left hand of the subject was stroked synchronously or asynchronously with a (seen) left rubber hand for 1 minute. Synchrounous stroking of the subject's hand and the rubber hand induced an illusory self-attribution of the rubber hand and a mislocalization of the subject's left hand, that was shifted towards the rubber hand. We compared whether localization and self-attribution during the rubber hand illusion was influenced by GVS (anode on the right or left mastoid process, < 2 mA) applied during the 1 minute stroking, with respect to a baseline without any galvanic stimulation and sham stimulations (on the neck). The localization of the subject's left hand was measured immediately after the stroking using a ruler. Self attribution of the rubber hand was mesured with questionnaires. Our preliminary data show that left and right anodal GVS did not modify the illusory self-attribution of the rubber hand (similar ratings of the illusions measured with questionnaires) and did not alter the localization of the subject's left hand. These data stress the robustness and consistency of the rubber hand illusion in healthy subjects even during artificially induced illusory self-motion. Although some clinical observations showed that vestibular stimulations influence self-attribution of one's own hand in some neurological patients (stimulation-induced recovery of ownership), our data in healthy subjects did not reveal a vestibular influence on the illusory self-attribution of a fake hand. As vestibular signals code for the motion and orientation of the whole body, we hypothesize that the vestibular contribution to bodily self-consciousness may be less important for body parts than for the whole body.

M The Signal Processing Architeture of Conscious and Unconscious Perception

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 97

ABSTRACT What distinguishes conscious from unconscious processing? Many believe that unconscious processing has its own special substrate or "channel" in the brain. For instance, the neural substrate of blindsight and other unconscious processes has been hypothesized to be subcortical, whereas conscious processing is often held to be restricted to the cortex. We call these "dual channel models". Alternatively, conscious and unconscious processes may both occur in a single information processing channel. On this view, representations become conscious due to their overall level of activation, or due to how they are processed at higher stages. We call these single channel models or hierarchical models. Distinguishing between these two kinds of models is of great importance as many neurobiological and philosophical theories rest on assuming that either of the models is correct. Previously we reported a visual psychophysics paradigm that dissociates changes in objective task performance from changes in subjective visibility (Lau & Passingham 2006, PNAS), capitalizing on some properties of metacontrast masking. These data present a stringent modeling challenge: which class of models best captures the observed dissociation between objective information processing and subjective, conscious experience? We used formal model comparison techniques to evaluate each model class's ability to fit the data. The results strongly favor a hierarchical model wherein conscious experience is determined by late stages of information processing. We then evaluate each models' ability to fit corresponding fMRI data (collected in a new experiment) in order to confirm our analysis. These results have implications for our neurobio-

logical and conceptual understanding of conscious experience and its neural correlates. On the hierarchical model supported by the results here, what determines whether a representation becomes conscious is not whether it is processed in some privileged neural circuit, or how it is processed at early sensory stages (cf Ned Block's recent discussions). Rather, a representation becomes conscious due to the nature of information processing that occurs at late processing stages. Philosophically, this model supports some versions of the higher-order theory of consciousness.

Cognitive Media and Self-interpretation

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 59

ABSTRACT Verbal reports of subjective experience play a crucial part in establishing a link between the explanandum of consciousness and the explanans of brain activity. But how do we come to know about our own experience? Evidence from neuroscience, comparative anthropology, and developmental theory increasingly emphasizes the socio-cultural dimension of mind. The default system of the brain is largely overlapping with the areas active during social cognition (Schilbach et al. 2008). Basic mind-reading abilities occur very early in the development that humans share with other primates (Tomasello et al. 2005) but is subsequently superseded by use of language and immersion in narrative practices (Gallagher & Hutto 2008). It thus seems not unlikely that knowing about one's own experience is similar to

social cognition and mind-reading. I therefore argue that the contents of conscious experience are individuated by socially mediated practices of self-interpretation. Such a claim stands in conflict with computational views that individuate representations according to their systemic function. But I claim that this need not be the case if cognition is seen as embodied, situated (Thompson 2007) and extended (Clark 2008). Human cognition is dependent on interaction with a socio-culturally shaped environment and the human brain's plasticity to invent, use and incorporate external cognitive media that change the information processing regimes for sucessful action in complex environments (Clark 2008). In this sense, language constitutes the paradigmatic cognitive medium. It is both a means of communication governed by social norms and a means of altering cognitive processing demands. I argue that by emphasizing the sensorimotor loop and the internalization of external linguistic cognitive media (Clark 2008, Fernyhough 2008, Clowes 2007), representation and interpretation can be combined. I first review some of the evidence that the social dimension of cognition is fundamental for mind. Then, I argue that contents of experience are individuated through self-interpretation and discuss the possibility of combining representational and interpretational theories of content. Finally, I speculate on the implications for the role of subjective experience in a science of consciousness.

Representationalism and Hallucinatory Pain

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TYPE Concurrent Session 2
TIME Saturday, 17:00–17:30
PLACE Room 3075, HU

ABSTRACT An important objection to representationalism about qualia is that, while we readily recognise the possibility of perceptual hallucination, we do not acknowledge cases where it seems that we are in pain but in fact we are not. a representationalist account of pain must explain the asymmetry between pain and perceptual experiences in this respect. a common-sense answer to this Asymmetry Problem is that pain, independently of its success at representing the external world, is unpleasant. This, the explanation goes, is why our concept "pain" tracks the experience itself instead of whatever it represents. It is an as yet unmet challenge for representationalism to explain how the unpleasant aspect of pain phenomenology is to be accounted for in terms of representational content. In particular, I show that a causal-informational account of representation such as Tye's will not do: under such an account there is no way to tell apart the purported two contents of pain representations (tissue damage and badness) given that they are necessarily coinstantiated in the conditions in which content is fixed. Imperative content provides a better answer to the Asymmetry Problem: the whole content of perceptions can be veridical or non-veridical, but not the whole content of pain can; the imperative part (upon which unpleasantness supervenes) is neither veridical nor non-veridical, just as desires and imperative sentences are neither true nor false. Imperative content is not supposed to correspond to the facts at all. Thus, it makes no sense to talk of hallucinating the negative phenomenology of pain, hallucinations being a special kind of non-veridical experiences. The unpleasant side of phantom-limb pain is as fine from the veridicality point of view as the unpleasant side of limb pain is. If we are to take representationalism seriously, this kind of content is our best shot for the representational content upon which the negative affective phenomenal character of pain is to supervene. Finally, I canvass an account of imperative representations that is naturalistically acceptable and, I hope, acceptable by Tye in particular.

Effects of Perceptual Expectations on Consciousness: Dissociation Between Long-range Synchronization and Gamma Oscillation

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TYPE Concurrent Session 3

TIME Sunday, 15:00–15:30

PLACE Room 2097, HU

ABSTRACT Conscious perception is not a passive process merely registering the information that impinges our senses. On the contrary, perception is a dynamic constructive phenomenon in which incoming sensory evidence is selected and compared to predictions on the basis of higher-order representations. Those predictive signals might be particularly relevant for stabilizing percepts and bringing them into consciousness when stimuli are ambiguous or constantly changing. It has been proposed that conscious perception is an emergent property resulting from the coordinated behavior of large populations of neurons, namely long-range synchronization. However, it is unknown how or whether neuronal synchronization is modulated by top-down processes. In this study we explore how higher-order representations affect visibility, and how this effect is reflected in brain activity. We hypothesized that long-range synchronization correlates with conscious perceptibility, whereas local synchronization in the form of local oscillation in the gamma frequency range correlates with the generation of top-down representations. We measured electroencephalographic activity in a visual hysteresis paradigm. The contrast of an initially hidden stimulus was first increased and then decreased, which led to continuous changes in visibility. Under these conditions, perceptual hypotheses are built up as soon as the subject perceives the stimuli, which in turn increases the visibility of subsequent lower contrast stimuli. Our behavioral results

confirm this effect by demonstrating a shift in the visibility threshold: The same physical stimulus initially judged as invisible while the contrast was increased was judged as visible when the contrast was subsequently decreased. In addition, long-range synchronization correlates with conscious perception (seen vs. unseen stimuli). This effect is modulated by the generation of a perceptual hypothesis: Stimuli that are rated as invisible during the contrast increase phase elicit higher long-range synchronization when they become visible during the subsequent contrast decrease phase. In contrast, local middle frequency gamma oscillations (55–70 Hz) follow the visibility curves, whereas high frequency gamma oscillations (80–95 Hz) correlate with the formation of predictions. Our study provides further evidence for the hypothesis that long-range synchronization correlates with perceptual awareness, whereas top-down influence is reflected by an increase in local gamma oscillations.

Computationalism: Still Cool After All These Years

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TYPE Concurrent Session 3
TIME Sunday, 15:00–15:30
PLACE Room 3075, HU

ABSTRACT In this talk, I want to systematically review the motivations for having a computational theory of consciousness to see if they turn out to be no longer plausible in the light of recent criticisms. These criticisms focus on the alleged inability of computational theories to deal with qualia, or qualities of experience (or objects of experience in some accounts), and with so-called symbol grounding on the

other hand. Yet it seems that computationalism remains the best play in town when one wants to explain and predict the dynamics of information processing of cognitive systems. Conscious information processing does not seem to be explainable better within any other framework; computationalism regarding consciousness can only be discarded by supposing that consciousness is epiphenomenal in information processing. I will argue that recent theories of consciousness that are to deal with the so-called hard problem of consciousness remain in their core computational if they do not subscribe to epiphenomenalism. For example, the quantum theory as proposed by Stuart Hameroff remains openly computational; the same goes for pan(proto)panpsychist speculation of David Chalmers. The qualitative character of information processing that Chalmers takes to explain the existence of subjective experience piggy-backs, so to say, on the very fact that there is information processing that is best explained in a computationalist framework. I will also briefly show that other alternative accounts of consciousness (such as direct theories of consciousness) that were supposed to oppose computational and functionalist conceptions are not only compatible with them but require them to begin with. In short, to discard credentials of computationalism in consciousness research one would have to show that it's possible to explain conscious information-processing mechanisms sufficiently in a non-computational way. And this has not been done by any of the critics of computational accounts. This all doesn't suggest, though, that computational explanation is sufficient for building a complete theory of consciousness; it might however be necessary.

The Role of Stimulus Awareness in the Neural Computations of Value for Simple Choices

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TYPE Concurrent Session 1
TIME Saturday, 15:00–15:30
PLACE Room 3096, HU

M

ABSTRACT Several human fMRI and monkey electrophysiology studies showed that neural activity in the orbitofrontal cortex (OFC) correlates with behavioral measures of subjective values, known as a goal-value (Roesch, & Olson, 2004; Padoa-Schioppa, & Assad, 2006). No previous studies have compared how the computation of goal values changes with awareness of the stimulus being evaluated. We use continuous flash suppression (CFS) – subjects' dominant eye receives dynamic images consisting of randomly generated patches of flickering colors, while the non-dominant eye is shown the target stimulus that is to remain subliminal (Tsuchiya & Koch, 2005). fMRI scans are acquired using a 3T-Trio scanner with 8-channel head coil. Before scanning, subjects provide liking ratings for 30 images of food items. In the scanner, on each trial, hungry subjects make a Y/N decision about whether or not they want to eat the food shown for 2s. After the experiment, one trial is randomly selected and the subject is given the food chosen on that trial. The key manipulation is that on half of the 210 trials, subjects are conscious of the stimulus, but half of the time the food image is hidden using CFS. In control trials, no food image is shown, and only noise is perceived. Subjects are told that even if they do not see a food item they should make their best guess (choice) based on how they feel. The preliminary data ($p<0.05$ uncorrected, and an extent threshold of 5 voxels) suggests that activity in the medial OFC correlates with values during both conscious and unconscious trials. Interestingly, the locus of activation significantly overlaps with those

correlating with goal values during conscious presentations found in previous studies. The pilot data further suggests that the value signal is stronger on average during the conscious trials than during the unconscious trials. a similar result holds for the difference between areas encoding for value in conscious and unconscious trials, but at a lower level of statistical significance. The results suggest that the brain may be able to compute value of choice options even when subjects are not aware of the choice options.

Importance of EEG Frequency Bands in the Assessment of Depth of Anesthesia

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 131

ABSTRACT Different brain states have been associated with the expression of various oscillation frequencies in electroencephalographic (EEG) recordings. Of particular importance is the assessment of depth of anesthesia (DOA) in patients undergoing surgical interventions. The proper quantification of brain activity by means of EEG recordings during anesthesia is helpful both for obvious medical reasons and for understanding how conscious states emerge from brain dynamics, and for that matter, how oscillatory activity correlates with conscious/unconscious states. Here, we recorded EEG signals from 62 patients undergoing surgery, under deep anesthesia induced with a cocktail

of substances. Auditory stimulation was applied through short clicks repeating with a frequency of 9.1 Hz. After cleaning and filtering the signals in the band of 0.5 to 600 Hz, we divided the data into segments having a length of 100 seconds. These segments were categorized into 5 DOA classes (ranging from 5: awake, to 1: deeply anesthetized) by 2 human expert anesthesiologists that relied on mid-latency auditory evoked potentials (MLAEP) and the notes of the attending anesthesiologist in order to classify. Next, we designed an artificial classifier that extracted time-domain descriptors from the original raw EEG signal with a Time Encoded Signal Processing And Recognition (TESPAR) technique. These descriptors were then classified by means of multilayer perceptron (MLP) classifiers that had to learn the mapping of EEG segments on the 5 DOA classes, from examples provided by the human experts. The artificial system could learn this mapping almost perfectly, i.e. its classification performance almost equaled the self-consistency of the human experts. Finally, we selectively filtered the EEG signals knocking out low, medium, or high frequency components or keeping various combinations of these, and then we reclassified filtered signals to identify which components contributed most to correctly identifying each DOA class. We found that the gamma band is especially relevant for identifying awake states, and that most other states can be detected relying on a combination of various frequency bands. Results suggest that brain states cannot be simply identified on the basis of single frequency bands, hence, various brain states are characterized by intimate relations among multiple frequency bands.

The Petrified Self and Anosognosia in Alzheimer's Disease

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 63

ABSTRACT Anosognosia – lack of awareness concerning a disease or loss of cognitive function – is a common feature in Alzheimer's disease (AD). We will explore the relationship between the preservation of the self and anosognosia in AD, suggesting that one potential explanation for this phenomenon is the lack of update of personal information due to the memory impairments characteristic of this illness. For this purpose we will briefly review the literature about the neural correlates of the self, the relationship between self and memory and the profile of memory impairments in AD, suggesting the hypothesis of a petrified self as the cause for anosognosia. We will show how this is in accordance with evidences from studies that point to an outdated self-evaluation in Alzheimer's disease and previous accounts of anosognosia, such as the views of Ramachandran (1999), Weiskrantz (1997) and Morris (Agnew & Morris 1998, Morris & Hannesdottir 2004).

Decoding Covert Intentions in Time-based Prospective Memory

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 71

ABSTRACT Our sense of 'volitional control' partly depends upon our ability to pursue 'distal intentions' or intended commitments to perform a task at a later point in time. Such distal intentions need to be pursued even in face of distracting short term tasks. This requires a capacity to maintain the prior intention while performing other tasks, and later retrieve and execute the intention once we think the appropriate conditions are met. Here we investigated a) whether it is possible to dissociate the spatiotemporal patterns of brain activity associated with encoding, maintenance, and retrieval of covert distal intentions and b) whether it is possible to decode distal intentions during a conflicting ongoing task. To answer these questions, we used a modified task-switching paradigm in combination with functional magnetic resonance imaging. Subjects had to perform one task (color judgement) while at the same time memorizing one of two other possible delayed tasks (magnitude or parity judgement). The subjects were required to switch to the delayed task in a self-paced fashion after a given time of 15s, 20s or 25s. a support vector machine was trained to recognize or "classify" the brain patterns associated with the future intention during the maintenance phase before the switch to the delayed task. When tested on novel imaging data, our method could successfully predict the covert delayed intention up to 20 seconds before the switch, and with up to 85% accuracy in single subjects. The information concerning the prospective task-set could best

be decoded from the spatiotemporal patterns of activity in the premotor and prefrontal cortices. The maintenance condition revealed more rostrolateral and dorsomedial patterns of activation in the PFC whereas the retrieval phase activated more rostromedial-PFC regions. Notably, during the maintenance phase high decoding accuracies were obtained in the premotor cortex (FEW,$p<0.001$), DLPFC, and orbitofrontal areas which can be ascribed to memory retrieval, temporal processing, task-set-conflict and inhibition. In conclusion, information about a covert prior intention to perform a task-set tens of seconds later can be decoded from ongoing brain activity even while one's currently executed intention ("intention-in-action") is to perform a highly demanding conflicting task-set.

Disentangling the Automatic from the Conscious Brain: fMRI of the Vegetative State

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TYPE Concurrent Session 2
TIME Saturday, 17:00–17:30
PLACE Room 2097, HU

ABSTRACT Recent evidence has suggested that functional neuroimaging may play a crucial role in assessing residual cognition, and awareness, in brain injury survivors. In particular, brain insults that compromise the ability of patients to produce motor output may render standard clinical testing ineffective. It is in these situations that functional neuroimaging may provide a window on brain function without requiring any behavioral response by the patient. However, using brain activity data to assess residual cognition, and especially awareness, presents many of the same complexities faced by bedside testing when teasing apart reflexive from voluntary behavior. Can auto-

matic brain responses be separated from willful mental effort? To address this problem, we propose and present data from a hierarchical approach to patient assessment, based on fMRI. Using this methodology, different sensory modalities are tested at increasing levels of complexity. At the lowest level, basic sensory perception is probed (e.g. sound perception, responses to the presence or absence of light). In an increasingly complex series of tasks we then follow neuro-cognitive systems along their processing stream. In the case of vision, for example, color perception, motion, and object recognition are sequentially tested. At the highest level of the hierarchy, this approach probes for the ability to willfully modulate brain activity (e.g. top-down allocation of attention). From a methodological standpoint, we argue that carefully designed experiments may allow the identification of volitional activity on the basis of brain activation alone. In particular, when 'task' and 'baseline' epochs are perceptually identical, and differ only in terms of their respective instructions, it is impossible to interpret differential brain activation without assuming a willfully different 'mind-set" across the two conditions.

Single Neurons Projection of Thoughts Onto a Computer Screen: Modeling the Data

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 139

ABSTRACT Look at the computer, concentrate on thinking of your favorite person, and make his or her image appear on the screen. Try harder. Harder... For people who do not possess super-hero powers, this experience is bound to fail. However, we conducted such a experiment

on eleven subjects, enabling them to control the appearance of an image on a computer screen with their mind. We recorded from neurons in the medial temporal lobe (MTL) in patients with pharmacologically intractable epilepsy implanted with chronic electrodes to localize the seizure focus for possible surgical resection. Patients were presented with four different images (familiar personalities, animals etc) that elicited specific firing activity in four single units selected in a prior screening session. The patients were asked to fade in and out one of two images simultaneously present on the screen by attending to one or the other overlapping images for 10 sec. Patients reached a control accuracy level of 71% after a few trials. We adapted a Diffusion-Decision model to quantitatively describe the activity of these 4 single neurons using Poisson rates ramping up to a threshold and an attentional modulation of the neuron's firing rates. This enabled the patient to learn how to utilize this real-time closed-loop circuit to improve conscious mental control over fading (by differentially attending to one or the other images). This implies that subjects can selectively and differentially control the firing activity of subsets of MTL neurons.

Hypnotic Susceptibility, Sleepiness and Subjective Experience

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 103

ABSTRACT Albeit being an interesting topic in consciousness research, relationships between different altered states of consciousness are rather insufficiently explored. In particular, hypnosis research

remains isolated from studies of other altered states of mind. The early view of hypnosis had been deeply influenced by its observable resemblance with sleep – even the phenomenon was named after the Greek god of sleep, Hypnos. Since those times a great number of experimental results had pointed out that hypnosis is neither the usual waking state nor any of the sleep stages. However, theoretical and experimental work suggests that the phenomena of hypnosis and sleep still share many similarities which should not be rejected. In our study, we investigated the relationships between hypnotic susceptibility, self-reported sleepiness, and the subjective experience of receiving hypnotic suggestions. Based on previous work, our initial hypotheses held that: 1) Hypnotic susceptibility correlates positively with self-reported daytime sleepiness; 2) Higher hypnotic susceptibility is associated with higher hypnotic inertia that manifests as increased drowsiness after the hypnotic procedure, and 3) Subjective experience gives a more valid measure of hypnotic suggestibility than behavioral scores alone. In order to test the hypotheses, we administered hypnosis-related and sleep-related scales to 90 volunteer subjects. After a standard group hypnosis session, the subjects were asked to fill out the Harvard Group Scale of Hypnotic Susceptibility Form a (HGSHS:A), the Karolinska Sleepiness Scale (KSS), the Epworth Sleepiness Scale (ESS), the Pittsburgh Sleep Quality Index (PSQI), and our self-developed the Questionnaire on Subjective Hypnotic Experiences (Form E). HGSHS:A scores and item difficulties were checked against previously established Finnish and international norms, and all scale results were analyzed by multiple statistical methods. Our findings indicate that hypnotic susceptibility correlates with both habitual daytime sleepiness and instantaneous sleepiness after the hypnotic procedure. Furthermore, our results lend also support to the third initial hypotheses about subjective scales being useful tools when evaluating experiences of hypnosis and sleep. For both these cases of altered consciousness, findings support the idea of common underlying psychological mechanisms, such as the ability to quickly relax the mind-body, or to get immersed into less externally driven mental content.

Vision by Inference: Visual Recognition Under Uncertainty

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 26

ABSTRACT When presented with images of isolated objects, human subjects can provide almost instant recognition, indicative of apparently feed-forward like processing of visual scenes. When objects are occluded or embedded into a set of distractors, recognition is more difficult and a visual search task must be first engaged. a third case, that was much less investigated however, is when the visual system handles very limited amounts of information about the objects in the visual scene. When elementary visual features are lacking and subjects are provided with barely discriminable information, they engage into a hypothesis-driven visual exploration process, giving either a wrong answer or the correct answer but after a very long exploration time. To study such cases, one needs to be able to control the amount of information that is provided to the visual system and to prevent elementary visual features to be detectable in the stimulus (in order to prevent instant recognition). We developed a stimulation paradigm that takes advantage of a deformable grid of black dots on a white background. The grid is progressively deformed towards points of maximum information content belonging to the object to be categorized. When the grid is the less deformed subjects have a very hard time perceiving the underlying target object, while for high levels of deformation towards informative points, the subjects can instantly recognize the object. By manipulating a single parameter, one is able to provide the visual system with progressively more information with-

out directly exposing the subject to elementary visual features of the object. Object-related information is retrieved from the statistical deviation of grid points from the regular lattice towards informative points belonging to the object. Therefore, subjects engage into an active visual inference rather than feed-forward recognition process. We show with psychophysical data collected from 9 subjects that our stimulation paradigm can provide a continuous and controllable transition from unperceivable to easily perceivable representations of objects. Therefore, this stimulation paradigm may be especially useful to study how the visual system handles uncertainty, i.e. visual inference.

From Implicit to Explicit Self-Representation: No Self-Consciousness Without Consciousness of Other Minds

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 42

ABSTRACT Self-consciousness can be defined as the ability to think of oneself *as* oneself (e.g. L. R. Baker, 1998). Here, I will argue that self-consciousness in this sense requires an explicit self-representation, which needs to be distinguished from the implicit self-related information that is a necessary structural component of conscious experience. This distinction can be elucidated with the help of Perry's (1993) theory of 'unarticulated constituents' and Recanati's (2007) framework for a relativist semantics, and can be further spelled out by distinguishing different levels of explicit representation (Dienes & Perner, 1999; Karmiloff-Smith, 1992). Given that self-consciousness

requires an explicit self-representation, it follows that it is crucial for any theory of self-consciousness to explain the transition between states that contain implicit self-related information (i.e., information that is *in fact* about the subject) to states that contain explicit self-related information (i.e., information that is represented as being about the subject). I will argue that an important part of this transition consists in the acquisition of a Theory of Mind, that is, the ability to ascribe mental states to others and to oneself. If this is right, it suggests a symmetric relation between self-consciousness and consciousness of other minds; in other words that the same cognitive mechanisms required for attributing mental states to others are necessary for attributing mental states to oneself (cf. Frith and Happé, 1994). I will present theoretical as well as empirical data that lend support to this "symmetry thesis", that is, the thesis that self-consciousness is constitutively linked to an awareness of other minds.

Towards a General Theory of Action Awareness

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TYPE Concurrent Session 1
TIME Saturday, 15:00–15:30
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ABSTRACT In this paper, I take steps towards articulating and defending a general theory of bodily action awareness. This theory is sensitive to the view that bodily actions are typically multistage events unfolding in time. They involve two causally related components: intention and bodily movement. I argue that a proper appreciation of the dual component ontology of action yields a correspondingly multifaceted account of action awareness. According to this account, what I call 'general action awareness' may be broken down into two types: 'Antici-

patory awareness' and 'concurrent awareness'. Anticipatory awareness is awareness of what one will do, and corresponds to the intention component of action. Concurrent awareness is awareness of what one is presently doing and corresponds to the bodily movement component of action. General action awareness is a function of the degrees of each of these two types of action awareness, which, I will argue, are integrated on the basis of an inferential mechanism. In the first part of the paper, I lay out the account sketched above in further detail. In the second part of the paper, I evaluate the account against competing accounts of action awareness. I argue that the account I defend has theoretical advantages over alternative accounts in that it (i) better explains pathological data from cognitive neuroscience and psychology, (ii) better explains salient experimental results in the literature, i.e., Marcel's vibro-tactile illusion and Haggard's intentional binding effect, (iii) better explains the sense of agency and its various components, i.e., the sense of ownership and sense of control that we have over our own actions, and (iv) is equally capable of accounting for the intuitions that action awareness is "immediate", "authoritative", and "transparent" (see O'Brien, 2003).

N A New Theoretical Framework for Agency, Ownership and Responsibility

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TYPE Concurrent Session 1
TIME Saturday, 14:00–14:30
PLACE Room 3075, HU

ABSTRACT The structure of the acting self is still perplexing and remains an often confounded issue in the recent debates. This talk provides a new systematic theory of self-consciousness in general and of two of its main features, the sense of agency and the sense of ownership. Furthermore, the phenomenon of responsibility can be separated from both phenomena. The theoretical framework will be shown to be fruitful in the context of the recent experiments in neuroscience including own studies worked out in cooperation with Vogeley. An important background of the new approach is a theory of levels of mental representation. It will be argued that we have to distinguish at least nonconceptual representations, conceptual representations and meta-representations. On the basis of clearly defined levels of representation it will be argued that one has to differentiate (i) an individual-orientated cognitive dimension of agency and ownership from (ii) a socio-normative dimension of responsibility. Gallagher introduced the distinction between agency and ownership. We need this distinction to account for passive movement of my arm since I still have the feeling of ownership in such a case but no feeling of agency. Furthermore, it is shown that we have to distinguish the feeling of agency and the judgment of agency. I can develop a feeling of agency in everyday automatic doings without explicitly judging that I am the agent. The feeling of agency is realized by nonconceptual representations. I may also develop a judgment of agency without any feeling of agency: The judgment of agency is realized by conceptual representations. Furthermore, it is shown that responsibility is a separate dimension from both aspects. I

can judge that I am the agent of an action but deny responsibility by arguing that I just followed a strict order. This indicates that the ascription of responsibility is presupposes a theory of social interaction. Responsibility is relying on meta-representations which are typically involved in the so-called theory-of-mind ability. Analogous distinctions have to be made concerning the phenomenon of ownership. The proposed theory of self-consciousness is shown to be very fruitful from the perspectives of psychology, psychiatry and neuroscience.

Individual Differences in Subjective Experience: The Case of Visual-Gustatory Interactions

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 84

ABSTRACT Cross-modal interactions are prevalent in perception. Such interactions can influence perception, performance, and brain activity. However, it is becoming increasingly clear that there are substantial individuals differences in the degree to which information processed in one sensory modality can alter processing in another. The wide range of synaesthesia variants known to science demonstrates this well. In the present study we examined whether visual stimuli can induce a gustatory experience in some individuals. We find that a minority of individuals do report vivid synaesthesia-like gustatory imagery induced by images of food. We will discuss how these interactions depend on familiarity and taste preference, whether they are induced by the food image or the sight of another individual eating it, and whether

the phenomenon depends on empathy and the presence of other types of synaesthesia. We speculate that the phenomenon may be mediated by hyper-activation of the mirror neuron system at least in some of the individuals we identified.

Does Phenomenal Consciousness Outstrip Cognitive Access?

AUTHOR **Alva Noë**

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TYPE Symposium 1: Talk 1

TIME Saturday, 10:30–12:30

PLACE Leibniz-Saal, BBAW

ABSTRACT Does phenomenal consciousness outstrip cognitive access, as Block (2007) has argued? In this talk I explore this question. I give close attention to the interpretation of empirical evidence bearing on the issue. I discuss change blindness – what does it really teach us about visual consciousness? – looking closely at recent work from the laboratory of Lamme (e.g. Sligte et al 2008). I also consider evidence from the neurosciences bearing on the neural substrates of states of phenomenal consciousness. I suggest, finally, that we need new ideas about consciousness, cognition and their neural substrates to untangle these puzzles. I show how a new approach (O'Reagan and Noë 2001; Noë 2004, 2009) provides the needed resources.

The Subjective and the Objective Duration of Static NREM Sleep Dreams

AUTHORS **Valdas Noreika**[1], Valtteri Arstila[1], Christine Falter[2], Julian Kiverstein[3], Jennifer Windt[4], Antti Revonsuo[5]

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 104

ABSTRACT Anecdotal evidence suggests that dreams may distort the subjective experience of time. The relationship between the subjective and the objective clock duration of dreams has been debated for many years. Several researchers have argued that people dream throughout the night, while others have claimed that dreams are formed instantaneously at the moment of awakening. Yet, only a few empirical studies, based on post-awakening reports, incorporation of external stimuli into dream content, or counting tasks performed in lucid dreams, have aimed to explore the average duration of dreams. These studies have focused on the duration of typical complex REM sleep dreams, leaving NREM sleep dreaming aside. We aimed to investigate the duration of static NREM sleep dreams, which usually consist of just a few comparatively mundane experiences. Such simple dreams, which can be considered as minimal states of sleep consciousness, are usually forgotten, unless reports are elicited in the sleep laboratory. 10 participants spent 4 experimental non-consecutive nights in the sleep laboratory and were awakened, following the early-night serial awakenings paradigm, 8 times per night. Awakenings took place during NREM sleep Stages 2 and 3 as well as during sleep onset REM sleep, and were followed by free dream reports and answers to a detailed questionnaire on different aspects of dreaming, including 5 questions about the

subjectively estimated duration and the speed of time passage in the dream. Post-awakening answers revealed that the subjectively estimated duration of dreams differs between sleep stages even when the duration of sleep was controlled, with REM dreams reported as having been longer than NREM dreams. Yet, even the simplest NREM dreams were often experienced as extending into 30 s, 1 min or even longer time intervals. By contrast, the subjective speed of time passage did not differ between dreams of different sleep stages and was typically scored as resembling waking life. The duration of minimal dreams was also tentatively explored by EEG contrast between the reports of dreaming and dreamless sleep from the same sleep stages. This novel approach might eventually provide new means for determining the objective rather than the subjective duration of dreams.

Measuring Flexible Control in Artificial Grammar Learning

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 115

ABSTRACT One operational criterion for assessing whether knowledge is consciously available is that it can be applied in a controlled, flexible manner (Baars, 1988). This study represents an attempt to apply this criterion to knowledge acquired in an Artificial Grammar Learning (AGL) experiment. We present data from one experimental study (N = 80) that applied a novel procedure for measuring flexible control in AGL. In the learning phase, participants were trained on two different artificial grammars, Grammar a vs. Grammar B (Dienes,

Altmann, Kwan, & Goode, 1995; Wan, Dienes, & Fu, 2008). In a pure test condition, grammaticality was judged with respect to one grammar throughout the block. In a mixed test condition, instructions to classify with respect to either Grammar a or Grammar B varied randomly from trial to trial. The pure test condition corresponds to the procedure of Dienes et al. (1995). The mixed test condition was a novel procedure assumed to require a higher degree of conscious, flexible control. The experiment used either traditional letter strings written in black ink or letter strings in which the colour and font of individual letters varied randomly between trials to increase the perceived complexity and thus reduce the influence of explicit strategies. The ability to classify the test strings according to the grammatical rule was above chance in both the pure and mixed test conditions. Confidence ratings indicated that participants in all conditions showed metacognitive awareness of the acquired knowledge. There was evidence of flexible control in all conditions. However, in the simple stimulus condition, there was a relative advantage of pure blocks over mixed blocks. This advantage was not found in the complex condition. Flexible control and metacognitive awareness indicate that learning was clearly not implicit, even in a condition of increased perceived complexity. We discuss which additional measurements are needed to assess whether learning in this situation is fully explicit or associated with conscious feelings reflecting implicit learning, e.g., fringe consciousness.

O

Effects of Object Substitution Masking on Different Qualities of Perceptual Awareness

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 6

ABSTRACT Object substitution masking (OSM) occurs when a briefly presented target is surrounded by a spatially distinct mask that outlasts it. This delayed mask offset has been shown to abolish an accurate perceptual representation of the target prior to semantic analyses. According to the re-entrant hypothesis of OSM, conscious perception emerges from recurrent communication between low level and high level visual areas. The trailing mask is thought to create a mismatch between low level information and feedback representations to the effect that processing of the object is interrupted, rendering only the mask available for conscious report. Interestingly, most previous studies have focused on OSM of simple geometric objects. Here, we investigated the impact of OSM on the perception of complex naturalistic objects. To achieve this, we first studied effects of set size and trailing mask duration on the perception of masked targets. These behavioral results confirm and extend previous findings of stronger masking with increasing set size and longer mask duration. We then conducted a high density electroencephalographic study and performed electrical neuroimaging analyses to identify the brain mechanisms that underlie different qualities of the formation of object representations. More specifically, we contrasted trials in which target objects were localised within the display but could not be identified with trials in which objects were fully identified and with trials in which objects were neither localised nor identified. While some EEG effects were suprisingly independent of how

accurate information about the target object could be reported, other effects were specific for consciously perceived targets. We discuss the results in the context of the re-entrant hypothesis of OSM.

The Visible Trace of Invisible Elements in Human Vision

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 5

ABSTRACT One of the most frequently used tools in conscious research is visual masking in which a target is rendered invisible by a following mask. Usually, it is assumed that the target is suppressed by the mask and, hence, does not reach awareness. Here, we show that even though the target itself is rendered invisible by masking, its features can still be clearly perceived at other locations. This result raises the question whether or not the target is conscious. We used a sequential metacontrast masking paradigm in which a central Vernier is followed on either side by sequences of flanking lines. These lines are consecutively shifted further away in space creating the percept of two diverging motion streams. Because of the masking the Vernier is invisible. Still, when the Vernier is slightly offset to the left or to the right, observers perceive a corresponding offset within the stream of lines, which are in fact straight. Hence, although the Vernier itself is invisible, its offset is visible. To investigate how the Vernier offset is processed, we presented a second offset to one of the flanking lines and measured the interaction between the two offsets. Our results show that the offsets are very

precisely processed although observers cannot consciously access the individual offsets within the motion streams. Importantly, the two offsets are integrated only if they are grouped within the same motion stream. Therefore, we propose that unconscious feature processing is achieved by grouping. In this framework, the Vernier itself is not conscious, not because of suppression but because of grouping.

P

What is the Explanatory Gap?

AUTHOR **David Papineau**
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TYPE Keynote Lecture
TIME Monday, 9:00–10:00
PLACE Leibniz-Saal, BBAW

ABSTRACT I shall offer a simple diagnosis of the so-called 'explanatory gap'. The 'gap' is nothing to do with the inability of materialism to explain or derive facts about consciousness, as most philosophers suppose, but simply due to the way that materialism remains so strongly counterintuitive even after we are presented with the overwhelming evidence in its favour. From this perspective, the 'gap' is not some philosophical or scientific problem that remains after we embrace materialism, but rather a result of the psychological difficulty of embracing materialism properly in the first place. (We feel that that there is something mysterious about the mind-brain relation only because we can't rid ourselves of the dualist thought that the brain somehow magically 'gives rise to' an extra realm of conscious feelings.) After demonstrating that all of us (including professed materialists) are subject to such an intuition of dualism, I shall address the question of why this intuition should persist even though theoretical considerations show that it must be false. This is a psychological issue. I shall consider five different empirical hypotheses about the source of the intuition and will conclude that the intuition stems from the peculiar concepts that we use to think about conscious states.

An Enactive Account of the Mutual Scaffolding of Concepts and Experience

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 36

ABSTRACT Specifying the content of experience, including the conceptual, is central to understanding consciousness, yet current theories of concepts do not seem up to the job. We suggest an empirically testable model of the mutual scaffolding of concepts and experience, where neither is ultimately primary but each gives rise to the other. Such a model can then serve as the anchor to an enactive theory of concepts more generally. Concepts are most naturally understood in symbolic and representational terms, while much of experience, in contrast, is non-symbolic and non-representational. We begin by proposing that concepts are grounded in a combination of (a) sensorimotor engagement between the agent and its environment, (b) a parsimonious set of proto-conceptual primitives, and (c) an ability to discover and assign salience to regularities between action and perception. This is in keeping with neuroscientific evidence and contemporary enactive approaches. The discovery of the most basic of regularities alters the interaction of the agent with its environment not only by shaping and directing the discovery of further such regularities between action and perception, but of regularities among the regularities themselves. So there are both sensorimotor contingencies and further contingencies that do not directly involve sensorimotor engagement but only relate indirectly back to such engagement. As this process of finding patterns and patterns within patterns snowballs, the result is increasingly more abstract and crucially

more recognizably representational and symbolic content – precisely to the extent that it becomes more invariant and therefore to some practical extent independent of particular moments of experience or particular contexts of application. Even such "high-level" conceptual content has impact down to the lowest levels of cognition, as recent empirical work e.g. in visual processing attests. Critically, conceptual content is never independent of its roots; it lies toward one end of a continuum grounded in and ultimately inseparable from basic sensorimotor contingencies. In parallel with this, we conclude that the aspects of cognition most naturally described as symbolic – i.e., the conceptual ones – arise from mechanisms best understood in sub-symbolic and associational terms.

Incidental Learning of Interactions Between Motor and Linguistic Sequences

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 112

ABSTRACT In order to investigate interactions between different levels of processing under a paradigm of Serial Reaction Time (SRT) task, we develop a dual task in which the usual dots stimuli are replaced by words forming meaningful sentences. In this new task, a motor (SM) and a linguistic (SW) sequence continuously and concurrently attract participant's attention. In a first experiment, SM is second-order-conditional (SOC), of length 12 and among 4 items, whereas SW is a fairy tale. Learning phase consists of 15 blocks of 100 words. During the

transfer block (13th), we either randomize the motor sequence (TM), the words' order (TW), or both (TMW). Transfer effect in TMW appears to be exactly equal to the sum of TM and TW effects. In a second experiment, we introduce new instructions in order that participants dedicate their attention either to the SM (CM) or to the SW (CW). a post-test SM recognition task is applied, completion of trigrams in both inclusion and exclusion, but also for specific words presented in bold in the SW. As expected, TM effect is stronger for CM, and TW is stronger for CW. Moreover only CW performs well in the SW recognition task. However, CM does not score better in the SM recognition task, as if forced-reading were interfering with participants' ability to form explicit knowledge about the sequence. We introduce in a last experiment an abstract interaction between SM and SW by building sentences such that every word has a specific position depending on its type (1: article/pronoun; 2: adjective/adverb; 3: noun; 4: verb). In the transfer block, we present conditions in which, either we break the interaction between the two sequences (TI), or we change the two sequences' construction but keep their interaction (TC), or both (TIC). All participants are to respond as fast as possible (CI), but additionally, half of them must also pay attention to the positions of the words (CE). During a post-test recognition task, we ask participants to discriminate old and new words' positions. Results should confirm an incidental learning of the abstract interaction between MS and LS.

History Dependence in Multistable Perception Highlights the Role of Noise in Visual Perception

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 24

ABSTRACT If our visual system is confronted with an ambiguous image it lapses into spontaneous alternations, a phenomenon dubbed multistable perception. a classical statistical property of these oscillations is statistical independence of successive dominance percepts ("sequential independence"). This feature is hard to reconcile with susceptibility of perceptual dominance to adaptation. To investigate this puzzling contradiction we assessed the predictive power of cumulative history for future dominance periods. Cumulative history was computed convolving all preceding dominance intervals with an exponential decay (time constant τ decay). We found that it has a significant influence on dominance durations, transition times, as well as transition direction. First, we observe a significant correlation between cumulative history and the next dominance time (correlation coefficient 0.2–0.5) for $0.3 < \tau\,\text{decay}/\,\text{Tdom} < 1$. Consistent with adaptation, observed correlation was negative for dominance of the same and positive for dominance of the other percept. Cumulative history of clear percepts also influences transition periods: their durations as well as the likelihood of return transitions peaked when histories were balanced, revealing the noise driven nature of perceptual reversals. We also carried out computational simulations of a simple rate model to assess its ability to replicate experimental findings. Additional statistical properties, revealed by the cumulative history approach, resulted in narrower regions of suit-

able values for adaptation and inhibition strength variables. Critically, they show that a system should operate close to the bifurcation line in a bi-stable rather than oscillatory regime. Former one implies that noise is indispensable for the phenomenal alternations even in the presence of adaptation dynamics. In summary, multistable perception depends significantly on history, even for continuous displays. This dependence was hitherto overlooked, as it is evident only with an integral measure of history. The modest degree of this dependence, extended transitions in the event of balanced histories, lack of correlation between estimated adaptation time-constants and spontaneous alternations rates of observers and results of simulation all point out at the importance of noise as a principal driver of perceptual transitions.

Part-Time Zombies, First-Person Privilege, and the So Called Explanatory Gap

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TYPE Concurrent Session 4
TIME Sunday, 17:00–17:30
PLACE Room 3075, HU

ABSTRACT Zombie and Inverted Spectrum thought experiments are the bedrock of the explanatory gap or hard problem. Althoughskepticism against these thought experiments is quite old, none of the objections discussed so far has been found decisive. It will be demonstrated however that a basic flaw of these thought experiments can be made apparent by replacing the usual full-time zombies by part-time zombies. This leads to a more fundamental objection. According to basic assumption of the explanatory gap position, there is a severe asymmetry between the first and the third person perspective, such that there are first

person facts (like spectrum inversions) that cannot be known in principle from the third person perspective. Given that scientific knowledge is third person knowledge, certain first person facts would be beyond the reach of scientific explanation. This view, however, is based on a confusion between experience and knowledge. Although there is a first-person privilege with respect to the experience of phenomenal qualities, there is no privileged first person knowledge of these states. Any fundamental restriction of third person epistemic access to a certain type of mental states will result in a similar restriction of first person access to this type of states. Given that most philosophers accept that we do have epistemic first person access to our own phenomenal states, we should also have epistemic third person access to these states. It would follow that there is no basic limitation for a scientific third person explanation of mental, particularly of phenomenal states within a physicalist framework. Even then the intuition might remain that the problem cannot be solved. But historical observation demonstrates that intuitions may change dramatically, particularly under the impression of scientific development. Findings from psychology of emotion and pain research show that this change is an ongoing process which is driven forward also by neuroscientific progress. It is, of course, unclear, how far this development will take us, both on the level of science and on the level of our intuitions. But this is a question of future scientific development, not a fundamental philosophical problem.

Seeing the Minds Eye: Mental Imagery and Conscious Vision

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ABSTRACT Mental imagery has been proposed to contribute to a variety of high-level cognitive functions, including memory encoding and retrieval, navigation and spatial planning, and even social communication and language comprehension. However, it is debated whether mental imagery relies on the same sensory representations as perception, and if so, what functional consequences such an overlap might have on perception itself. Here, I will discuss novel evidence that single instances of imagery can have a pronounced facilitatory influence on subsequent conscious perception. Either seeing a weak stimulus or imagining a specific pattern could strongly bias which of two competing stimuli reach awareness during binocular rivalry. Effects of imagery and perception were location- and orientation-specific, accumulated in strength over time, and survived an intervening visual task lasting several seconds prior to presentation of the rivalry display. Interestingly, effects of imagery differed from those of feature-based attention within the same paradigm. The results demonstrate that imagery, in the absence of any incoming visual signals, involves low-level retinotopic visual areas and the formation of a short-term sensory trace that can bias future perception, suggesting a means by which high-level processes that support imagination and memory retrieval may shape low-level sensory representations.

Personal Autonomy and Intentional Action Control

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 57

ABSTRACT The capacity to consciously control one's own actions is an essential aspect of autonomous agency. However, based on Libet's famous experiments (Libet et. al. 1983) some philosophers claim that human agents lack the capacity for conscious action control. Thus, they conclude autonomy must be an illusion. I argue that these skeptical conclusion about the possibility of conscious action control and autonomous agency rest on two faulty assumptions. First, it is presupposed, on a conceptual level, that only actions that are under immediate conscious control can be understood as autonomous. Secondly, it is maintained that the empirical findings support the claim that it is impossible to consciously control one's own actions. In contrast to these assumptions I argue, firstly, that unconscious action control can be a part of autonomous agency as long as it is still the agent which controls his actions. Secondly, I develop a framework of intentional action control which emphasizes the different functions of consciously forming and holding an intention. I conclude that autonomous agency is not threatened by recent neuropsychological findings about mechanisms which initiate and sustain actions without being under immediate conscious control. Quite the opposite, an empirically based picture of autonomous agency emerges. Of particular importance for my own account of autonomous agency is the notion of an intention conceived of as a mental state that modulates the mechanisms which initiate and sustain actions in order to achieve the intended goal. Apart from philosophical accounts of natural agency (Bishop 1989; Bratman 1987, 2006; Mele 1995) I put emphasis on recent

neuropsychological approaches towards executive functions (Miller & Cohen 2001) and the role of conscious intention formation for actions which are not under immediate conscious control (Goschke 2003; Hommel 2003). In my opinion understanding the interdependencies between conscious and unconscious action control is one of the major challenges for the development of a naturalistic account of autonomous agency. My discussion will clarify some important conceptual issues about intentional action control and autonomy and I will use empirical data about intentional action control in order to elaborate a detailed account of autonomous agency.

What Kind of Mental Images Are Synaesthestic Spatial Forms?

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 82

ABSTRACT For a substantial minority of people, thinking about members of certain sequences (e.g., months, week days, numbers) is accompanied by the additional sensory experience that the concept member occupies a precise location in imaginal or peripersonal space. This location is in turn part of a spatially extended pattern which can be very complex and idiosyncratic. These spatial forms remain a poorly understood individual difference in everyday mental imagery. Outstanding questions include whether spatial forms should be considered as a variety of synaesthesia, or as an extreme on the continuum of everyday mental imagery, whether they are associated with benefits or disadvantages, and what type of visuo-spatial representation they are. Both behavioural and self-report data will be presented to address these issues.

First, by self-report, people with spatial forms show above average everyday mental imagery. In addition, scores on a questionnaire that taps spatial form experience in the general population also correlate strongly with self-reported general imagery. Second, mental imagery instructions can induce control groups to show similar behavioural patterns to people with spatial forms in laboratory experiments. Third, spatial forms do not confer strong advantages in tests that might be expected to benefit from inspectable visuo-spatial models of the layout of the forms. In these tests, loading visuo-spatial components of working memory also fails to selectively impair performance of spatial form groups. It is tentatively concluded that spatial forms may be vivid automised visual images at the end of the spectrum of individual differences in mental imagery, but do not seem to be spatial cognitive maps of the type that some introspective reports would initially suggest.

Q

Is Sequential Knowledge Essentially Statistical in Nature?

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 114

ABSTRACT We investigated whether the sequential knowledge acquired in sequence learning is essentially statistical in nature, as many have argued, or can include more abstract properties, and whether such knowledge can be unconscious. We adopted three types of stimuli in probabilistic sequence learning. Compared with the standard stimuli that followed a second order conditional (SOC) sequence, transfer stimuli followed a different SOC sequence (same abstract properties, different n-grams); deviant stimuli followed neither SOC sequence (both abstract properties and n-grams different), which contained mainly runs and alternations. The three types of stimuli all appeared in each block. The probability for standard stimuli was .833 or .667 depending on experiments and correspondingly the probabilities for transfer and deviant stimuli were either same (both .083), or different (.25 for transfer and .083 for deviant). Subjects were presented two generation tests after either a short or long training phase, while indicating either their confidence in their judgment (on a 50–100% scale) or the basis of their judgment as it subjectively seemed to them: random, intuition, rules or memory. Subjects had to generate sequences that either followed the training regularities (inclusion) or failed to follow them (exclusion). In training, subjects showed faster responses to standard stimuli than transfer stimuli, showing procedural learning of n-grams, but also faster responses to transfer stimuli than deviant stimuli, showing procedural learning of abstract features of the sequential structure beyond n-grams. After training, subjects could, depending on training

conditions, generate more standard than transfer responses, indicating control over the use of knowledge of n-grams, and more transfer than deviant responses, indicating control over the use of abstract knowledge. In both cases, control could be exerted when subjects were subjectively unaware of their knowledge (i.e. they felt they were guessing or using intuition). The results were inconsistent with the claim that subjects can only implicitly learn n-grams (fragments or chunks), i.e. only engage in first-order statistical learning, and suggested instead that sequential knowledge could be based on abstract rules. The data challenge chunking or fragment models of unconscious learning.

R

Inattention Boosts Subjective Visibility: Implications for Inattentional and Change Blindness

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 9

ABSTRACT Why is it that the whole visual scene in front of us appears to produce uniform subjective visibility, when current research seems to suggest that we can only process a small part of it effectively (e.g. experiments of change and inattentional blindness)? Here we report a paradoxical finding that can explain this phenomenon. Subjects detected strongly and weakly attended gratings whose contrasts were adjusted to produce the same detectability (d). We found that subjects were conservative in detecting the strongly attended gratings and liberal in detecting the weakly attended gratings, i.e. they produced higher hit rate when there was a lack of attention. We confirmed that this was still the case even when subjects were instructed to be unbiased and were given feedback after each trial. The effects were robust and easy to replicate. In order to test whether the results were merely driven by the difference in stimulus contrasts between the attended and unattended conditions, in a separate experiment we used multiple levels of contrasts for both conditions. The results demonstrated that more attention leads to lower hit rate even when the effect of stimulus contrast was independently accounted for. We reasoned that these effects were due to weakly attended stimuli producing disproportionately high phenomenology, and we tested this hypothesis directly in another experiment. We matched for subjects' ability to discriminate between two orientations of a grating, and required subjects to give subjective visibility ratings after the discrimination. As expected, participants gave higher ratings for the weakly attended gratings. Thus, surprisingly, our results demonstrate

that the subjective visibility associated with weakly attended signals is higher than what would be warranted by the quality of these signals. This effect can explain people's experience of a uniformly visible visual field and their surprise after performing badly in inattentional and change blindness experiments – the lack of attention to the periphery may paradoxically give rise to an inflated sense of phenomenology. Our results provide further support to the idea that attention and awareness are fundamentally different processes.

Attention and Biased Competition in Multi-Voxel Object Representations

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 2

ABSTRACT The biased-competition theory accounts for the effects of attention at the neuronal level. Two hallmarks of this model are 1) the neuronal response to simultaneously presented stimuli is a weighted average of the response to isolated stimuli, and 2) attention biases the corresponding weights in favor of the attended stimulus. However, perception is not a property of single neurons, but probably relies instead on the activity of larger populations of neurons, which could be reflected in fMRI patterns of activity. Because several non-linearities can influence the pooling of single-neuron responses into BOLD signals, the fMRI effects of attention need not exactly mirror those observed at the neuronal level. Here we ask 1) how simultaneous stimuli are combined

in multi-voxel patterns of representation and 2) how this effect depends on stimulus category, the brain region under consideration, and the allocation of attention. We considered data from an fMRI study in which four object categories (faces, houses, shoes and cars) were presented in four conditions: in isolation, or in pairs such that each category was attended, unattended, or attention was divided equally between the two. Unlike traditional analyses that collapse the response across all voxels in a region of interest, the response in each condition was represented in a multi-dimensional space where each voxel defined a dimension. In this high-dimensional space, the BOLD response to two simultaneously presented categories was well described as a weighted average of the response to individual stimuli. The weights were biased towards the preferred category in category-selective regions (FFA and PPA for faces and houses, respectively). Independently of this category-specific effect, and consistent with the biased competition theory, attention shifted the weights in favor of the attended stimulus, and the magnitude of this shift (30%) was quantitatively consistent with previous reports in single neurons.

Towards a Taxonomy of Visual Attention

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TYPE Symposium 1: Talk 2
TIME Saturday, 10:30–12:30
PLACE Leibniz-Saal, BBAW

ABSTRACT Although recent work has improved our understanding of visual attention, it remains poorly understood. In fact, it is not even clear how best to talk about it: Is it a faculty or a resource, a pro-

cess or a thing? Should it be characterized in terms of limited capacity or selectivity, effort or clarity? And how does it relate to awareness? It is proposed that a useful way to analyze visual attention is via a computational approach similar to that advocated by Marr (1982). It is argued that processes requiring attention are exactly those that require selection in their input. Possible types of selectivity are discussed and suggestions made as to how these relate to each other. It is also suggested that there may be a similar fractionation of visual awareness into several different modes, and that these may be related to different types of attention.

Language the Mediation of Shallow and Deep Interpretation and Its Role in Conscious Mental Life

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 54

ABSTRACT In recent years the philosopher Andy Clark (1998; 2006) is one of several who, against previous cognitive science orthodoxy, have argued that human language plays a central role in human thinking. Clark's ecological account of the cognitive role of language hinges on language playing a role in constraining, structuring and scaffolding non-linguistic cognition, rather than mirroring it. Clark's view hangs together well with current embodied and ecological approaches to mind. Clark's account seems to hinge on what I have called shallow interpretation (Clowes, 2007): that is, words are used as ecological pivots around which other cognitive abilities turn. This account argues for a special role for language which appears contrary to other 'embodied' theories of thinking, specifically those posited by

some cognitive linguists (Fauconnier & Turner, 2002; Lakoff & Johnson, 1999). The cognitive linguists see distinctly human abilities depending on what might be called 'deep interpretation': the use of unconscious metaphor systems facilitated in part by language. This talk will consider how human conscious mental life depends upon the ability to shift between shallow and deep interpretation and what this indicates about our conscious mental lives more generally.

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S

Noise Masks Noise: Masking by Illusory Objects Reveals the Dynamics of Metacontrast Masking

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TYPE Concurrent Session 3
TIME Sunday, 14:00–14:30
PLACE Room 3096, HU

ABSTRACT Metacontrast is a form of visual backward masking whereby conscious perception of a target is reduced when it is followed by a surrounding mask. Here I first show that metacontrast can occur between objects defined by higher order properties, such as texture and movement. Second, I show that Metacontrast is even possible between two illusory objects: When a portion of a random texture is replaced by a new version of the same texture, brief illusory contours are seen, without any luminance or chromatic transients. I show that transient objects defined in such a way are subject to, and can induce, metacontrast masking. An illusory notched square is masked by an illusory square annulus that abuts the central square without overlap. At short Stimulus Onset Asynchronies (SOAs), discrimination of the position of the notch is nearly perfect. Performance drops dramatically at intermediate SOAs (40–60 ms), but then increases again and plateaus at longer SOAs. Such a U-shaped function is typical of metacontrast. This new and greatly simplified stimulus permits an analysis of the dynamics of metacontrast. The two parts of the metacontrast U-shaped function result from the combination of two conflicting forms of integration: static integration which creates a single static object and dynamic integration (apparent movement) which is detrimental to discrimination performance on the target. At short SOAs static integration is powerful, perception of the discriminative feature of the target is good. As SOA increases, apparent movement progressively takes precedence over static integration, and perception of the target as

such is impaired. Finally, at even longer SOAs, there is no integration, and the target and the mask are clearly seen as two separate objects.

Mirroring the Self and Others

AUTHOR **Noam Sagiv**
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TYPE Symposium 2: Introduction
TIME Sunday, 10:30–12:30
PLACE Leibniz-Saal, BBAW

ABSTRACT Our perception of our own body and our senses of self can sometimes be disrupted. Indeed we have learnt a great deal from studying the deficits of neurological patients. However, there is much to be learnt from positive symptoms shown by patients, and in some cases otherwise healthy individuals. These often force us to examine our own assumptions about the mind and brain and doubt what many have been taking for granted. Phantom limbs, for example, have fascinated scientists and philosophers alike. The present symposium, Peter Brugger will examine a number of problems from duplicated limbs and anarchic limbs and to whole body duplication. Out-of-body experience and the double illusion belong to a class of 'autoscopic phenomena'. While such mirroring of oneself can occur in clinical populations, Olaf Blanke will show that it can also be induced experimentally in the laboratory. A different kind of mirroring will be discussed by Jamie Ward – mirror touch synaesthesia in which individuals actually have tactile experiences while watching others receive a tactile stimulus. The speakers will discuss the phenomenological, cognitive, and neural basis of several anomalies of bodily awareness. Some of the phenomena presented here received very little attention in the scientific literature so far, but it becomes

increasingly clear that they offer a unique point of view of the topic and provide an opportunity to test theories concerning the self.

Synesthesia

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TYPE Tutorial M4
TIME Friday, 9:30–12:30
PLACE Room 4, BBAW

ABSTRACT Have we grossly underestimated how different our own perceptual experiences may be from other people's experiences? Studies of synaesthesia reveal a remarkable diversity. In this tutorial, I will provide an overview of the phenomenology, behavioural and neuroimaging studies, as well as theoretical frameworks for understanding this diversity and it implications for understanding consciousness. First, I will review a wide range of synaesthetic experiences (beyond the relatively more familiar varieties of coloured graphemes and coloured hearing), how we study those in the lab, and what is known about their neural mechanism and course of development. In the second part I will discuss the relationship between synaesthesia, phantoms and hallucinations; visuo-spatial variants of synaesthesia; and a number of related phenomena including personification, animistic thought, and mirror synaesthesia. I will consider what they tell us about of the self, the way in which we understand others, and contribution of the debates on embodied cognition. In the final part of the tutorial I will discuss how findings from synaesthesia studies constrain our ideas about consciousness. These include the problem of qualia, representation and meaning, synaesthesia and functionalism, and the neural correlates of consciousness. An open discussion will follow.

V1 and V2 are not the Direct Neural Correlates of Visual Awareness: Evidence from the TMS-study

AUTHORS **Niina Salminen-Vaparanta**[1], Mika Koivisto[2], Valdas Noreika[2], Simo Vanni[3], Matti Itkonen[2], Antti Revonsuo[4]

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 8

ABSTRACT The role of V1 and V2 in visual awareness remains controversial. Lamme (2000, 2006) proposed that visual information is processed twice in V1: when the visual input arrives to the striate area, and when it comes back after a feedforward and feedback loop in the ventral visual stream. The recurrent processing to V1 was suggested to be sufficient for visual awareness to arise. In contrast, Koch (2003) argued that V1 is prerequisite for visual awareness, and processes visual information largely unconsciously. The present study aimed to test the hypothesis that if Lamme's model is accurate, then TMS-stimulation disturbs visual awareness during feedforward activation ~ 50–100 ms post stimulus (Bullier et al. 1996) and feedback activation after ~ 140 ms post stimulus (Koivisto et al. 2005). In the previous TMS-studies of early visual areas only the accuracy of the responses, but not the subjective awareness itself, has been measured. Consequently, in the present study the accuracy of responses and subjective awareness of stimulus features and occurrence were studied. Six participants performed a letter-identification task by giving a forced-choice response and an evaluation of their experience of the stimulus while receiving magnetic stimulation. Single TMS-pulses were delivered after the stimulus onset either to V1 or V2, by combining the detailed retinotopic maps of V1 and V2,

acquired with multifocal fMRI (Vanni et al. 2005), with a modelling of the electric field distribution in occipital lobe during TMS-stimulation. In both V1 and V2 stimulation, awareness of stimulus features was suppressed in relatively long time window (between 40–120 ms post stimulus), whereas awareness of stimulus occurrence was impaired between 40–80 ms after stimulus onset. Because V1 and V2 stimulations revealed only single time windows for suppression of awareness, without any later suppression after 140 ms, the information processing in early visual areas seems to be a prerequisite for visual awareness (e.g., feedforward processing), rather than a direct neural correlate of it. However, it remains possible that the late parts within the suppression time windows involve rapid local recurrent processing.

Performance Feedback and Event Related Potentials in Blindsight

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 116

ABSTRACT Lesions of the primary visual cortex cause visual field defects in the contralateral hemifield. Although patients are unaware of stimuli presented within absolute defects, they may still detect, localize, and discriminate them when forced choice methods are used. As blindsight improves with practise, we here asked whether trial-by-trial feedback would enhance detection performance. a disk (3.2° in diameter, 80 ms, -.5 log contrast) was presented in pseudo-random alternation with a blank stimulus to the hemianopic field of two patients. Both target and blank stimuli were announced by a brief beep, and the patients indicated 'blank' or 'target' by button press. In half of the

1,200 trials, each response was followed by visual feedback (an icon showing a thumb pointing upward or downward) to signal response correctness. To learn how stimuli, responses and feedback are reflected in the electroencephalographic brain activity, we recorded event-related potentials (ERPs) while the participants performed the task. Although the patients reported no stimulus awareness, even without feedback detection was better than expected on the basis of uninformed guessing. However, feedback improved detection so that d' consistently increased from 1.8 to 3.4 (across both patients) over the course of 10 blocks. Electrophysiologically, target but not blank stimulus presentations produced a delayed ipsilesional N1-component. Interestingly, response-related ERPs show an enhanced negativity at parietocentral electrode sites for correct compared to error responses. Furthermore, the error feedback, which occurred in about 25–30% of the trials, yielded a frontocentral P3-like positivity. Together the results indicate that trial-by-trial feedback improved the detection of 'blind-seen' targets that differentially modulated ipsilesional brain activity. The unusual negativity that followed correct more than false responses shows that the brain integrated stimulus and response information in the absence of stimulus awareness on the part of the patient. Possibly by virtue of being relatively rare, the error feedback after the false responses initiated a pronounced potential that may play a role in improving the implicit performance.

A Modality Independent Monitoring Network Modulates Conscious Experience of Agency

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 65

ABSTRACT Introduction Predictive self monitoring is crucial for conscious experience of agency[1]. Only if there is a mismatch in prediction and actual feedback, feedback is experienced fully conscious. Recently, we have demonstrated a fronto-parietal monitoring network underlying these predictions in a visuo-motor-task using fMRI[2, 3]. Here, we researched if this network is modality independent. Experiment: We investigated 20 healthy subjects in a 3 Tesla MRI-scanner. In two different paradigms, participants had to monitor temporal incongruence between their own actions and sensory consequences. In the first experiment, participants performed a simple visuomotor task (steering a car) and had to detect intermittent takeover of control by the computer. In the second, auditory-speech task, participants read words aloud in scanning pauses receiving auditory feedback via headphones and had to detect asynchronicity between their own actions and auditory feedback. Both experiments contained a control condition (CC) in which no monitoring had to be performed, a solitary monitoring condition without (sine) actual incongruence (MCsIn) and a monitoring condition with (cum) actual incongruence (MCcIn). Results: In both experiments, epochs of action monitoring comprising incongruence events (MCcIN>CC) induced a significant ($p < 0.01$ FDR corrected) activation of a network consisting of bilateral inferior parietal lobes, inferior frontal/insular and anterior cingulate cortices, ventral striatum, cerebellar hemispheres and right dorsolateral prefrontal cortex. Additionally, modality specific activation in this contrast was found in respective sensory cortices i.e. in left temporal auditory areas in the auditory-speech task and in

temporoparietal junctions in the visuomotor task. In both experiments, solitary action monitoring (MCsIn>CC) events induced activation of the right inferior frontal/insular cortex. Discussion: Our experiments prove the existence of a modality independent network for sensory-motor self-monitoring. Within this network the transition between the right inferior frontal gyrus and anterior insula is already activated in the absence of actual incongruence events and might therefore be related to self-awareness in general[4].

[1] Blakemore SJ, Frith C. Curr Opin Neurobiol 2003; 13: 219–24. [2] Schnell K et al. Neuroimage 2007; 34: 332- 341. [3] Schnell K et al. Brain 2008; 131: 2783–97. [4] Craig AD. Curr Opin Neurobiol 2003; 13: 500–5.

Instruction Following in Disorders of Consciousness: a Time-frequency EEG Approach

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TYPE Concurrent Session 3
TIME Sunday, 14:30–15:00
PLACE Room 2097, HU

ABSTRACT One of the most important clinical challenges in patients with severe brain damage is to estimate their residual sensory awareness. We have previously shown that patients in a minimally conscious state (MCS) and some patients in a vegetative state (VS) exhibited larger P3 event-related potential (ERP) responses to their own first name, as compared to 7 unfamiliar equiprobable first names (Perrin et al.,

2006). Although the data suggested that these patients were still able to process salient semantic information, the passive paradigm cannot give sufficient evidence for conscious brain activity as a P3 response to the own name can also be observed in sleep (Perrin et al., 1999) and anaesthesia (Davis et al., 2007). We therefore extended the previous paradigm with an additional – but crucial – condition in which subjects were asked to actively count one specified unfamiliar first name. Furthermore, we decided to not only rely on ERPs which reflect strictly phase-locked neuronal responses (i.e. evoked cerebral activities which appear with a constant latency after the stimulus). As cerebral functions of brain damaged patients are often distorted and delayed in time the analysis of induced responses (i.e. non phase-locked responses) may help to better characterize residual cerebral activity. Specifically we collected data from 22 patients diagnosed as VS (n=8) or MCS (n=14) as well as 12 age-matched controls. In a complementary time-frequency analysis to Schnakers et al. (2008) we found signs for EEG synchronization changes in MCS (but not VS) to "to-be-counted" target and own names, suggesting voluntary compliance to task instructions and therefore residual conscious processing. Yet, the observed EEG changes were rather untypical in nature as they appeared as desynchronization in a low frequency range (theta band), as opposed to classically seen alpha desynchronizations and delta/theta synchronizations in response to cognitive demands (for review see Klimesch, 1999). Given the present data it appears that MCS but not VS patients do show reliable residual cognitive processing. We believe that time-frequency analysis might offer an unexploited alternative to classical ERP analysis which in some cases might even be more sensitive for detecting awareness in disorders of consciousness.

Is Free Will Saved by Perceptual Biases?

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 69

ABSTRACT The results of Libet et al. (1983) indicate an unconscious neuronal initiation of free conscious decisions. In this classic study a new method was introduced to determine mental acts. This paradigm was immediately criticized by several authors (e.g. Breitmeyer, 1985) as it used a fast rotating spot circling around a clock face. In particular the representational momentum, first described by Freyd & Finke (1984), was discussed to be a possible influence on the timing of subjective events. Research on this effect indicates that judgements on the location of moving objects are biased by the direction of the movement. It therefore might serve as an alternative explanation of Libet's findings. Nevertheless, as the representational momentum is highly sensitive to influences like object speed, size, or context, possible influence of the effect is hard to determine. The current study tried to fill this gap. Combining Libet's clock paradigm with a typical representational momentum experiment enabled us to investigate if the results of Libet et al. (1983) could be explained by the mentioned effect. Our findings indicate that the representational momentum is weakened by the use of a clock face – as employed by Libet – and the observed antedate of the rotating spot is relatively small. Hence, the representational momentum offers no sufficient alternative for explaining Libet's findings.

TT, ST, IT, NPH... How Do We Understand Others?

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 58

ABSTRACT There is a longstanding controversy about how we know about the mental states of others (mindreading). According to Theory-Theory (TT), when we ascribe mental states to a person, we employ a folk-psychological theory similar to a scientific theory (Gopnik, Meltzoff 1997). Some proponents of TT postulate an innate neural mechanism designed to understand others (Baron-Cohen et al. 1985). According to Simulation Theory (ST), we create pretend mental states in ourselves and project them onto others, thus simulating in our own minds what others might be thinking (Goldman 2006). Gallagher's (2005) Interaction Theory (IT) rejects an assumption shared by those views, namely, that we have a problem of gaining access to other minds in the sense that they have mental states 'hidden' behind their (otherwise meaningless observable) behavior. The central claim is that we can, in most cases, directly perceive what other people are up to. Finally, according to Hutto's (2008) Narrative Practice Hypothesis (NPH), our direct encounter with stories about people acting for reasons, being supplied in interactive contexts, provides us with the forms and norms of folk psychology. The controversy results from the fact that these views are typically introduced as characterizations of the 'most pervasive' or even 'only' and thus exclusive way of understanding other minds. In this paper, it is argued that such strong claims are unconvincing. For example, Goldman's (2006) Simulation Theory does not work partly because it does not illuminate how we come to know which pretend mental states we have to create. Here, assumptions borrowed from TT are necessary. In the constructive part of the paper, it is argued

that a more differentiated framework is needed according to which we have different mindreading strategies at our disposal. Whether and when we employ them depends (1) on our prior relation to the person we wish to understand, (2) on their behavioural patterns which we observe and (3) on the context of the situation in which the observed person displays these behaviours. In the sketch of such a framework, it is shown how elements of TT, ST, IT, and NPH can be integrated.

Attention and Consciousness

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TYPE Symposium 1: Introduction
TIME Saturday, 10:30–12:30
PLACE Leibniz-Saal, BBAW

ABSTRACT The symposium addresses conceptual and empirical issues regarding the relationship between attention and consciousness: Is attention necessary or sufficient for consciousness? What is the impact of an investigation of attention on the relation between phenomenal consciousness and access consciousness? Can we have phenomenology as of the specific details of a scene or object in the absence of attention and cognitive accessibility? Is an investigation of atten- tion a reliable guide to conscious experience? Is it possible to isolate the mechanisms of atten- tion from the mechanisms of subjective experience? How should we adequately interpret experimental demonstrations of change blindness and inattentional blindness in this context? In what way do these phenomena inform us about the nature and content of our mental representations? Based on their impressive previous work in the field of consciousness studies, the three speakers try to shed more light on these issues, arguing for different perspectives.

What's Wrong with Mr Hyde? Personal Identity, 'Multiple Personality' and the Unity of Consciousness

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 33

ABSTRACT It has been argued repeatedly that the phenomenon of Multiple Personality actually confronts us with the existence of different persons in their own rights, all located within one human body (e.g. Rovane 1998). This interpretation is based on the limited accessibility between the different streams of consciousness of a 'host personality' and her various 'alter personalities': affected people for example 'lack time' or can't remember their actions. Further, this view is based on the assumption that a unified consciousness is a necessary condition for there being a person or, in other words, that the identity of a person (her 'self') is tied to the scope of those mental states she can consciously recall. I find that this view is misleading in at least three respects. On the one hand, the view sketched so far confounds the identity of persons with that of personalities, or better: different facets of a person's emotional/psychological life. Whereas the term 'person' refers to a human being emphasising her (conceptual) capability as a rational and moral agent, the term 'personality' refers roughly to the particular character a concrete person develops during her life. Therefore, the unity of consciousness is not the foundation of the unity of a person, but rather derivative from it. On the other hand, consciousness is understood single-sidedly as basically consisting in mental 'states' which 'occur' 'within' the human being. This employs the Humean picture of the mind as theatre of changing impressions and neglects that large parts of a person's mental life are constituted by the person herself as the subject that generates them. Finally, the constitution of an individual's personality or 'self' is not understandable atemporally, i.e.

without consideration of her biography, and in particular her actions. In this sense, the dissociation of different realms of experience can be seen as an instrument for a certain purpose, e.g. a reaction to traumatising events, which is performed rather than suffered by the affected individual and presupposes rather than undermines the unity of the different personalities.

Feature-Based Attention Modulates Priming Effects in a Primed-Pointing Paradigm

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 13

ABSTRACT We introduced two experiments to study the influence of feature-based attention with color and shape on the time course of speeded primed pointing responses. Color or shape targets were preceded by prime stimuli that triggered either the same or opposite response as the targets on the same location. Before each trial the relevant target pair was indicated by an attentional cue stimulus. Time intervals between presentation of cue and prime as well as prime and target stimuli were varied systematically. Prime visibilities were explored in separate behavioral tasks. Pointing trajectories showed strong priming effects that were amplified by attentional direction on the relevant feature at optimal cue-prime intervals. In conclusion, visual feature-based attention seems to modulate the earliest phases of visuomotor processing. This modulation was independent of visual awareness of the primes, strongly supporting the notion of distinct processes underlying visual awareness and attention.

Accessing Preconscious Stages of Lightness Processing

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 21

ABSTRACT We demonstrate qualitative dissociations of lightness processing in visuomotor priming and conscious vision. Speeded keypress responses to the brighter of two luminance targets were performed in the presence of preceding dark and bright primes (clearly visible and flanking the targets) whose apparent lightness was enhanced or attenuated by a lightness illusion. Response times to the targets were greatly affected by consistent vs. inconsistent arrangements of the primes relative to the targets. These priming effects could systematically contradict subjective lightness matches, such that one prime could appear brighter than the other but prime as if it was darker. Instead of following this illusion, priming effects eclusively depended on the raw local contrast of flankers to the immediate background. Our findings indicate that visuomotor priming effects, as opposed to conscious perceptual judgments, access an early stage of lightness processing exclusively based on local image contrast and still devoid of lightness constancy.

The Intentional Content and Structure of Motor Experience

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 32

ABSTRACT While there has been a burgeoning interest in the phenomenology of action in recent years, the basic motor experience of acting is still somewhat neglected, often ignored or at least not clearly distinguished from other forms of actional experience. After drawing that distinction, an account of the structure and intentional content of motor experiences is proposed. It is argued that they present their subjects (rather than the experiences themselves, as suggested by Searle (1983) – as the cause of bodily movements; that they are constitutive of an elementary form of action; and that they therefore (pace e.g. Bayne 2009) should not be considered to be perceptions of actions. Then a case is made for the view that the intentional content of motor experiences is nonconceptual according to criteria such as their fine-grainedness, analog character and context-dependence. It is further argued that these elementary action (re)presentations are intention-independent in a sense that is parallel to the way in which perceptual states are belief-independent. Finally, it is shown how this conceptual framework can account for empirical results (e.g. Kammers et al. 2006) showing a divergence between assessments of location manifested in grasping behavior and in verbal judgment, and for other phenomena such as 'utilization behavior', in terms of the relative independence of conceptual and nonconceptual representations.

Losing Your Self: Neural Correlates of Frontotemporal Dementia

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 67

ABSTRACT Recent studies suggest that frontotemporal lobar degeneration is the second most common diagnosis of dementia in individuals younger than 65 years. The most common subtype, frontotemporal dementia (FTD), is characterized by alterations in behavior and personality, namely decline in social interpersonal conduct, impairment in regulation of personal conduct, emotional blunting, and loss of insight ('diagnostic core features'). Although FTD is clinically well characterized and several hints for specific cognitive deficits were recently published, there is still controversy with regard to the neural basis of the disease. Accordingly, the aim of our study (Schroeter et al., 2008) was to focus neural impairments in FTD to specific brain regions and discuss the disease in a framework of cognitive neuropsychiatry. We conducted a systematic and quantitative meta-analysis including morphometric studies with magnetic resonance imaging (MRI) and functional imaging studies applying (18F) fluorodeoxyglucose positron emission tomography (FDG-PET). Seven significant above-threshold clusters were identified. They were located in several frontomedian regions (anterior medial frontal cortex, pregenual anterior cingulate cortex, subcallosal/septal area, gyrus rectus), medial thalamus, left superior frontal sulcus, and right anterior insula. Our study characterizes FTD as the frontal variant of frontotemporal lobar degeneration. More specifically, it indicates that FTD is mainly characterized by impairments in frontomedian networks. This brain region has been previously suggested as the key region for

theory of mind (ToM) or 'mentalizing', where mental states have to be attributed to self and other people, and which enables social cognition. Moreover, it has been related to self-related processing, and it was suggested that permanently processing self-referential stimuli constitutes the self of a person. In sum, our study suggests that FTD selectively affects neural networks related to social cognition, finally leading to the aforementioned clinical symptoms. Hence, the disease FTD enables an understanding of the "condition humaine", the neural networks that make us human.

References: Schroeter ML, Raczka K, Neumann J, von Cramon DY. Neural networks in frontotemporal dementia – a meta-analysis. Neurobiology of Aging 2008;29:418–26.

Stability of Pattern Vectors Distinguishes Conscious from Non-Conscious Neural Information

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 16

ABSTRACT One consistent finding among neuroimaging studies contrasting conscious and non-conscious perception is a significantly stronger response to consciously perceived stimuli in content-specific areas such as the FFA or V5/MT. By contrast, we assert that the transition of neural information from "non-conscious" to "conscious" depends as much on the nature of the distributed pattern of neural information as it does on the specific loci and absolute level of neural activation. Based on the theory of Marcel Kinsbourne, we predicted that, compared

to non-conscious perception of the same content, conscious perception would be associated with (1) a more consistent and distinct spatial distribution of information from one stimulus presentation to the next, and (2) a more consistent pattern of activation within that configuration, without necessarily any difference in intensity. We parametrically manipulated the visibility of face and house stimuli using dichoptic color masking. Behavioral discrimination accuracy ranged from ~100% ("visible"), to ~70% ("threshold";), to chance (50%, "invisible"). a Gaussian naive Bayes classifier was trained to discriminate the stimulus category at each level of visibility based on voxels in the temporal lobes, with nested cross-validation used for voxel selection. The classifier was significantly above chance (12 subjects) at both the highest and lowest levels of visibility (but, surprisingly, not at the threshold level). When the classifier was trained on 'visible' patterns and tested on "invisible" and vice-versa, accuracy was indistinguishable from chance, and there was little overlap in the space of voxels that was maximally informative at each level of visibility. In order to test our predictions, we treated each set of "informative" voxels as a high-dimensional space, and the BOLD activation patterns as vectors within that space (treating the vector angle as a reflection of the information content, and the norm as a reflection of the intensity of the representation). Our results confirm our predictions, suggesting that conscious states are (relatively) stable states. We are able to rule out an explanation based solely on differences in signal-to-noise ratio. Our results also indicate that conscious information is more sparsely and narrowly distributed, challenging the idea of a "global broadcast".

Sensitivity and Subjective Awareness Increase with Practice in Metacontrast Masking

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TYPE Concurrent Session 2

TIME Saturday, 16:00–16:30

PLACE Room 3096, HU

ABSTRACT Can practice effects on unconscious stimuli lead to awareness? Can we learn to see? Recent evidence suggests that blindsight patients trained for an extensive period of time can learn to discriminate and consciously perceive stimuli in their blind hemifield. So far, it is unknown whether such learning effects generalize to normal observers. Here we investigated practice effects in metacontrast masking. Objective thresholds were assessed individually as a function of stimulus onset asynchrony (SOA). Subjects were then trained for five consecutive days on the SOA that resulted in chance performance. Our results show a linear increase in sensitivity (d') but no change in bias (c) for the trained SOA. This practice effect on sensitivity spreads to all tested SOAs, but only partially to another stimulus location. The effects are still detectable after several months without exposure to the stimuli. Additionally, we show that subjects rate their perceptual awareness of the target stimuli differently before and after training, exhibiting not only an increase in sensitivity, but also in the subjective awareness of the percept. Preliminary data indicates an important role of feedback in the development of subjective perceptual awareness over the course of learning. We conclude that subjects can indeed learn to see.

Knowledge Applied to New Domains: The Unconscious Succeeds Where the Conscious Fails

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TYPE Concurrent Session 1
TIME Saturday, 14:30–15:00
PLACE Room 3096, HU

ABSTRACT There is a common view that consciousness is needed for knowledge acquired in one domain to be applied to a novel domain. We present evidence of precisely the opposite; where the transfer of knowledge from one domain to another is achieved only in the absence of conscious awareness. Adopting higher order thought theory and exploiting subjective measures of consciousness we examine knowledge transfer using the artificial grammar learning (AGL) paradigm. In the standard non-transfer AGL task participants are initially exposed to strings of letters which, unbeknown to them, conform to complex grammar rules. Subsequently participants are informed of the existence of rules and required to distinguish the grammaticality of new letter strings. In this context participants reveal both conscious and unconscious knowledge; judgments made with confidence and those attributed to random selection both show above chance accuracy, with conscious knowledge being more reliable. Knowledge in all categories appears to derive from familiarity (Scott & Dienes, 2008). In the transfer variant of AGL, training strings are presented in one alphabet or modality and test strings presented in another. We examined three types of transfer: between one letter-set and another, between tone sequences and letter sequences, and between tone sequences and symbol sequences. For each test string participants reported whether they thought the string was grammatical, how familiar it felt, how confident they were in their grammaticality judgment, and their perceived basis for that judgment i.e. random selection, intuition, familiarity, rules, or

recollection. An objective measure of fluency was also obtained using a timed perceptual clarification task. Results were consistent across all three conditions. Responses attributed to random selection showed above chance accuracy (60%) while those attributed to other categories did not (52%). Familiarity ratings were predicted by consistencies in the repetition structure of training and test strings and were hence related to grammaticality. Fluency, though increasing familiarity, was unrelated to grammaticality. While all judgments were predicted by familiarity ratings only those attributed to random selection showed a significant additional contribution of grammaticality. It appears that in knowledge transfer, as in visual perception (Marcel, 1993), the unconscious may outperform the conscious.

The Influence of rTMS over the Dorsolateral Prefrontal Cortex on Hypnotic Response

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 100

ABSTRACT Higher cognitive functions have traditionally been assumed to require consciousness and attention (e.g. Norman and Shallice 1986), involving dorsolateral prefrontal cortex (DLPFC), bilaterally: the left dorsolateral prefrontal cortex (DLPFC) for creating accurate higher order thoughts (HOTs) and conscious awareness (Lau, 2008), and the right DLPFC for top-down attentional processes (Vanderhasselt et al, 2007). Current neurophysiological (Gruzelier, 1998) and sociocognitive theories of hypnosis (Dienes and Perner, 2007) also suggest possible role of DLPFC for hypnotic suggestibility by assigning distinct roles to each DLPFC. Specifically, it would be expected that disruption of left DLP-

FC function would increase hypnotic susceptibility (by making it harder to create accurate HOTs and thus easier to form intentions to respond to hypnotic suggestions without awareness). Conversely, we predicted that disrupting the right would lead to a decrease in hypnotic suggestibility. The present study used repetitive transcranial magnetic stimulation (rTMS) to investigate the role of both – left and right – DLPFC on hypnotic suggestibility. The function of the left DLPFC was temporarily disrupted using rTMS; the vertex was stimulated as a control (sham) site. We found that the participants' subjective ratings of hypnotic phenomena were significantly increased for left DLPFC stimulation, as compared to control stimulation. This effect accounted for 25% of the variance, controlling for expectancy. Objective and involuntariness ratings did not differ significantly across conditions. On the other hand, the influence of the TMS on the right DLPFC showed a decrease in hypnotic suggestibility, as expected (the results obtained by a previous pilot study). These results are in line with previous studies (Dyer, Dienes and Hutton, 2007; Lau and Passingham, 2006; Vanderhasselt et al, 2007) and provide strong support for the role of the left DLPFC in subjective feelings of hypnosis. The findings thus provide support for the assertion of cold control theory that hypnotic responding can be resultant from inaccurate HOTs. However the lack of differences observed for objective and involuntariness ratings suggest that other factors may play an important role in hypnotic processing (e.g. socio-cognitive factors). Altogether, this study offers novel insight into the mechanisms underlying hypnotic processing and the nature of subjective consciousness experience.

Measuring Consciousness: Neurophysiological and Behavioral Approaches

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TYPE Symposium 4: Introduction
TIME Monday, 16:30–18:30
PLACE Leibniz-Saal, BBAW

ABSTRACT How can we measure whether a particular sensory, motor, or cognitive event is consciously experienced or remains unconscious? Such measurements provide the essential data on which a science of consciousness depends, yet there is no clear consensus on how such measurements should be made. Our speakers will describe both behavioral and neurophysiological approaches to measuring consciousness, relating these approaches to each other and to relevant theoretical frameworks. Issues include (i) graded versus dichotomous notions and measures of consciousness, (ii) convergence and divergence among measures, and what this reveals about the unity of consciousness, (iii) measures of conscious content versus conscious level, and (iv) the role of higher-order cognition in conscious report. Advances in measuring consciousness have implications for basic cognitive science and neuroscience, for comparative studies of consciousness, and for clinical applications.

A Framework for Measuring Consciousness

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TYPE Symposium 4: Talk 1
TIME Monday, 16:30–18:30
PLACE Leibniz-Saal, BBAW

ABSTRACT Measures of consciousness cannot exist independently of theory. Only by behaving sensibly in a theoretical context do proposed measures pick themselves up by the bootstraps, validating both themselves as measures of what they say they measure and also validating the theories involved. Much of what we know derives from subjective (introspective) verbal report, but on some theories such reports confound mechanisms of metacognitive access with mechanisms of consciousness and are also susceptible to biases. In response, there has been a growing emphasis on neurophysiological measures as well as on behavioral measures that do not rely on introspection. But for these 'objective' measures it can be hard to guarantee that they are measuring consciousness per se. I will review definitional, methodological, and conceptual issues surrounding the problem of measuring consciousness and describe some specific examples based on measures of complexity and causal density in neural dynamics.

Self-Other Distinction in the Perception of Actions Performed in Synchrony with Music

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 61

ABSTRACT Previous research has shown that point-light displays of bodily movements can provide essential information about the identity of an acting agent. Observers can distinguish between their own and others' actions when depicted as point-light displays. Nevertheless, the self-other distinction in point-light displays has been little studied when action information is presented in different sensory modalities simultaneously and in music related contexts. The aim of this study was to investigate the self-other distinction in point-light displays in which actions are presented in visual or audiovisual modalities. Specifically, is agent recognition facilitated by audiovisual presentation for actions that were originally performed with musical pacing stimuli? In a first session, participants executed different ecologically valid actions ranging in complexity (clapping, walking, and dancing) in time with three musical pieces. Performances were recorded by a motion capture system. In two subsequent sessions the same participants watched point-light displays of their own or another participant's actions. The task was to identify the agent depicted (self vs. other). Various manipulations were applied to the visual information (degradation from fifteen to two point-lights) and to the auditory information (self generated claps vs. externally generated music vs. no sound). Results indicate that recognition accuracy was significantly better than chance in all action and degradation conditions and was significantly increased when more kinematic information was available, both between different actions and within the same action. Auditory information, whether self or

externally generated, did not contribute reliably to performance even for the most ambiguous visual displays. The absence of a benefit of audio-visual displays suggests that information about the temporal relationship between agents' movements and the music made no compelling contribution to the perception of action identity. Overall findings suggest that judgements of action agency depend predominantly on motor cues. The potency of such cues is evidenced by the fact that agents were recognizable in the case of simple actions, even when minimal visual information was provided.

Modular Small-World Neural Networks as a Substrate for Consciousness

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 96

ABSTRACT This presentation proposes the unification of two influential approaches to the scientific study of consciousness, namely neurodynamics and global workspace theory. 1) a number of researchers pursuing a neuroscientific understanding of consciousness have advocated the idea that the conscious condition depends on a balance of segregated and integrated activity in the brain, and several formal complexity measures have been defined that attempt to quantify this balance (Edelman, Tononi, Seth, and others). Meanwhile, anatomical and functional studies have shown that the nervous systems of many animals exhibit small-world connectivity properties at multiple scales (Sporns and others). Recent computer modelling work where complexity measures are applied to modular small-world neural networks has shown that they are capable of supporting dynamically complex activity,

wherein segregation and integration are duly balanced (Shanahan, 2008b). So, from the standpoint of those who advocate a neurodynamical approach, such networks look like a promising candidate for the neural substrate of consciousness. 2) According to global workspace theory (Baars), the mammalian brain instantiates an architecture comprising a set of parallel specialist processes and a global workspace. Parallel specialists (or coalitions of processes) compete to influence the global workspace, which in turn exercises a systemic influence on the full cohort of specialists. The conscious/ unconscious distinction then aligns with the distinction between localised processing and processing mediated by the global workspace. The long-range connections of the cerebral white matter have been hypothesised as the basis of a possible global neuronal workspace (Dehaene and others), and computer models show how they might exhibit the required a succession of broadcast, reverberating states (Shanahan, 2008a). From a graph-theoretical point of view, localised regions of cortex form densely clustered modules, while long-range white matter pathways confer small-world properties on cortex as a whole. In short, modular small-world networks also look like a promising candidate for the neural substrate of consciousness from the standpoint of global workspace theory. Shanahan, M.P. (2008a). a spiking neuron model of cortical broadcast and competition. Consciousness and Cognition 17 (1), 288–303. Shanahan, M.P. (2008b). Dynamical complexity in small-world networks of spiking neurons. Physical Review E 78, 041924.

Functional Connectivity Study of fMRI "Resting Brain Activity" in Vegetative State

AUTHORS **Andrea Soddu**[1], Melanie Boly[1], Quentin Noirhomme[1], Audrey Vanhaudenhuyse[1], Mario Stanziano[2], Smadar Ovadia[3], Pierre Maquet[1], Michele Papa[2], Rafael Malach[3], Steven Laureys[1]

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 130

ABSTRACT Introduction: The aim of this study is to assess fMRI resting-state cerebral connectivity in vegetative state patients by means of a user-independent method. Resting baseline (or "default model") activity is thought to be related to awareness of the internal world (i.e., mind wandering, daydreaming, mental imagery, inner speech etc) and encompasses posterior-cingulate/precuneal, anterior cingulate/mesiofrontal and temporoparietal junction cortices. Methods: We here present a novel clinical application for a user-independent "default mode" network analysis. Resting state data were acquired on 12 vegetative state (age range 27–87 y) and 26 healthy subjects (21–60 y). Patients' diagnosis was based on Coma Recovery-Scale assessment prior and following scanning. Data were pre-processed and analyzed using independent component analysis ICA as implemented in Brain Voyager. Connectivity studies employed 13 target regions of interest (10×10×10 mm) defined on an average "default mode" map calculated in controls. Resting state connectivity was assessed by calculating the number of functional connections within the "default mode" map for each subject. Next, student-T tests compared patients to controls at the group-level ($p < 0.05$). Results: Compared to controls, vegetative patients showed a lower total number of edges (i.e., connections; 46+/–15

and 24+/–9, $p=5*10^{-6}$) and less functional connections with the precuneus (9+/–2 and 4+/–3; $p=7*10^{-4}$). The "default mode" network shows a reduced connectivity in vegetative patients as compared with controls mainly in posterior brain areas encompassing the precuneus and posterior parietal cortices. Conclusions: The presented connectivity ICA method permits a user-independent identification of the "default mode" network connectivity in the vegetative state. Comparison with healthy control data emphasizes the importance of precuneal and posterior parietal functional disconnections in pathological loss of consciousness.

References: Boly, M (2008), 'Consciousness and cerebral baseline activity fluctuations', Human Brain Mapping, vol. 29, no., pp. 868–74. Fair, DA (2008), 'The maturing architecture of the brain's default network', Proc Natl Acad Sci USA, vol. 105, no. 10, pp. 4028–32. Fox, MD (2005), 'The human brain is intrinsically organized into dynamic, anticorrelated functional networks', Proc Natl Acad Sci USA, vol. 102, no. 27, pp. 9673–8.

Awareness of Fearful Faces Requires Attention

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 17

ABSTRACT Fearful faces receive privileged access to awareness relative to happy and non-emotional faces. We investigated whether this advantage depends on currently available attentional resources. In an

attentional blink paradigm, observers detected faces presented during the attentional blink period that could depict either a fearful or a happy expression. Attentional load of the blink-inducing target was manipulated by increasing flanker interference. For the low-load condition, fearful faces were detected more often than happy faces, replicating previous reports. Importantly, this advantage for fearful faces disappeared for the high-load condition, during which fearful and happy faces were detected equally often. These results suggest that the privileged access of fearful faces to awareness does not occur automatically, but instead requires attentional resources.

The Explanatory Role of Computational Models in Cognitive Neuroscience

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 50

ABSTRACT This paper reevaluates the role of computational models in Cognitive Neuroscience in light of recent work on Mechanisms. This reevaluation has implications for the purported autonomy of psychological theories, and clarifies the sense of emergence appealed to in PDP work. The basic goal of Cognitive Neuroscience is to integrate theories of cognitive function with knowledge about neural structures. This consists neither in ontological identifications across levels, nor in reducing the laws of one level to the laws of the other. Rather this integration occurs through explanations of cognitive functions by neural structures. Further, these explanations are typically mechanistic. This paper concentrates on the role of computational models in these explanations. The explanatory role played by computational models cannot be filling in the

details of Marr's computational level for a given algorithmic-level cognitive theory. The filling in of details would not constitute an explanation, since this sort of strategy already assumes that the algorithm can be instantiated (in multiple ways), and that the theory is autonomous from any particular instantiation. For computational models to be explanatory, the status of the cognitive theory must not be autonomous from the explanans being sought. Computational models are not meant to be lower level implementations of cognitive theories, as should be obvious from the fact that they exhibit behaviour analogous to cognitive functions. Computational models are better understood as simulations. Simulations can serve both as proofs of concept for cognitive theories, and as a method for discovering mechanisms. PDP models in particular, which do not have cognitive modules hard-coded in, but rather gradually develop intermediate structures, can be seen as a method for discovering novel mechanisms. Seeing computational models as simulations clarifies talk of emergence in the PDP literature. Bedau introduces a notion of "weak emergence as underivability except by simulation". I argue that the sense of emergence most applicable to PDP models is related to this one, although behaviours need only be underivable in practice, not in principle. In this sense, saying that a behaviour emerges from a computational model means exactly that the simulation has discovered a mechanistic explanation for the behaviour.

Object Recognition Through Image-to-Sound-Based Sensory Substitution of Sight

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 83

ABSTRACT Our knowledge of objects is largely derived through our senses. The visual one is of particular importance because it allows us to gain information about complex scenes and silent objects we cannot explore tactually. Blindness prevents this immediate access, and sensory substitution attempts to (re-) establish it by transforming visual images into a format that an intact sensory modality can process. To learn whether blind and blindfolded subjects learn to interpret sound patterns that represent everyday objects, we here used an image-to-sound converting sensory substitution system with a small head-based video camera. The objects belong to three categories (bathroom, kitchen, food); five objects were presented per category and session. To further generalization across object classes such as cups, brushes, and carrots, different exemplars were used in each of 15 sessions. Participants listened to the sound patterns generated by viewing the objects from different perspectives, and tried to categorize ("kitchen") and identify ("cup") them. Before and after the training, participants were asked to describe the features that allow recognition of the objects. Also before and after the training, participants underwent functional magnetic resonance imaging to reveal how the brain responds to the sound patterns and how the training affects activation patterns. Results show marked improvements in both categorization and identification performance; they were accompanied by increased activation in multimodal superior parietal

regions. Particular features (like handles) and materials (like metal) are especially relevant for recognition. Despite the necessity to adapt to the properties of the unusual "eye"; the training enabled fast recognition for prototypical exemplars in a subgroup of participants. In a developmental sighted "audiovisual"; synaesthete, the auditory format that represents visual information generated visual phenomena unrelated to the objects, however, object-related visual representations were described by a late blind participant with deprivation-induced synaesthesia.

Dream Remembering: An Exploration of the Ways Dreams Penetrate Consciousness

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 105

ABSTRACT While it may seem intuitively clear that dreams have the power to influence waking thoughts and feelings (e.g., the distress that follows severe nightmares), surprisingly little research has explored the ways in which dreams enter waking consciousness. In general, the literature on dream recall has been limited to dream recall frequency (Blagrove & Akehurst; 2000, Schredl, 2008; Schredl & Reinhard, 2008; Schredl, 2007). By focusing on the frequency with which dreams are recalled, the specific details, nuances, and processes by which dreams are remembered have been overlooked. We address specifically how dreams may penetrate waking consciousness, including the ways in which they continue to linger for minutes, hours, days, and, sometimes, even years later. To investigate the phenomenon of dream remembering beyond frequency per se, we designed a new questionnaire to measure and explore the dimensionality of dream remember-

ing. We anticipated that a uni-dimensional model would be insufficient to capture the complexity of dream remembering. Rather, we expected that a multi-dimensional model would more accurately depict the different forms of dream remembering. In an initial study, we administered a dream remembering questionnaire to 512 participants. Using exploratory factor analysis (Principal Components, Varimax rotation), we identified nine dimensions of dream remembering. The nine-factor model includes the following dimensions: (1) vivid dream revisualization (including recall frequency), (2) affective and motivational carryover, (3) the frequency of disturbing dreams (e.g., nightmares), (4) liminal dream re-entry, (5) dream/reality blending, (6) cued daytime dream recall, (7) lingering sensory acuity, (8) persistent paralysis, and (9) dream recall consistency. Based on the findings of this study, we propose a theoretical shift that allows for the articulation of a multi-dimensional model of dream remembering. Furthermore, a re-conceptualization of what is meant by "remembering" carries implications for the domain of scientific consciousness research. By deepening our understanding of the components involved in remembering dreams, greater insight may be gained into components and processes of memory, boundaries between states of consciousness, as well as the purpose and function of dreaming.

Epistemic Restraint: An Antidote to Zombie Poison

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 140

ABSTRACT Zombies haunt philosophers of mind now more, perhaps, than Halloween movie-goers. The implications of Cartesian dualism made it easy to laugh it off until David Chalmers presented materialists with a red pill: materialism cannot make sense of the difference between conscious beings and philosophical zombies, where the latter are functionally indistinguishable from the former but unconscious. Moreover, not only are materialists unable to explain the existence of consciousness, but even if we take the existence of consciousness as a primitive, materialists are unable to explain why individual conscious experiences have the characteristics they do. In fact, the materialist is unable to distinguish not only the zombie from the conscious being, but the subject with normal vision from the subject with an inverted color spectrum. The zombie problem, or so-called "hard problem," has now made its way into the science of consciousness as it suggests that researchers cannot study consciousness by studying its material underpinnings. This "hard problem" of consciousness studies comes in several forms, but all of these point to the same epistemic gap: despite our valiant efforts, we cannot get "all the way" to consciousness. I argue in this paper that the hard problem is actually an impossible problem. However, I also argue that the problem is not as rich as it first appears, and that it is no greater than the necessary limitation on our knowledge of the real world or the existence of other minds. Thus, epistemic restraint dissolves the hard problem in the same way that it dissolves these other metaphysical worries: by setting our sights a little lower than epistemic infallibility, we can re-open the portals of consciousness studies. This need not be equivalent to ignoring the problem, or taking the blue pill, as we can admit levels of certainty in knowledge, where the highest level is not attainable for any objective claims. In my view, the hard problem is a colorful illustration of an epistemic limit that, because it is a necessary feature of our experience, makes no practical difference.

T

Modality-Independent Modulation of Unpredictable Event on Visual Perceptual Stability

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 20

ABSTRACT In visual competition, perception for invariant visual patterns changes stochastically from one percept to the other. This perceptual alternation is known to be susceptible to various internal (e.g. attention or top-down control) or external (e.g. stimulus blanking or visual transient stimulation) factors. Recently we have shown that both auditory and visual transient stimulation increased the frequency of immediate perceptual alternation (IMRF, 2008), suggesting that stability of visual perception was reduced by modality-independent transient events. Here we report that unpredictability of the external event is critical for the perceptual destabilization. Participants observed bistable apparent motion ("quartet dots") wherein two dots could be seen as moving vertically or horizontally, and kept reporting the perceived direction of motion by button press. Task-irrelevant visual (100 ms flash of background display) or auditory (100ms beep sound) transient stimuli, which the participants were explicitly instructed to ignore, were present at either random (Experiment 1; 4–12 sec) or constant (Experiment 2; 4 sec) intervals. In separate sessions, the flash and the beep were presented either in isolation (flash-only or beep-only conditions), synchronously (synchronous condition), or asynchronously (asynchronous condition). Each session lasted for 4 minutes and was repeated 2 times (8 sessions in total). Results showed that the increase in perceptual alternation occurred mostly within the period of less than 2 seconds after the visual and auditory transient in Experiment 1 (random interval). The effect magnitudes were similar irrespective of modality and correlated within participants between visual and auditory

stimulation. In addition, the synchronous condition did not promote the destabilization further, suggesting that the destabilization is not additive among modalities. Interestingly, the perceptual destabilization was not observed in Experiment 2 (constant interval). Since the increase in perceptual alternation occurred less than 2 seconds after the transient stimulation, the shorter fixed interval (4 seconds) in Experiment 2 was not likely to account for the discrepancy. These results suggest that the destabilization mechanism exerts modality-independent unpredictable (or salient) events to increase the probability of perceptual alternation. Alternatively, the stabilization mechanism is prone to disturbance by modality-independent unpredictable events. The functional role of the process will be discussed.

Implicit Learning of Mirror Symmetries

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 118

ABSTRACT Research into implicit learning shows that people can implicitly learn the n-gram structure of sequences. a type of structure that goes beyond n-grams is symmetry. Yet detecting symmetry allows shorter (hence faster) encodings of stimuli and may be evolutionarily useful in e.g. detecting good genes. Thus, we reasoned implicit learning may become sensitive to symmetry, specifically mirror symmetries, above and beyond n-gram structure. In the first experiment, people were exposed to a series of numbers and for each number indicated whether it was larger or smaller than previous one. For each block of 12 numbers, the second half was a retrograde (or, in a different group, an

inverse-retrograde) of the first half (the "far" rules), while during each half, the second quarter was an inverse-retrograde (or retrograde) of the first quarter (near rules). Over sixty-four blocks, we compared reaction times of mirrored parts to the initial random parts they mirrored. Participants' reaction times showed they learnt the inverse retrograde symmetry between quarters (near rules) but not the symmetries between halves of blocks (the far rules). That is, people could learn to detect symmetries between sets of three trials but not sets of six trials, which may have exceeded the memory buffer of the implicit learning system. In the second experiment, we explored the unconscious learning of symmetry in movement. Subjects walked around a circle with eight points, walking out sequences of seven movements, apparently as an exercise in Zen meditation. The last three movements of each sequence were the retrograde (or inverse) of the first three. After 24 training sequences obeying the retrograde (or inverse) rules, subjects were asked to either rate their liking or else classify 20 further walking sequences. Subjects liked the symmetry they were trained on even though they could not classify which sequences obeyed the training structure. Both experiments indicated that people could learn mirrored rules, under certain conditions, consistent with an ability to implicitly learn more than n-grams (in fact, being able to learn an "operation over variables", difficult for some computational models of learning).

Differential Patterns of Spontaneous Phenomenological Response to a Hypnotic Induction

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 102

ABSTRACT Previous research indicates that individuals exhibit heterogeneous patterns of spontaneous experiences following a hypnotic induction. Such variability is explained in part by hypnotic suggestibility but is also present among highly suggestible individuals. Typological models have proposed that highly suggestible individuals are comprised of dissimilar types of respondents who differ in multiple dimensions of hypnotic responding. This study sought to discern phenomenological classes from the spontaneous experiential responses to a hypnotic induction and to assess whether experiential variability among highly suggestible individuals conforms to a typological pattern. Six hundred and forty individuals experienced the Waterloo-Stanford Group Scale of Hypnotic Susceptibility, Form C (WSGC; Bowers, 1998), which consists of a hypnotic induction followed by a series of suggestions. a two-minute resting epoch was embedded within the WSGC. Participants retrospectively completed the Phenomenology of Consciousness Inventory (PCI; Pekala, 1991) in reference to their experiences during the resting epoch. Five phenomenological state factors derived from the PCI (dissociated control, positive affect, negative affect, visual imagery, and attention to internal processes) were submitted to a latent profile analysis. The fit indices and likelihood ratio tests of multiple models were contrasted and participants were assigned to a class on the basis of the posterior probabilities of the best fitting model. a four-class model exhibited the strongest fit to the data. The first and second classes were comprised of individuals from all levels of hypnotic suggestibility, whereas the third and fourth classes were comprised of only low and medium suggestible individuals. Highly suggestible individuals were divided evenly between the first and second classes, which differed in negative affect, dissociative experiences, and attentional absorption. These results indicate that highly suggestible individuals do not exhibit a homogeneous experiential response pattern to a hypnotic induction and provide support for typological models of high hypnotic suggestibility.

References: Bowers, K.S. (1998). Waterloo-Stanford Group Scale of Hypnotic Susceptibility, Form C: Manual and response booklet. International Journal of Clinical and Experimental Hypnosis, 46, 250–268.

Pekala, R.J. (1991). The Phenomenology of Consciousness Inventory. West Chester, PA: Mid-Atlantic Educational Institute, Inc.

Binding, Attention and Consciousness in the Multisensory Brain

AUTHORS **Thomas Thesen**[1], Mark Blumberg[1], Chad Carlson[1], Werner Doyle[2], Amy Trongnetrpunya[1], Ruben Kuzniecky[1], Orrin Devinsky[1], Charles Spence[3], Eric Halgren[4]

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 88

ABSTRACT Information about events in our environment reaches the brain via several distinct sensory channels that, at the peripheral level, convert quite different physical forces into neural impulses. Our brain has the ability to integrate these inputs across sensory modalities to create a coherent and unified object representation. The processing of these signals and, consequently, their interpretation by the brain, may depend on brain state modulated endogenously by internal motivations. The current study investigates the neurophysiological basis of feature binding, attention and task demands across the visual and tactile modalities by means of intracranial EEG recordings directly from the human brain with high temporal and spatial resolution. Subjects were stimulated with brief tactile taps on the thumb and index finger with simultaneous LED flashes at the same locations. Each task employed stimulus conditions that consisted of bimodal congruent, bimodal incongruent or

unimodal tactile or visual stimulation. Attention to modality varied between blocks. In Experiment I, subjects made speeded button responses to any stimulus in the target modality, irrespective of location. In Experiment II, subjects were instructed to maintain a different task set and made speeded elevation discrimination responses to stimuli in the target modality. Data from intracranial electrodes were analyzed in the time and frequency domains to compute ERPs and event-related power changes across multiple frequency bands. We show the spatio-temporal dynamics of feature binding across sensory modalities and their neurophysiological modulation by task demands and attention, shedding light on the neural mechanisms underlying top-down influences on perception and the unity of conscious experience.

Implicit Learning of Subliminal Material

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 111

ABSTRACT This research aims to establish implicit learning of subliminally presented material using different implicit learning paradigms. In a typical implicit learning paradigm – the serial reaction time task – subjects are presented with a sequentially structured series of stimuli and are required, on each trial, to press the key corresponding to one of four possible stimuli. Reaction times decrease progres-

sively during learning, and increase when the pattern of the stimuli changes. Performance in this task has been taken to indicate the existence of dissociations between ability to learn about the sequential contingencies between successive stimuli and awareness of these same contingencies. Typical results, however, systematically indicate some awareness of the relationships between successive stimuli. To address this issue so as to provide a more convincing demonstration of unconscious learning, we explored whether it is possible to learn about sequential contingencies between subliminally presented stimuli. The first two experiments aimed at influencing implicit learning of a supraliminal sequence through presentation of backward- and forward-masked subliminal primes before the onset of each visible stimulus. Crucially, while the supraliminal sequence remains the same throughout the experiment, the subliminal sequence of primes changes in a transfer block. Results show substantial decreases in performance when the subliminal sequence is changed, which suggests that the primes were indeed processed and modulated learning of the supraliminal sequence. In a third experiment, participants respond to a sequence consisting alternatively of visible and invisible items. The visible items do not constitute a regular sequence, but are completely predicted by the combination of the previous visible and invisible item. Again, participants show decreased performance when the subliminal items change. In a fourth experiment, participants are presented with a visible sequence, each item of which is presented together with a subliminal item. Unbeknownst to them, the subliminal items also constitute a sequence. The transfer block consists of visible and invisible sequences switched. We predict that exposure to the sequence in a subliminal manner will positively influence performance when the sequence is made visible.

Origins of Shared Intentionality

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TYPE Keynote Lecture
TIME Saturday, 9:00–10:00
PLACE Leibniz-Saal, BBAW

An Integrated Information Theory of Consciousness

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TYPE Presidential Adress
TIME Friday, 18:00–19:00
PLACE Leibniz-Saal, BBAW

ABSTRACT The integrated information theory (IIT) starts from phenomenology and makes use of thought experiments to claim that consciousness is integrated information. Specifically: (i) the quantity of consciousness corresponds to the amount of integrated information generated by a complex of elements; (ii) the quality of experience is specified by the set of informational relationships generated within that complex. Integrated information is defined as the amount of information generated by a complex of elements, above and beyond the information generated by its parts. Qualia space is a space where each axis represents a possible state of the complex, each point is a prob-

ability distribution of its states, and arrows between points represent the informational relationships among its elements generated by causal mechanisms. Together, the set of informational relationships within a complex constitute a shape in Q that completely and univocally specifies a particular experience. Several observations concerning the neural substrate of consciousness fall naturally into place within the IIT framework. Among them are the association of consciousness with certain neural systems rather than with others; the fact that neural processes underlying consciousness can influence or be influenced by neural processes that remain unconscious; the reduction of consciousness during dreamless sleep and generalized seizures; and the distinct role of different cortical architectures in affecting the quality of experience. Equating consciousness with integrated information carries several implications for our view of nature.

Neural Signatures of Body-Ownership and Agency

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TYPE Concurrent Session 4

TIME Sunday, 16:00–16:30

PLACE Room 2097, HU

ABSTRACT Body ownership can be easily confounded with the sense of controlling one's body because agency is a powerful cue to ownership: my body feels like mine because I can control it at will. As a result, interactions between body-ownership and agency are difficult to investigate. We developed an fMRI paradigm to investigate multisensory and sensorimotor aspects of body representation in the

brain. Movements of the participant's hand were either self-generated or externally-generated, and video-feedback was relayed in real-time or with a systematic delay. Analyses showed different activations in the right parietal lobe for intersensory and sensorimotor conflicts. Activity in the SMA was linked to a sense of agency over and above the sense of body-ownership, while activations in midline cortical structures were associated with a purely sensory-driven sense of body-ownership. The results are discussed in the light of recent neurocognitive models of self.

Decoding Implicit Consumer Choices from Brain Signals

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 135

ABSTRACT In everyday life decision makers often face situations in which they lack choice-relevant information and are pressured for time. Even when sufficient information is given people are not very good in computing "right" choices by thorough, conscious deliberation. Instead a period of "unconscious thought" after information presentation was recently found to lead to sound choices among complex products (Dijksterhuis et al., 2006). Does that mean that the human brain does not require conscious deliberation for making choices among products? Do automatic brain processes guide a subsequent choice without the involvement of conscious deliberation and even attention directed to the decision? To address this question we implemented two independent

experiments using functional magnetic resonance imaging (fMRI). In a first experiment, we investigated the neural processing of consumer products while subjects actively evaluated the products. Male participants were instructed to rate the attractiveness of each car they were presented with. In a second experiment, we studied the predictability of choices from brain activity while products were presented outside the focus of attention. Instead of evaluating the products, the participants were now engaged in a demanding visual fixation task while task-irrelevant images of cars were presented to the background of the screen. After the scanning session participants of both experiments were asked about their willingness to buy each of the presented cars. Importantly, during the experiments subjects were not informed that they would have to make such a purchase decision later on. Multivariate pattern classification was then applied to the imaging data in order to search through the whole brain for information predicting these subsequent consumer choices. We found that neural activation patterns in medial prefrontal cortex and insula predict subsequent consumer choices in both experiments. Interestingly, the amount of predictive information encoded in these areas was just as high even when subjects were not attending to the product. These findings suggest that the brain can evaluate consumer products even in the absence of explicit deliberation and attention to products and purchase choices. Moreover, the results indicate that information encoded this way is sufficient to reliably predict consumer choices later on.

Attention, Seeing and Change Blindness

AUTHOR **Michael Tye**
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TYPE Symposium 1: Talk 3
TIME Saturday, 10:30–12:30
PLACE Leibniz-Saal, BBAW

ABSTRACT Some theorists maintain that there is a very tight connection between attending to a thing and seeing (or being visually conscious) of that thing. This talk sides with those who hold that there is such a connection but it is denied both that attending to a thing in the visual case requires seeing it and that seeing a thing requires attending to it. The talk also draws out the consequences of a proper understanding of the relationship of attention and seeing for a proper understanding of change blindness.

V

Mechanisms of Masked Priming: a Meta-Analysis

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 120

ABSTRACT The extent to which unconscious information can influence behavior has been a topic of considerable debate throughout the history of psychology. a frequently used method for studying subliminal processing is the masked priming paradigm. The current meta-analyses focus on studies using this paradigm. Our aim was twofold: first, to assess the magnitude of subliminal priming across the literature and to determine whether subliminal primes are processed semantically; second, to examine potential moderators of priming effects. We found significant priming in our analyses, indicating that unconsciously presented information can influence behavior. Furthermore, priming was observed under circumstances in which a non-semantic interpretation could not fully explain the effects, suggesting that subliminally presented information can be processed semantically. Nonetheless, the non-semantic processing of primes is enhanced and priming effects are boosted when the experimental context allows the formation of automatic stimulus-response mappings. Our quantitative review also identified several moderators that influence the strength of priming.

The Higher-order Global State (HOGS) Model of Consciousness

AUTHOR **Robert Van Gulick**
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TYPE Concurrent Session 3
TIME Sunday, 14:00–14:30
PLACE Room 3075, HU

ABSTRACT Higher-order theories of consciousness (Rosenthal, Lycan and Armstrong) and global workspace or integration theories (Barrs) are normally regarded as distinct and competitive alternatives. Moreover, both are typically regarded as more plausible as accounts of access consciousness rather than as accounts of phenomenal consciousness. Access consciousness (Block) is defined in terms of availability to report and wide inferential application. Information broadcast in the global workspace can be accessed by many mental system and modules, while the presence of a higher-order thought or perception directed at a first-order state makes it accessible for report. However, it is less clear why presence in the global workspace or the addition of a higher-order thought should give rise to the sort of "what-it is-likeness" that is regarded as definitive of phenomenal consciousness. I propose an alternative model that combines key aspects of the higher-order and global integration theories. The Higher-Order Global State (or HOGS) model is not a mere conjunction, but involves re-conceptualizing both of the prior theories in a way that reveals their underlying connections and provides some insight into the phenomenal aspect of consciousness. On the HOGS model the higher order aspect of consciousness is not located in explicit meta-states that are separate from their lower-order mental objects. The higher-order aspect is instead an implicit reflexive feature of the relevant globally integrated states. The transformation of a non-conscious mental state M into a conscious state is accomplished not by intentionally directing a separate and explicit meta-state upon M, but by recruiting M into a globally integrated

state that implicitly incorporates a significant meta-intentional aspect in its content and organization. The meta-intentional aspect is directly linked to the structure of phenomenal experience, especially to the duality of subject and object. The structure of experience is that of a world of objects experienced from the perspective of the experiencing subject or self. The experiential self in turn is present in experience not as another object but as the unified point of view to which objects are present.

Age Effects on Attentional Blink Performance in Meditation

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 126

ABSTRACT Here we explore whether mental training, in the form of meditation, can aid in overcoming age related attentional decline. To investigate this, we compared performance on the attentional blink task between three populations: a group of long-term meditation practitioners within an older population; a group of age and education-matched control subjects and a group of young control subjects who had never undergone any form of meditation practice. In the attentional blink task subjects have to detect two targets embedded among distracters. Upon detection of the first target, subjects show a substantial reduction in accuracy for detecting the second target when it appears between 200 and 500 ms after the first. This drop in performance is referred to as the

attentional blink and is thought to arise due to an inability to efficiently distribute limited attentional resources. Research has shown that the blink is increased in that it is both steeper and broader in aging populations. The broader blink effect in aging populations is thought to reflect a reduced ability to sustain attention over time. Meditation is expected to counteract these aging effects on attentional blink performance in that the practice of meditation lays much emphasis on the training of attention. Our results show that long term meditation practice leads to a reduction in the attentional blink. Furthermore, meditation practitioners taken from an older population, performed comparably to a control group taken from a younger population, whereas the control group, age-matched to the group of meditation practitioners, does not only exhibit deficits in performance for shorter delays, typically known as the AB phenomenon but also at longer delays. On the contrary, meditation practitioners do not show any of these deficits in performance. These results support the hypothesis that meditation practice can: (i) alter the efficiency with which attentional resources are distributed and (ii) help to overcome age-related attentional deficits both in the ability to distribute attentional resources in the temporal domain and in the sustaining of attention over time.

Modulation of Sensory and Pain Processing with Hypnosis: a Thulium-YAG Event Related fMRI Study

AUTHORS **Audrey Vanhaudenhuyse**[1], Melanie Boly[1], Evelyne Balteau[1], Caroline Schnakers[1], Gustave Moonen[2], André Luxen[1], Jean-Francois Brichant[3], Pierre Maquet[1], Steven Laureys[1], Marie-Elisabeth Faymonville[4]

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 101

ABSTRACT Background: The neural mechanisms underlying hypnosis and especially the modulation of pain perception by hypnosis remain unclear. Using fMRI, we here describe how the hypnotic state alters the perception of sensory and painful stimulation. Methods: We used a parametric single-trial thulium-YAG laser fMRI paradigm in 13 healthy volunteers. Two sessions were performed on different days: one during normal wakefulness and one during hypnotic state. During each session, 200 laser stimuli with an intensity ranging from 300 to 600 mJ were administered on the dorsum of the subjects' left hand as described elsewhere (Boly et al, PNAS 2007). After each stimulus, subjects rated their sensory perception on a five-point scale (P0, no perception; P1, perceived not painful; P2, mild; P3, moderate and P4, severe pain). a repeated measures ANOVA compared sensation scores in normal wakefulness and hypnotic state, separating stimuli into low sensory range (i.e., <450 mJ) and high noxious range (i.e., ≥; 450 mJ) intensities (using SPSS 14.0). Cerebral activations induced by the intensity-matched laser stimuli in normal wakefulness and in the hypnotic state were compared using statistical parametric mapping (SPM5). Results: As com-

pared to normal wakefulness, subjects' ratings of perception decreased during the hypnotic state for both sensory (mean ± standard deviation 0.5 ± 0.2; 0.3 ± 0.2; $p < 0.001$; respectively) and noxious stimuli (1.8 ± 0.4; 1.3 ± 0.4; $p < 0.001$). Laser induced cerebral activation was decreased during hypnosis in anterior cingulate, right prefrontal and right premotor cortices, as well as in downstream regions encompassing brainstem, right thalamus, bilateral striatum, bilateral insula and right primary somatosensory cortices. Conclusion: These findings point to an important role for both the cortical pain neuromatrix and hierarchically "lower-level" brain areas in a hypnosis-induced decrease of sensory and affective aspects of stimulus perception. It reinforces the idea that not only pharmacological but also psychological strategies for relieving pain can modulate the network of cortical and subcortical regions that participate in the processing of noxious external stimuli.

Is Perception Discrete or Continous

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TYPE Symposium 3: Talk 1

TIME Monday, 10:30–12:30

PLACE Leibniz-Saal, BBAW

ABSTRACT The widespread idea that brain oscillations and rhythmic neuronal processes participate in sensory processing, and more particularly in conscious perception, could imply that perception is generated cyclically, as a sequence of individual "snapshots". What is the behavioral evidence for such "discrete perception"? I will present a series of experiments showing that perception and attention sometimes follow the intrinsically rhythmic dynamics of particular

oscillatory brain processes in the theta (4–8Hz) and alpha (8–13Hz) frequency bands.

Markers of Awareness? EEG Potentials Evoked by Faint and Masked Events, with Special Reference to 'Attentional Blink'

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TYPE Tutorial A4
TIME Friday, 14:00–17:00
PLACE Room 4, BBAW

ABSTRACT Averaged event-related EEG potentials (ERPs) indicate cortical activity with extremely good temporal resolution and therefore continue being the most illustrative means of looking at the brain's activities in perceiving single events. Searching for brain-physiological correlates of the subjective state of being aware of perceptual input has always been a major goal of ERP research. To this end, ERPs have been measured in response to stimuli that were hard to perceive. This research started with ERP correlates of the detection of auditory signals and later focused on tasks where visual stimuli were briefly displayed that either were masked by following stimuli or were presented in rapid series to produce the "attentional blink". Relevant ERP components proposed in this context as perceptual correlates of awareness have included early components related to perception (e.g., visual P1), middle-latency negative peaks (posterior N2, N2pc), and the P3 complex. Of interest are also the ERP signs of motor activation (Lateralized Readiness Potential) and semantic processing (N400) which may be evoked by stimuli even if remaining unidentified. The tutorial will suggest as a conclusion that there is no "awareness component" but that components may only be correlates of awareness, with P3 being the

closest correlate. In contrast, variations of early components like P1 are evidently decoupled from variations in awareness, and N2-type components are more related to attention than to awareness. The reason why P3 is the best indicator of awareness is its close association to processes of classification and decision.

Learning to be Conscious

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 11

ABSTRACT The neural workspace model, often discussed in the consciousness literature, is relatively inflexible and has little or nothing to say about the relationship between learning and consciousness. Yet, anecdotal reports abound, for instance, that people who have become expert in conducting subliminal perception experiments actually consciously experience the very primes that normal participants fail to perceive! Expertise can thus modulate availability to awareness. We investigated this issue by exploring whether extended training on processing subliminally presented materials improves performance and awareness. We performed a training experiment where participants learned to identify subliminally presented numbers for five days. The numbers were masked and there was a varying time interval between the number presentation and the postmask presentation. On each trial, participants had to identify the number stimuli and indicate on a four-point PAS scale (Ramsy & Overgaard, 2004) what was the visibility of the stimulus. We

observed not only that objective identification performance improved but also that the subjective feeling of visibility increased with training. This suggests that training can decrease the threshold for conscious perception. We discuss these results in the perspective of the radical plasticity thesis, stating that "consciousness emerges in systems capable not only of learning about their environment, but also about their own internal representations of it". We argue that learning increases the quality of representations, making them more easily available to awareness.

Why Phenomenal Consciousness Cannot be Explained by Content

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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 47

ABSTRACT The phenomenal character of conscious experience is often explicated by some special kind of content: phenomenal content, the content of a higher-order thought, non-conceptual content, etc. It is then said that the proposed kind of content is able to explain the phenomenal character (sometimes among other factors). However, since mental representations are introduced to explain complex behavior, the content of mental representations is ultimately determined by the target object of the behavior to be explained (whatever additional criteria are formulated). Importantly, the target object plays an essential role for the acquisition of contents but not for the possession: Once a specific content is acquired, it is possible to have a mental representation with this content without there being the represented object (these are cases of misrepresentations). Thus, the content of a given mental representa-

tion is fixed by the behavioral pattern it explains, where the behavioral pattern is individuated by its usual target object. The difference between conscious and unconscious representations does not lie in the target of the behavior (resp. the behavioral pattern) it helps to explain – this can be demonstrated with a lot of different pathological impairments of consciousness. For example, patients suffering from visual form agnosia are able to act according to the "perceived" form of an object although they are unable to consciously register this form. Hence, the content of their unconscious representation is the same as the content of the conscious representation in healthy subjects (both can engage in a behavior targeting at the form). Hence, the content of a mental representation (whatever kind of content it is) cannot explain the phenomenal character of conscious experiences. In other words: there is no such thing as "phenomenal content". This finding implies that a lot of classical arguments and theories in philosophy are not sound (e.g. the argument for p-consciousness by Block, the higher-order thoughts theories). Moreover, it shows that the investigation of the content of conscious representations does not help us in understanding phenomenal consciousness. Rather, empirical research has to focus on the processing of mental representations in order to shed light on phenomenality.

W

Blaming the Brain? a Neurophilosophical Perspective on the Neuroscience of Aggression

AUTHOR **Henrik Walter**
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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 34

ABSTRACT Interpersonal violence and aggression are serious problems in almost every society. Apart and above from political, sociological and psychological approaches, neuroscience has made considerable progress in understanding its underpinning brain mechanisms[1, 2]. But does a neurobiological understanding of violence implicates excusing it? Can we blame our brains for our aggressive acts? These questions have gained even more weight, as in the last decade the problem of free will has gained considerable interest not only in philosophy, but also in science and in the public[3,4]. Some approaches to free will argue that a neuroscientific account of volition leaves no room for personal responsibility (hard determinism), whereas others, while acknowledging the scientific findings, argue that they have no impact for moral responsibility (conservative compatiblism). I will argue that both approaches are flawed: Hard determinism is wrong, because even if accepting its premises, there is room and reason to distinguish between different types of violent acts calling for a revised version of responsibility. Conservative compatibilism is wrong, because even if none of our practices in fact will change, as claimed by this position, the justifications for ascribing responsibility should change, which is a revision in its own. The position I defend, is called "revisionist compatibilism"[5]. I will use aggression as a prime example for it, present a survey of recent neurobiological findings, and will show why a revisionist position is best suited to deal with them.

[1] Siever J. Neurobiology of violence and aggression. Am J Psychiatry 2008; 165:429–442. [2] Buckholtz J & Meyer-Lindenberg A. The neurogenetic architeture of aggression.TINS 2008; 31: 120–9. [3] Walter H. Neurophilosophy of free will. MIT Press 2001. [4] Haggard P. Human volition: the neuroscience of will. Nat Rev Neurosci 2008; 9:934–946. [5] Walter H. Neurophilosophy of Moral Responsibility: The Case for Revisionist Compatibilism. Philosophical Topics 2004; 32: 477–503.

Your Body is My Body: the Remarkable 'Mirror-Touch' Synaesthesia

AUTHOR **Jamie Ward**
AFFILIATION Department of Psychology, University of Sussex
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TYPE Symposium 2: Talk 1
TIME Sunday, 10:30–12:30
PLACE Leibniz-Saal, BBAW

ABSTRACT For some people, watching other people being touched may trigger conscious tactile experiences projected on to their own body – this has been termed 'mirror touch' synaesthesia. In this talk, I'll outline its cognitive and phenomenological characteristics. Visuo-tactile cuing experiments show that it occurs automatically; it may be as common as 1–2% of the population; it depends primarily on observed touch to humans, not objects; and is sensitive to the spatial relationship between self and other. It may reflect hyper-activity within an observed touch network which is common to synaesthetes and non-synaesthetes alike, but in which these individuals tend to incorporate observed bodies of other people within their own body schema – resulting in a blurring between self and other at some sensorimotor level.

The Experience of Attention

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 40

ABSTRACT The phenomenology of perceptual experience is shaped by attention. Imagine listening to a jazz band. Your experience has one kind of phenomenology when you are focusing on the sound of the piano, and a different phenomenology when you are focusing on the trombone. Or, to consider a visual example, imagine being in the subway: you have one visual phenomenology when you are focusing on your newspaper and a different one when (maybe without having moved your eyes) you are focusing on your neighbor. But what exactly is the contribution of attention to perceptual phenomenology? Often attention is said to highlight a certain part of our perceptual experience, or to make it more prominent. Yet what does this prominence amount to? Does your environment necessarily appear different when you focus on one aspect rather than another, as if the object of your attention gets 'colored' with prominence? The answer, I believe, is no: the phenomenology of attention cannot be understood in terms of a particular way our environment appears to be (a certain environmental content). I argue against four different versions of such a view: (a) that attention enables conscious experience tout court (which implies that all contents of experience are attentional contents) (b) that attention enables the presentation of objects, (c) that attention presents relatively determinate or specific contents, (d) that attention presents a primitive or relational property of prominence. As alternative I suggest that the phenomenal shaping of experience by attention consists in part in an experience of attention itself: we are perceptually aware of ourselves and our own active mental attending. I end by suggesting different

ways of conceptualizing that self-awareness and by an outlook into the consequences of my conclusion.

Awareness of Own and Observed Actions: Social Role Influences Feelings of Control

AUTHORS **Dorit Wenke**[1], Roland Pfister[2], Sukhvinder Obhi[3], Antje Holländer[1], Wolfgang Prinz[1]

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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 72

ABSTRACT The experience of causing an event alters subjective time: actions and their effects are subjectively perceived as temporally shifted towards each other. In the present study we investigated temporal binding in a social setting in which two participants performed actions at different points in an action sequence: One participant (the "leader") initiated the sequence by pressing a key at a time her choosing. The leader's action produced a tone that served as a go-signal for the other participant (the "follower") to press his key. Participants either estimated the length of the interval between the first (leader's) keypress and the tone, between the tone and the second (follower's) keypress, or between the follower's keypress and the ensuing second tone. First results indicate that all intervals are perceived to be shorter when judged from the leader perspective than when judged from the follower perspective. This result suggests that leaders experience more control over the events in the action sequence they initiate than do followers who merely respond.

Measures of Knowledge Access in Artificial Grammar Learning Task

AUTHORS Michał Wierzchon[1], Maciej Taraday[1], Anna Hawrot[2], Dariusz Asanowicz[1]

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TYPE Poster Session 1

TIME Saturday, 17:30–19:30

PLACE Poster No. 121

ABSTRACT The aim of the presentation is to compare the access consciousness measures applied in implicit learning studies. Most of the researchers have agreed that the accuracy of the indirect tests performance reflect in fact both conscious and unconscious influences of memory. To assess the ability of conscious access to the information stored in the memory multiple methods were proposed, such as confidance ratings or more recently post-decision wagering. In the presentatation the results of those two methods will be compared with the feeling of warmth scale data. It was assumed that feeling of warmth, as a more sensitive measure, would be correlated with the classification accuracy to more extend than other scales. To address the problem, the two artificial grammar learning experiments were conducted. In the classification phase of both experiments, the declarative ratings of confidence, feeling of warmth and post-decision wagering were collected. The results indicate the classification above the chance level in all experimental groups. The higher classification accuracy was related with the higher feeling of warmth declared by the participants and high confidence ratings in both experiments. The results of post-decision wagering were not related to the classification performace. The results of the studies seem to confirm that warmth scale is an sensitive measure of knowledge access. The scale is also more understandable for paritcipants. Finally the results showed significant difference between the post-wagering scale and other two scales results suggesting, that those measures could reflect other aspect of access consciousness.

Consciousness and Targetless Higher-Order Thoughts

AUTHOR **Jonah Wilberg**
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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 35

ABSTRACT In this paper I defend higher-order thought (HOT) theories of consciousness against a prominent objection. The central claim of HOT theory is that a mental state is conscious only if one has, or is disposed to have the HOT that one is in that state. According to the objection, HOT theory is unable to account for cases in which the relevant HOT misrepresents, or occurs in the absence of its target. In response, I show that there is a coherent account HOT theory can offer of such cases.
I begin by evaluating different ways of drawing the distinction between 'misrepresentative' HOTs that merely misrepresent their targets, and 'targetless' HOTs that occur in the absence of their targets. I argue that the objection is most forcefully presented in terms of targetless HOTs, where these are understood as HOTs whose intentional content fails to correspond to any existing mental state tokens. There are two main responses to this form of the objection, I argue. One of these is defended by David Rosenthal, who claims that the mental state token corresponding to the intentional content of the targetless HOT is conscious, despite failing to exist. I argue that this response contradicts both a popular conception of state consciousness, and an implicit principle of HOT theory.
a more successful response, I argue, is to say that no mental state token is conscious in virtue of a targetless HOT. This response is often briskly dismissed as inconsistent or strongly counter-intuitive. I show, however, that this response can be consistently developed, and that some realistic examples (Anton's syndrome, peripheral vision) increase its intuitive plausibility. Moreover, I argue, those consequences of this response which seem most counter-intuitive are also consequences of numer-

ous commonly accepted views. For example, my response entails that one can seem to be in a conscious state without actually being in one. But this is in any case a consequence of various philosophical accounts of self-knowledge, or so I argue. We thus have a promising defence of HOT theory against the objection from targetless HOTs.

Moving Beyond the Common Bias That Consciousness is an Evolutionary Adaptation

AUTHOR **Juliane Wilcke**
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TYPE Poster Session 1
TIME Saturday, 17:30–19:30
PLACE Poster No. 93

ABSTRACT Is consciousness an evolutionary adaptation? Only few have claimed that it is not, amongst them Thomas Huxley, Stephen Jay Gould, David Rosenthal (about state consciousness) and Colin Blakemore (about phenomenal consciousness). Yet despite the general consensus that consciousness is an adaptation, most of the arguments for this position have failed. Because it is important that we understand why, I discuss problems with five arguments, namely, the arguments from the evolution of consciousness, from its subjective centrality, from the standard view, from the absence of opposing evidence and from the cost of consciousness. An important factor in the arguments' failures seems to be an underlying bias that consciousness is an evolutionary adaptation. This is directly visible in two of the arguments and suggested more generally both by the nature of the mistakes in the arguments and a lack of attempts at providing support. The adaptation bias is widespread, as evinced by the small number of opponents and the repeated claim that the default position is that consciousness is an adaptation. Consciousness researchers should be concerned about

this bias because it impedes progress in increasing our knowledge about consciousness. Fortunately, there is a simple remedy for the adaptation bias: Mere awareness of the bias can help to neutralise it by highlighting the need for good scientific evidence for-or against-consciousness being an adaptation. And there are methods for obtaining such evidence which are more promising than the arguments above. For example, a more credible preliminary conclusion about the adaptation status of consciousness could come from a combination of evidence for special design, species comparisons and the exclusion of plausible alternative hypotheses. Furthermore, instead of limiting progress by asking exclusively whether or not consciousness is an adaptation, we should examine its potential evolutionary functions, consider different stages of its evolutionary development and take into account contextual factors such as selection pressures. To increase the amount and quality of research on the evolution and function of consciousness, we need to use good methods from disciplines such as evolutionary biology, evolutionary psychology and evolutionary cognitive neuroscience to obtain as much relevant evidence as possible.

Dreams as Imagination or Quasi-Perception? a Reconciliatory Answer to a Classical Problem

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TYPE Concurrent Session 4
TIME Sunday, 16:30–17:00
PLACE Room 3075, HU

ABSTRACT The question of how to conceptualize the conscious experience of dreaming dates back to antiquity. In On Dreams, one of the earliest philosophical treatments of dreaming, Aristotle described dreams as quasi-perceptual experiences involving the persistence

of vision during sleep. This view was contradicted by Hobbes in the Leviathan, who defined dreams as the imaginations of them that sleep. The question of whether dreams are instances of quasi-perception or imagination continues to be a matter of philosophical controversy and was discussed in several recent publications. After briefly reviewing the main philosophical arguments, I will suggest a reconciliatory model of dreams as immersive, sequentially organized, visuospatial experiences during sleep. Unlike imagination models of dreaming, it takes seriously first-person reports of vivid, quasi-perceptual dreams characterized by the predominance of visual imagery and the subjective feeling of presence. It is also borne out by neuroimaging studies showing that REM sleep/dreaming is characterized by wake-like activation especially of cortical visual areas. On the other hand, phenomenological, functional and epistemological considerations suggest that dreams are phenomenally indeterminate with respect to the experience of bodily selfhood. While movement and vestibular sensations are common, other dimensions of bodily experience such as touch, proprioception and thermal sensations, which are related to full phenomenal embodiment in standard wakefulness, are absent in most dreams. I will argue that in dreams, the organization of vivid, quasi-perceptual visuospatial imagery around an internal, first-person perspective gives rise to a basic sense of immersion; because it arises independently from real-world inputs, visual imagery in the dream state can be described as hallucinatory. At the same time, most dreams do not seem to give rise to vivid, quasi-perceptual self-experience and full phenomenal embodiment. In terms of the phenomenal indeterminacy of the dream self, dreams are possibly more akin to offline wake states such as imagination and daydreaming. Further parallels between waking imagination and dreaming include frequent perspective changes, unstable location in the imaginary or dream world, and detachment from real-word and real-body inputs. Consequences of this view for the discussion on embodiment and the recently introduced concept of minimal phenomenal selfhood will be pointed out.

Comparing the Updating of Conscious and Unconscious Perceptual Streams: a New Temporal Illusion

AUTHORS **Chien-te Wu**[1], Niko Busch[2], Michele Fabre-Thorpe[1], Rufin VanRullen[1]

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TYPE Concurrent Session 3
TIME Sunday, 15:00–15:30
PLACE Room 3096, HU

ABSTRACT An optimal correspondence of temporal information between the physical world and our perceptual world is an important factor for survival. Several recent studies revealed that specific discrepancies exist between physical time and time perception. However, the relationship between the perceived time of events and the dynamic state of their neuronal representations remains largely unexplored. In the current psychophysical study, we demonstrate a striking phenomenon in which the stimulus that systematically triggers the occurrence of another perceptual event is frequently perceived as lagging the event itself. We used a paradigm referred to as motion-induced blindness (MIB) in which a static visual stimulus presented on a constantly rotating background disappears and reappears from awareness periodically, with the dynamic characteristics of bistable perception. a sudden stimulus onset (e.g., a flash) presented during a period of perceptual suppression (i.e., during MIB) is known to trigger the almost instantaneous reappearance of the suppressed stimulus. Surprisingly however, we report here that although the sudden flash triggers the reappearance of the static target, it is systematically perceived as occurring after this reappearance. This temporal-reversal illusion may be explained by different time courses for updating the conscious representation of a temporarily suppressed 'old stimulus', and for establishing conscious perception of a newly presented stimulus. In a second study, the color of the target was changed at different latencies (either before, simultaneously or after) relative to

the onset of the sudden flash, and subjects reported the perceived color at target reappearance. Again, the target reappearance was frequently perceived as preceding the flash onset, but was generally associated with the color presented ~100 ms before the flash onset. In other words, a novel stimulus onset can reactivate a temporarily unconscious target representation with a shortened latency (resulting in the perceived temporal reversal) but not all the target features benefit equally from this reduced access time to consciousness – color apparently updating at a slower pace than the rest of the target representation. This illusion sheds important light on the distinct neural signatures of conscious and unconscious events in the brain.

Does the Brain's Clock Work Better Than the Mind's Clock?

AUTHORS **Agnieszka Wykowska**[1], Valtteri Arstila[2], Niko Busch[3]

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TYPE Poster Session 2

TIME Sunday, 17:30–19:30

PLACE Poster No. 28

ABSTRACT With the use of the ERP methodology, we investigated the question of whether the "brainwe' clock" has a better temporal resolution as compared to the "mind's clock". That is, whether the brain can differentiate stimuli more accurately than we can consciously do. If so, we predicted to find two types of ERP effects: one that mirrors the physical (a)synchrony between stimuli and a second type that reflects the consciously perceived temporal pattern. Participants made simultaneity judgments concerning two types of visual stimuli that were presented either simultaneously, with 30 ms or with 60 ms stimulus

onset asynchrony (SOA). As the 30 ms SOA condition was just at the threshold of perceived asynchrony (Pöppel, E., 1994), it yielded a rate of 50% perceived synchrony. ERP waveforms elicited by the second stimulus were compared between three conditions: perceived simultaneity with simultaneous stimuli, perceived simultaneity with 30 ms SOA and perceived asynchrony with 30 ms SOA. The results showed that the brain was able to differentiate between asynchronous and simultaneous stimuli with high temporal resolution at the sensory stages of processing. However, this distinction was not long-lasting and the 30-ms asynchronous stimuli (short SOA) were processed similarly to simultaneous stimuli at later stages. This probably yielded the effect of perceived simultaneity in 50% of trials of the short SOA condition. We conclude that early neural processing stages exhibit high temporal accuracy, but this precision is lost at later stages, which are presumably related to conscious temporal perception and decision making. Identification of these stages can provide insights into the neural underpinnings of conscious and unconscious temporal experience.

Reference: Pöppel, E. (1994). a hierarchical model of temporal perception. Trends in Cognitive Sciences, 1(2), 56–61.

Y

Is the Revival of Mind-body Identity Theory Possible?

AUTHORS **Jack Yang**[1], Allen Houng[1]
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TYPE Poster Session 2
TIME Sunday, 17:30–19:30
PLACE Poster No. 52

ABSTRACT One of the most remarkable objections to the classic mind-brain identity theory, proposed by Place and Smart, is Saul Kripke's modal argument. Most materialists will reply by denying that the entailment from conceivability to metaphysical possibility is false. But this essay is an attempt to make a new way out for the identity theory from a different approach without discarding theory of rigid designator and ontological commitment on which Kripke is based. Thus, I will explain away conceivability of mind-body separability. First, I will reject Kripke's premise that the confusion between heat "reality" and sensation of heat "appearance" is analogically the only source of Cartesian intuition of separating mind-body. Instead, a new source of apparent conceivability, between pain and C-fiber firing, can be discovered and extinguished so that the identity theory will survive from Kripke's attack. I will propose that Cartesian intuition of mind-body separability comes from different identity (or boundary) conditions when we conceive, and thereby we have different limited conceptual frameworks to conceive properties of the referent. If we fix the identity condition, we can only conceive in the same limited conceptual framework and thereby explain Cartesian intuition away. For example: heat is "occurrence of new degree of freedom" in classic physics, but we can only conceive that heat is "molecular motion" after thermodynamic theories are provided and they fix the strict identity condition. Therefore, creating new theories and identity conditions will change our concept. That is why our Cartesian intuition can be extinguished after scientific theories are built strictly. Moreover, according to the causal theory of reference, after

we baptize what pain is, we have learned to use it by the chain of communication. It means that if everyone designates the same thing in our world, usage of pain has to be accessed by others. Therefore, either phenomenology is not totally private, or our concept of "pain" cannot be referred to our phenomenological experience, but our functional and behavioral states. After all, based on strict theory and the identity condition, we eventually can reconsider the mind-body identification.

Awareness and Decision in Monkey with Blindsight

AUTHORS **Masatoshi Yoshida**[1], Kana Takaura[1], Tadashi Isa[1]
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TYPE Concurrent Session 4
TIME Sunday, 16:00–16:30
PLACE Room 3096, HU

ABSTRACT Macaque monkeys with a unilateral lesion in V1 have been used as an animal model of blindsight. Here we sought for the neural mechanisms responsible for their visual awareness and residual vision. First, we examined whether the monkeys showed behavior analogous to human blindsight patients. Two macaque monkeys with a unilateral V1 lesion were tested with two saccade tasks. 1) a forced-choice (FC) task, in which the saccadic target comes on one of two possible positions, requires discrimination of target positions. 2) a yes-no (YN) task, in which, in addition to the above condition, the monkeys have to maintain fixation when the saccadic target is absent, requires detection of the target. The d' for the FC task was significantly higher than that for the YN task, consistent with the studies of human blindsight patients. Next, we recorded neural activities from the superior colliculus (SC) of the monkeys performing the FC and YN tasks. We found that the transient response of the ipsilateral SC to the visual target was larger in

the hit trials than the miss trials in the YN task. Such modulation was not found in the normal, contralateral SC. This suggests that the activity in SC comprises a part of neural correlates of reduced visual awareness specific to blindsight. Finally, we examined the decision threshold for initiation of saccades in the FC task. We modeled the distribution of saccadic reaction times by a modified diffusion model and obtained evidence that the decision threshold in the affected hemifield was lower than that in the normal hemifield (Yoshida et al. 2008). These results suggest that the geniculostriate pathway is crucial for decision processes. We propose that these results reflect deficits in deliberate control of visual-oculomotor processing after V1 lesions, which may parallel loss of visual awareness in human blindsight patients.

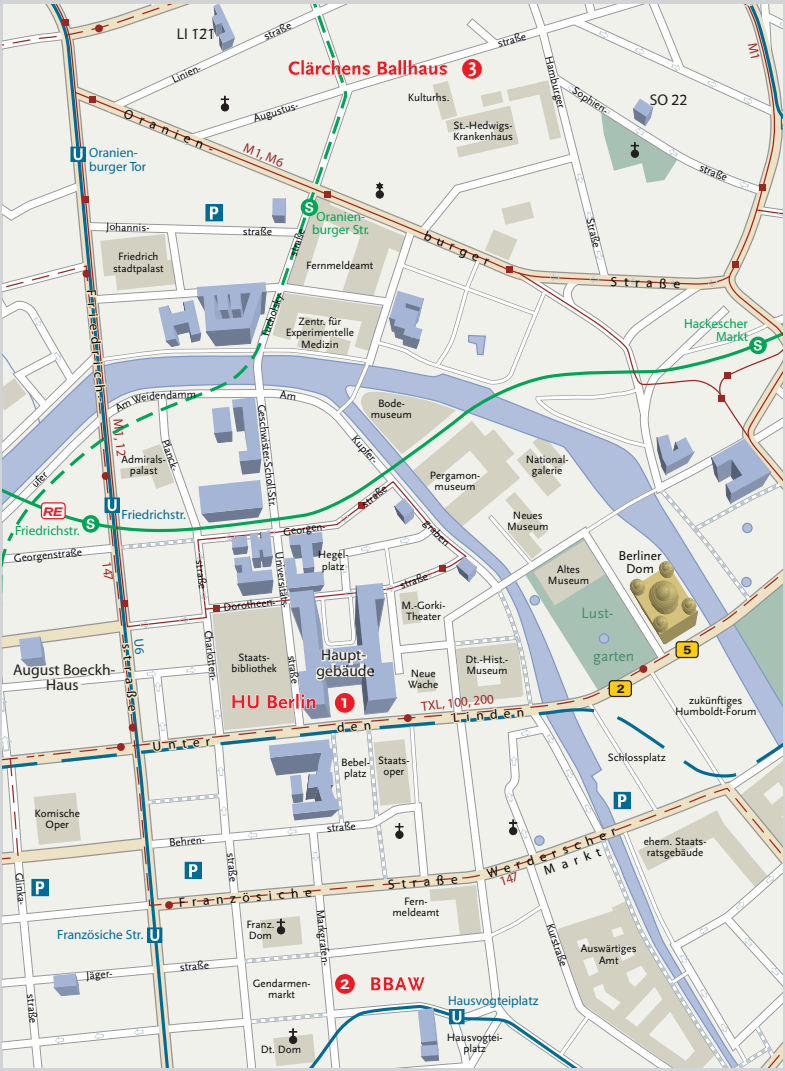
Appendix ›

INDEX

DIRECTIONS

Tutorials	The tutorials on Friday will be held at the Berlin-Brandenburg Academy of Sciences and Humanities in Rooms 1–4 at the back of the Leibniz-Saal.
Keynotes and Symposia	All keynotes and symposia will be held in the Leibniz-Saal at Berlin-Brandenburg Academy of Sciences and Humanities.
Concurrent and Poster Sessions	The concurrent and poster sessions on Saturday and Sunday afternoons will be held at Humboldt University. The university can be entered from Unter den Linden 6. Guides will be available from the front entrance of the university to lead the way. Snacks and a cash bar will be provided during the poster session.
Student Party	The student party is being held at a secret student only location!
Banquet	The banquet will be held at upstairs in the mirror hall at Clärchens Ballhaus at Auguststraße 24 in Mitte. For those looking for an alternative to the banquet we have organized a poor person's pay as you go feast in the beer garden at the back of Clärchens.
Nourishment	Since the venues around Gendarmenmarkt are relatively expensive, and cater for a tourist crowd, for lunch you might want to consider one of the restaurants or cafés near Humboldt University, or even take a short 15 minute walk to Oranienburgerstraße (on the other side of Museum Island), where there are many lunch options ranging from very cheap pizza or falafel to more sophisticated Japanese, Italian, and German restaurants. On Friday and Monday the cafeteria at Humboldt University will be open. Please feel free to ask for suggestions and directions at the registration desk.
After Party	The location of the ASSC After Party will be announced immediately after the final keynote lecture talk on Monday.

LOCATIONS



1. Humboldt-Universität zu Berlin, enter from Unter den Linden 6.

2. Berlin-Brandenburg Academy of Sciences and Humanities, Leibniz-Saal, enter from Markgrafenstraße 38.

3. Clärchens Ballhaus, Auguststraße 24.

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