2016/2017 CIMeC PhD Colloquia

LIST:

04/11/2016

Hugo Critchley
Brighton and Sussex Medical School and the Sackler Centre for Consciousness Science University of Sussex, Brighton UK

How brain and body interact in emotion: The heart and threat.

02/12/2016

Micah Murray
Director, The Laboratory for Investigative Neurophysiology (The LINE) Department of Radiology and Department of Clinical Neurosciences & Director, Electroencephalography Brain Mapping Core, CHUV Center for Biomedical Imaging (CIBM) University Hospital Center and University of Lausanne)

The Multisensory Scaffolding for Perception, Sensory Substitution, & Memory.

27/01/2017

Marcello Massimini
Professore Ordinario, Università degli Studi di Milano

Mechanisms of loss and recovery of consciousness: insights from cortical perturbations.

17/02/2017

Jeremy M. Wolfe
Professor of Opthalmology and Radiology at Harvard Medical School and Brigham & Women's Hospital

Lost and found: Errors and successes in visual search.

09/03/2017

Gilles Pourtois
Professor at the Department of Experimental Clinical and Health Psychology at Ghent University and the recipient of an ERC Starting Grant in 2008

Effects of attention and motivation on early visual cortex activity in humans.

03/04/2017

Hans Op de Beeck
Laboratory of Biological Psychology, University of Leuven

The multitude of neurological representations behind visual cognition.

16/06/2017

Gregor Thut
Institute of Neuroscience and Psychology, University of Glasgow

Brain oscillations as drivers of brain function: Probing and manipulation of the brain-behavior relationship in humans using EEG/MEG and transcranial brain stimulation.

07/07/2017

Valeria Della-Maggiore
Director of Physiology of Action Lab, Universidad de Buenos Aires

Impact of conflicting material on motor learning and consolidation.

DETAIL:

04/11/2016

Hugo Critchley
Brighton and Sussex Medical School and the Sackler Centre for Consciousness Science University of Sussex, Brighton UK

How brain and body interact in emotion: The heart and threat.

"The expression and experience of emotions is supported by physiological changes within the body, mediated in part by efferent autonomic and afferent viscerosensory nerves. Correspondingly, brain regions implicated in the processing of motivational salience and
affective representations are coupled to the control of internal physiological state. We are defining how interoceptive signals concerning physiological arousal (notably, those signals encoding the timing and strength of individual heartbeats) influence the perception of environmental stimuli and evoked behavioural, emotional and cognitive responses. These insights are complemented by an enhanced understanding of individual differences in dimensions of interoceptive processing and of the neural mechanisms through which mind, brain and body interact to influence subjective experience and behaviour. Within the lecture, these processes will be illustrated with particular attention given to the fresh understanding of interactions between heart signals and the processing of fear and threat signals."

02/12/2016

Micah Murray
Director, The Laboratory for Investigative Neurophysiology (The LINE) Department of Radiology and Department of Clinical Neurosciences & Director, Electroencephalography Brain Mapping Core, CHUV Center for Biomedical Imaging (CIBM) University Hospital Center and University of Lausanne)

The Multisensory Scaffolding for Perception, Sensory Substitution, & Memory.

"This talk summarizes our efforts to identify the spatio-temporal brain mechanisms and behavioural relevance of multisensory interactions in humans and the consequence such has had on our understanding of the organization of the brain, the functional selectivity of low-level cortices, and plasticity across the lifespan. Across studies we have used combinations of psychophysics, ERPs, fMRI and TMS, taking advantage of innovations in signal processing to yield greater mechanistic interpretability of the data. Several general conclusions are supported by the collective data. First, (near) primary cortices are loci of multisensory convergence and interactions. Second, these effects occur at early latencies (i.e. <100ms post-stimulus onset). Third, these effects directly impact behaviour and perception. Fourth, multisensory interactions are context-contingent. One the one hand, they affect not only current stimulus processing, but also later unisensory recognition. Current unisensory (auditory or visual) object recognition and brain activity are incidentally affected by prior single-trial multisensory experiences; the efficacy of which is predictable from an individual's spatiotemporal dynamics of multisensory interactions. We then extend such findings across the lifespan to show how multisensory processes may be yoked together. Finally, examples of multisensory processes at the service of sensory substitution are presented. Together, these data underscore how multisensory research is changing long-held models of functional brain organization and perception in both health, across the lifespan, and in disease and its remediation."

27/01/2017

Marcello Massimini
Professore Ordinario, Università degli Studi di Milano

Mechanisms of loss and recovery of consciousness: insights from cortical perturbations.

"We usually assess another individual's level of consciousness based on her/his ability to connect to the surrounding environment and produce appropriate responses. However, conscious experience can be entirely generated within the brain, even in the absence of any interaction with the external world; this happens almost every night, during dreaming, and may occur during certain forms of anesthesia as well as in brain-injured patients who emerge from coma and remain unresponsive. Hence, clinical and physiological evidence advocate the development of brain-based metrics that are independent on both sensory inputs and motor outputs. As an attempt in this direction, an empirical measure of brain complexity has been recently developed based on the electroencephalographic (EEG) response to a direct cortical perturbation with transcranial magnetic stimulation (TMS), the perturbational complexity index (PCI). Based on theoretical postulates, PCI gauges the conjoint presence of integration and information in the human brain, independently of sensory inputs and motor outputs. In a series of experiments, PCI was tested on TMS-evoked potentials recorded in healthy subjects during wakefulness, dreaming, NREM sleep, and different levels of sedation induced by different anesthetic agents (including the dissociative anesthetic ketamine), as well as in patients who emerged from coma and attained a stable diagnosis. Overall, PCI allows a reliable assessment of the level of consciousness at the individual level even in subjects who are fully disconnected from the surrounding environment on both the input and output side. These measurements are scientifically relevant in the context of the information integration theory of consciousness (IITC) and prompt further validation toward the development of a practical diagnostic test. In parallel, employing cortical perturbations may help elucidating the mechanisms by which brain complexity collapses and recovers in the human brain. Recording brain responses to direct cortical stimulations both noninvasively (using TMS/EEG) and invasively (by employing intracranial electrical stimulation/recordings in neurosurgical patients) revealed basic neurophysiological mechanisms by which cortical neurons, despite being active and reactive, may become unable to engage in long-range, complex patterns of causal interactions. An interesting possibility is that neuronal bistability – the intrinsic tendency of cortical neurons to fall

into a silent downstate after an initial activation - may play an important role in impairing the brain's capacity to integrate information not only during NREM sleep but also in anesthesia and in brain-injured patients."

17/02/2017

Jeremy M. Wolfe
Professor of Opthalmology and Radiology at Harvard Medical School and Brigham & Women's Hospital

Lost and found: Errors and successes in visual search.

"After seeing a scene for a fraction of a second, you can have quite a sophisticated understanding of what you are viewing. If you examine that scene for a few seconds, you will recognize it, even several days later. Nevertheless, you may not be aware of very clearly visible items in that scene. If you are a radiologist, for example, you may miss an easily detectable cancer. How can we see so much and, yet, miss so much? How can you fail to 'see' what is right in front of your eyes? What can we do in realms like medicine or airport security to help us see what needs to be seen?"

09/03/2017

Gilles Pourtois
Professor at the Department of Experimental Clinical and Health Psychology at Ghent University and the recipient of an ERC Starting Grant in 2008

Effects of attention and motivation on early visual cortex activity in humans.

"In this talk, I'll review and discuss recent neurophysiological (EEG/ERP) findings from my lab informing about the expression and timecourse of modulatory effects exerted either by attention or motivation in early visual cortex. Contrary to previous findings, our results show that the earliest wave of activation in V1 (i.e., the retinotopic C1 component) is reliably influenced by attentional or motivational factors related to the current and internal state of the participant. Moreover, a simple gain control mechanism cannot easily accommodate these effects. Instead, they likely reflect an abstract and flexible coding of the stimulus that is optimized to deal efficiently with the demands imposed by the current attentional or motivational set".

03/04/2017

Hans Op de Beeck
Laboratory of Biological Psychology, University of Leuven

The multitude of neurological representations behind visual cognition.

"Theories in cognitive neuroscience make predictions about the content of cognitive representations in particular brain regions. With brain imaging, we can test these hypotheses through multi-voxel pattern analysis. Using this approach, more and more neural representations have been discovered in more and more neural regions. To make sense of such data, we need to consider functional hypotheses that explain the co-occurrence of multiple cognitive representations and the transitions among them. Testing these hypotheses requires the use of multifactorial experimental designs. In the domain of object recognition, findings with such designs back up the statement that ventral visual cortex contains feature-based categorical representations with sensitivity to multiple category-relevant object features. On the topic of expertise and learning it allows us to partially predict how neural representations will be changed through learning. In the domain of numerical cognition, the findings suggest that non-symbolic magnitude representations are less abstract than suggested previously. In more clinical populations, this approach has the potential of testing detailed and quantitative predictions from neurocognitive models of a wide range of disorders. Overall, this approach of theory-driven MVPA provides us with an unprecedented rich view of information processing in the human brain."

16/06/2017

Gregor Thut
Institute of Neuroscience and Psychology, University of Glasgow

Brain oscillations as drivers of brain function: Probing and manipulation of the brain-behavior relationship in humans using EEG/MEG and transcranial brain stimulation.

"A key question in cognitive neuroscience is how brain activity orchestrates brain function. Recent advances assign an important role to oscillatory brain activity. This type of activity is thought to reflect the assembly of neuronal elements into functional networks and can be measured using electro-/magnetoencephalography (EEG/MEG). My talk will cover developments in the field of EEG/MEG and non-invasive transcranial brain stimulation (NTBS) (and their combination) to examine the roles of oscillatory EEG/MEG signals in brain function (i.e. for "understanding the brain") and in serving as potential targets for experimental and clinical interventions (i.e. for "improving neurostimulation tools"). The talk will cover with perception/attention as the model system how we have used EEG/MEG to unravel correlative brain-behavior relationships (including new approaches for mapping EEG/MEG to psychophysics) to then guide causal interventions into oscillatory brain activity and associated function. I will outline how this has helped so far to identify neural predictors of task performance in oscillatory brain activity, to inform the interpretation of these brain signals (e.g. how they link to

information processing and theory) and to develop a principled framework for enhancing the efficacy of existing neuromodulation techniques."

07/07/2017

Valeria Della-Maggiore
Director of Physiology of Action Lab, Universidad de Buenos Aires

Impact of conflicting material on motor learning and consolidation.

"Anterograde interference (AI) usually refers to the impact of prior learning on the ability to successfully learn a subsequent, conflicting task. AI has been unambiguously reported in visuomotor and force-field adaptation tasks. It has even been suggested that AI may be stronger than retrograde effects, thereby masking the effect of interest in retrograde protocols aimed at studying consolidation. Yet, none of the work aimed at examining the magnitude of AI have actually quantified its effect on the speed of learning. In this seminar, I will show recent data from our lab in which we dissociated the impact of prior learning on the initial level of performance from its impact on the speed of learning and long-term memory. Contrary to current views, our results indicate that anterograde effects in visuomotor adaptation do not significantly affect the ability to learn conflicting material. Yet, it hampers memory retention, suggesting that it may however interfere with memory consolidation. Our findings may explain the failure of retrograde protocols to unveil memory consolidation in this type of motor learning."