Aarhus MEG Special 2014

DATE: Wednesday 14 May 2014
TIME: 10:45 - 17:00
PLACE: DNC Auditorium, Aarhus University Hospital, Building 10G, Nørrebrogade 44, 8000 Aarhus C.

PROGRAM:

10:45 – 11:00	Welcoming remarks and introduction to AU neuroimaging infrastructure.
11:00 – 12:15	Keynote talk **Professor Matti Hamalainen** Harvard University / Massachusetts General Hospital *The Quest for the Philosopher's Stone of Human Brain Imaging*

Abstract:

Neuroscientists and clinicians use several noninvasive imaging methods to gain insight into the anatomy of the human brain and the distribution and temporal orchestration of its activity. It is regularly emphasized that one should strive for the best possible temporal and spatial resolution. However, this quest for the philosopher's stone of brain imaging often ignores the fact that, especially for the functional imaging methods, the phenomena probed have inherent time scales and the temporal resolution cannot be improved by oversampling the signals. Even more importantly, different functional imaging methods provide information about distinct aspects of brain function. For example, electroencephalography (EEG) and magnetoencephalography (MEG) record the electric and magnetic field produced by neural currents while functional magnetic resonance imaging (fMRI) and optical imaging (NIRS) are sensitive to slow hemodynamic changes associated with the actual brain activity. Positron-emission tomography (PET) complements this picture by providing information about the distribution and concentration of specific chemical compounds in the brain. Therefore, to extract all available information about human brain function, all data should be preferably acquired simultaneously and analyzed jointly. This talk will discuss the characteristics of the electrophysiological and hemodynamic methods, the technology we have developed to analyze the imaging data separately and jointly, and will finally show examples of how these methods have been used to resolve intriguing questions in basic and clinical neuroscience.

12:15 – 13:15	Lunch break (light lunch provided)
13:15 – 14:30	Keynote talk **Dr. Markus Siegel** University of Tuebingen *Spectral fingerprints of large-scale neuronal interactions*

Abstract:

Normal brain function requires the interaction of functionally specialized but widely separated cortical regions. I will discuss a series of M/EEG experiments, in which we investigated large-scale cortical interactions by assessing correlations between neuronal oscillations in different brain regions. We found evidence that coherent oscillations mediate the attentional selection, perceptual disambiguation, and cross-modal integration of sensory inputs. Furthermore, we found that spontaneous cortical oscillations exhibit characteristic global correlation patterns that are specific for the underlying oscillation frequency and that are sensitive markers of pathological cortical development. Together, these data suggest that cognition is mediated by correlated oscillations within large-scale cortical networks. These oscillations may be 'spectral fingerprints' of underlying canonical neuronal computations.

14:30 – 15:45 Keynote talk

Professor Joachim Gross

Glasgow University

The functional role of oscillatory phase in coding and communication

Abstract:

Invasive and noninvasive studies in humans under physiological and pathological conditions converged on the suggestion that neural oscillations implement cognitive processes such as sensory representations, attentional selection, and dynamical routing/gating of information. However, most MEG/EEG studies investigating oscillations analyze temporal modulations of oscillatory amplitude or power differences between experimental conditions while ignoring phase. In contrast, computational models and invasive recordings (mostly in animals) provide compelling evidence about the functional role of phase dynamics in perception and cognition. These studies suggest that temporal phase coding could be advantageous in fundamental operations such as object representation and categorization by implementing efficient winner-takes-all algorithms, by providing robust sensory representations in unreliable environments, by lending themselves to multiplexing and by gating information flow in large-scale brain networks. Here, I aim to present recent evidence that highlights the functional role of oscillatory phase in coding and communication.

15:45 Introduction to running MEG studies at AU.

16:00 – 17:00 Lab tour and reception
Basement, Building 9