

SPECIAL SESSION

Electrophysiological Correlates of Behaviour

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Abstract

This symposium explores novel ways to monitor and analyse physiological brain activity in awake rodents and humans, for basic research purposes that addresses key aspects in cognitive and sleep research, as well as medically oriented applications with respect to the pharmacology and translational value of electrophysiological activity, and the use of biosignals for improved human-machine interfaces and a web-based platform for diagnosis of CNS conditions in humans.

Specifically, the first presentation by Nadine Becker and Matt Jones (University of Bristol) explores how spatial information acquired in a T-maze task is encoded in firing patterns of cortical and hippocampal areas, monitored in rats via chronically implanted electrode arrays, and discusses how area- and task-component-specific firing patterns can be monitored and deciphered, and what this implies for our understanding of cognitive processes in specific brain areas.

The second presentation by Valter Tucci (Genoa, Italy) investigates how genetic variables determine biological clocks and how information is time-stamped in the mouse brain. He will discuss the interplay between different time-keeping mechanisms on the basis of mouse models with mutations of clock genes, and how these affect the ability to time intervals at different timescales, related to sleep, circadian rhythms and an experimental timing task. Behavioural analysis was combined with long-term electrophysiological measures in the home-cage and uncovered close relations between timing behaviors and sleep physiology.

The third presentation by Lianne Robinson and Gernot Riedel (Aberdeen, UK), embarks on pharmacological aspects of electrophysiological and behavioural profiles recorded in chronically implanted rodents. The talk will explore how sleep-wake cycles, and vigilance stage-specific EEG parameters, are affected by cannabinoids in mice and rats, and how this can be exploited for cognitive and therapeutic research.

Continuing with this line of research, Karsten Wicke (Abbott, Germany) will present results from rat sleep EEG recordings that represent a back-translation from clinical human data to preclinical experiments and are used as a predictive translational model for the clinical potential of new pharmacological mechanisms. The antidepressant potential of drugs affecting the glutamatergic system will be discussed.

The remaining two presentations venture further into human and clinically oriented applications. Felix Putze and Tanja Schultz (Karlsruhe, Germany) will present developments in the area of 'cognitive technical systems', which utilises a range of biosignals emitted from the human body such as EEG and muscle activity. These signals are measured and interpreted by machines and offer an inside perspective on human mental activities, intentions, or needs and thus complements the traditional way of observing humans from the outside. Current and future applications for this technology will be discussed.

Finally, Björn Crüts (BrainMarker, The Netherlands) will introduce an internet-based platform for qEEG-based diagnosis of neurological and neurodegenerative disorders. He will focus particularly on examples regarding EEG markers for depression and respective treatments, to explain how their database and algorithms aid diagnosis and therapeutic applications in hospitals.

Together, these presentations span a wide range of technical and methodical approaches and their applications, and thus provide an exciting overview of a currently booming area of research and development.

SPECIAL SESSION CONTENTS (sorted by paper ID)

Sleep, Circadian Rhythms and Interval Timing

Valter Tucci (Istituto Italiano di Tecnologia, Genova)

Modulation of Sleep-Wake Cycles in Mice and Rats with Cannabinoids

Lianne Robinson, Andrea Plano, Anushka Goonawardena, Bettina Platt and Gernot Riedel (University of Aberdeen)

Cognitive Technical Systems

Felix Putze and Tanja Schultz (Karlsruhe Institute of Technology)

Neural Correlates of a Spatial Learning Task in Parietal Cortex, Prefrontal Cortex and Hippocampus

Nadine Becker and Matt Jones (University of Bristol)

NMDA Receptor Antagonists Induce Antidepressant-Like Sleep Changes: A Translational Model from Rats to Humans?

Karsten Wicke and G. Gross (Abbott, Germany)

Quantitative EEG for the Diagnosis of Disease States

Björn Crüts (BrainMarker, The Netherlands) and Pascal Römken (Atrium Medical Centre, The Netherlands)