

Introductory Remarks to Symposium 3

Prefrontal mechanisms of adaptive cognitive behaviors in health and disease

Ilka Diester and Artur Schneider, Freiburg

Our environment is constantly evolving, making the ability to adapt to changing, challenging conditions essential. For informed decision-making, an organism must store and update information about the world and its interactions with it. The prefrontal cortex (PFC) plays a key role in these higher-order cognitive functions, including attention, working memory, strategy shifting, and inhibitory control. Its impairment is linked to various mental disorders, such as loss of impulse control and schizophrenia, underscoring its clinical significance. The symposium will thus transition from exploring functions to dysfunctions in the adult and developing brain.

Claudia Böhm will kick-off the symposium with the organization of task-relevant information in PFC. In a multi-phase spatial working memory task in rats, PFC cells structured task elements (e.g., locations, actions, phases) based on the task's logic.

Young Investigator Speaker Zoe Jäckel will further illuminate the role of rat PFC subareas in action control by presenting data obtained with a battery of techniques including optogenetics, electrophysiology, behavioral analysis, and fMRI.

Turning to PFC-related pathologies, M. Victoria Puig will show that dysfunctional prefrontal-hippocampal communication plays critical roles in cognitive impairment observed in schizophrenia, and the contribution of serotonin receptors to the modulation of prefrontal-hippocampal circuits. Bringing developmental aspects into play, Paul G. Anastasiades will show how disruptions in postnatal synaptic maturation of the prefrontal cortex may contribute to a number of neuropsychiatric disorders, such as schizophrenia and autism.

Peter J. Uhlhaas will roundup the symposium by discussing cognitive deficits in schizophrenia that are linked to PFC dysfunction highlighting a disrupted excitation/inhibition balance, involving PV+ interneurons and AMPA/NMDA receptor activity. He will present oscillatory impairments in schizophrenia. These oscillations, maturing during adolescence, may underlie PFC-circuit development and contribute to psychosis onset.

The symposium is supported by the Research Unit FOR5159 "Resolving prefrontal flexibility".

Symposium 3

*Wednesday, March 26, 2025
14:30-16:30, Lecture Hall 104*

Chairs: Ilka Diester and Artur Schneider, Freiburg

- 14:30 Claudia Böhm, Berlin
ORGANIZATION OF TASK ELEMENTS INTO FUNCTIONAL MODULES IN PREFRONTAL CORTEX (S3-1)
- 14:55 Zoe Jäckel, Freiburg
PREFRONTAL ORCHESTRATION: A CORTICAL NETWORK FOR RODENT MOTOR INHIBITION (S3-2)
- 15:10 M. Victoria Puig, Barcelona, Spain
PREFRONTAL-HIPPOCAMPAL NEURAL DYNAMICS AS USEFUL BIOMARKERS OF COGNITIVE IMPAIRMENT AND RESCUE IN SCHIZOPHRENIA: ROLE OF SEROTONIN RECEPTORS (S3-3)
- 15:35 Paul G. Anastasiades, Bristol, UK
SYNAPTIC DEVELOPMENT OF PREFRONTAL AND SENSORY CORTICAL CIRCUITS (S3-4)
- 16:00 Peter J. Uhlhaas, Berlin
PREFRONTAL CORTEX AND COGNITIVE DYSFUNCTIONS IN SCHIZOPHRENIA: THE ROLE OF NEURAL OSCILLATIONS AND E/I-BALANCE PARAMETERS (S3-5)
- 16:25 **Discussion / Concluding Remarks**

