

Introductory Remarks to Symposium 29

Neural circuits and decision strategies for behavioral trade-offs

Madhura Ketkar, Carlotta Martelli and Luisa Ramirez, Goettingen and Mainz

Animals, including humans, often must choose between conflicting behavioral strategies. For example, a foraging individual can decide to either keep exploiting a familiar location with limited food resources or explore other unknown but potentially richer locations. Such decision implies an added risk, such as that of starvation or predator encounters, leading to the emergence of an exploration-exploitation trade-off. Similar trade-offs exist across different behavioral contexts, from defensive behaviors, such as freezing or escaping, to thriving behaviors such as satisfying hunger or sexual drive. Optimal choices under such conflicting scenarios require animals to evaluate their options within the specific context, therefore integrating information from different neuronal circuits in a flexible and conditional manner. While these trade-offs have been extensively observed from humans to insects, the neuronal mechanisms underlying this complex decision making remain poorly understood.

This symposium will highlight recent advances in understanding how brains decide between competing behavioral choices. Bringing insights from different behavioral contexts, the speakers will discuss the neuronal principles underlying behavioral trade-offs in rodent, fish and fly brains. Carolina Rezaval will present her findings revealing a state-dependent dopamine filter system in the male *Drosophila* brain that balances threat perception and the drive to mate. Jean-Baptiste Masson will discuss a modelling approach that explores the link between the central nervous system and the body of a fly larva that implements a behavioral choice. In the young investigator talk, Katja Slangewal will show how the visual system of zebrafish integrates conflicting streams of information to form a unique behavioral decision. Mehran Ahmadlou will present neuronal mechanisms in mice that regulate the choice between exploratory, perseverative and disengaged behavioral strategies. Lastly, combining social foraging data and theoretical insights, Lisa Blum-Moyse will present a novel modelling framework that can generate testable hypotheses and guide experimental designs to study foraging decisions.

The symposium will receive financial support from SPP2205.

Symposium 29

Friday, March 28, 2025
14:30 -16:30, Lecture Hall 9

Chairs: Madhura Ketkar, Carlotta Martelli and Luisa Ramirez, Goettingen and Mainz

- 14:00 **Opening Remarks**
- 14:35 Carolina Rezaval, Birmingham, UK
FROM STIMULUS TO ACTION: HOW THE BRAIN BALANCES REPRODUCTIVE AND SURVIVAL NEEDS (S29-1)
- 15:00 Jean-Baptiste Masson, Paris, France
EMBODIED NEUROAI: DECISION MAKING WITH *DROSOPHILA* LARVA (S29-2)
- 15:25 Katja Slangewal, Konstanz
NEURAL BASIS OF VISUAL INFORMATION INTEGRATION AND DECISION MAKING IN LARVAL ZEBRAFISH (S29-3)
- 15:35 Mehran Ahmadlou, London, UK
A SUBCORTICAL SWITCHBOARD FOR CONTROLLING EXPLORATORY, PERSEVERATIVE, AND DISENGAGED STATES (S29-4)
- 16:00 Lisa Blum-Moyse, Konstanz
THEORETICAL MODELS OF SOCIAL FORAGING (S29-5)



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Evolutionary optimization of neuronal processing