

Introductory Remarks to Symposium 11

Wired for motion: perspectives on motor control

Jonas Fisch and Lena Lion, *junge Neurowissenschaftliche Gesellschaft*

How does the nervous system enable precise movements, from navigating complex environments and manipulating objects to social interactions? The answers lie in the intricate organization of molecular, neuronal, and circuit-level mechanisms that control motor behavior. Motor control demonstrates the nervous system's ability to adapt and coordinate, and understanding the neural basis of movement reveals how the nervous system directs motor functions, from reflexes to voluntary actions. In this symposium, we will explore the underlying principles of motor control from the molecular architecture of individual neurons to neuronal circuits involved in feedback integration to an application-oriented approach of computer-brain interfaces to provide tactile sensation in prosthetic devices.

Dr. Irene Pallucchi will present her work on how functional subtypes of zebrafish motoneurons and V2a interneurons are reflected in their molecular architecture. Both MN and V2a IN cluster into three groups reflecting the speed circuit modules in spinal motor networks, which enable flexible motor actions. Sirin Liebscher follows with insights into neuronal pathways in *Drosophila melanogaster* that regulate walking behaviors. By combining optogenetics and intracellular recordings, she links neuronal activity to locomotion phases and multimodal inputs, revealing novel insights into circuits driving adaptive movement. Dr. Corinna Gebehart investigates *Drosophila* brain circuits for self-motion estimation. Combining electrophysiology, imaging, and connectivity studies to dissect the neural architecture of action selection, she identifies a network sensitive to angular motion that integrates signals across timescales for locomotion control and action selection. Focusing on sensory integration, Prof. Dr. Graziana Gatto examines how mouse spinal circuits relay sensory and descending inputs to generate reflexive and complex behaviors, employing optogenetics and neuro-mechanical modeling. Concluding the symposium, Dr. Giacomo Valle will discuss intracortical microstimulation in the somatosensory cortex, designing spatiotemporal stimulation patterns to restore natural touch in bionic hands.

This symposium is generously supported by 3Brain.

Symposium 11

Thursday, March 27, 2025
10:30 - 12:30, Lecture Hall 8

Chairs: Jonas Fisch and Lena Lion,
junge Neurowissenschaftliche Gesellschaft

- 10:30 **Opening Remarks**
- 10:35 Irene Pallucchi, Basel, Switzerland
MOLECULAR BLUEPRINTS FOR SPINAL CIRCUIT MODULES CONTROLLING LOCOMOTOR SPEED IN ZEBRAFISH (S11-1)
- 11:00 Sirin Liebscher, Wuerzburg
ELECTROPHYSIOLOGICAL CHARACTERIZATION OF CENTRAL BRAIN NEURONS CONTROLLING WALKING IN *DROSOPHILA* (S11-2)
- 11:15 Corinna Gebehart, Lisboa, Portugal
MULTILAYER CIRCUIT PROCESSING FOR SELF-MOTION ESTIMATION IN *DROSOPHILA* (S11-3)
- 11:40 Graziana Gatto, Cologne
SENSATION TO ACTION: A SPINAL PERSPECTIVE (S11-4)
- 12:05 Giacomo Valle, Gothenburg, Sweden
RESTORING TOUCH THROUGH A BRAIN INTERFACE: SPATIO-TEMPORAL PATTERNING OF MICROSTIMULATION OF HUMAN SOMATOSENSORY CORTEX (S11-5)

