Introductory Remarks to Symposium 18

Astrocyte control of neural circuit function and animal behaviour

Johannes Hirrlinger and Christian Henneberger, Leipzig and Bonn

Over the past few decades, fascinating new insights into astrocyte biology have solidified the idea that these cells are also indispensable for neural circuit development, operation, and adaptation throughout life. Astrocytes and other glial cells like microglia and oligodendroglial lineage cells together with neurons form neuron-glia assemblies in which all cell types work in unison to jointly fulfil the function of the brain or a specific brain region. These assemblies do not just increase the dimensionality of the potential cellular interactions, they also fundamentally change the properties of neural circuits, because glial cells and their networks have vastly different structural and functional properties. Consequently, accumulating evidence shows that astrocytes crucially contribute to controlling animal behavior on various time scales. Despite this progress and such exciting novel insights, many longstanding questions remain: How do astrocytes integrate and respond to diverse neuronal signals at the cellular and population levels? How do they convert this task- and animal state-dependent information into functional outputs that modulate neural circuit dynamics and animal behavior? How does this astrocytic influence on neurons augment/complement neural circuit properties? How does impairment of these functions contribute to disease? How can beneficial functions of astrocytes be boosted in disease to protect CNS cells from damage and promote regeneration? How do other glial cells like microglial cells affect neural circuit dynamics and animal behavior?
With this symposium, we aim at providing an up-to-date snapshot of astrocytes' role in regulating neural network function and animal behavior, and extend this view on the contribution of microglial cells. We will discuss that glial cells are an essential element in controlling animal behavior, and lay down the concept of neuron-glia assemblies as the fundamental computational units underlying brain function. This symposium will be a primer and inspiration for developing and/or refining new concepts that take a comprehensive view at brain function and animal behavior.

Symposium 18

Thursday, March 23, 2023
16:15 - 18:15, Lecture Hall 8

Chairs: Johannes Hirrlinger and Christian Henneberger, Leipzig and Bonn

16:15 **Opening Remarks**

16:20 Hajime Hirase, Copenhagen, Denmark
OPTOGENETIC ACTIVATION OF TRANSIENT ASTROCYTIC Gq SIGNALING IN FRONTAL CORTEX (S18-1)

16:45 Marie-Luise Brehme, Hamburg
CHEMOGENETIC ACTIVATION OF Gq IN MICROGLIA LEADS TO DEFICITS IN SYNAPTIC PLASTICITY AND REMOTE MEMORY (S18-2)

17:00 Christian Henneberger, Bonn
AN ASTROCYTIC SIGNALING LOOP FOR FREQUENCY-DEPENDENT CONTROL OF DENDRITIC INTEGRATION AND SPATIAL LEARNING (S18-3)

17:25 Stefanie Schirmeier, Dresden
THE ROLE OF GLIAL CELLS IN POST-INGESTIVE NUTRIENT SENSING AND FOOD CHOICE BEHAVIOR (S18-4)

17:50 Amit Agarwal, Heidelberg
STRUCTURAL AND FUNCTIONAL DYNAMICS OF MITOCHONDRIA IN ASTROCYTES *IN VIVO* (S18-5)