



Introductory Remarks to Symposium 24

Form follows function? Rules and consequences of structural synaptic plasticity

Tobias Rose and J. Simon Wiegert, Martinsried and Hamburg

Learning and memory formation are strategies of the brain to adapt to the ever-changing outside world, and synaptic plasticity in neuronal circuits is considered one of the key mechanisms involved. On the one hand, animals constantly form new memories, on the other hand, some of these memories can last for the entire lifetime of an animal. Thus, plasticity and stability of neuronal circuits need to be well-balanced. How structural and functional circuit modifications are coordinated to fulfill such a challenging task is still unclear.

It is well established that altered experience triggers structural modifications in the brain, including changes in dendritic branching and spine size, axonal bouton size, and changes in the formation and elimination rates of individual synapses. Furthermore, certain patterns of neuronal activity can persistently enhance or decrease functional synaptic transmission. It is now widely accepted that both structural and functional plasticity are involved in learning and memory in many brain areas such as hippocampus, neocortex, amygdala, and striatum.

Recent work has begun to address how structural adaptations such as changes in synapse morphology or synaptic wiring correlate with functional circuit modifications. It is well established that bidirectional functional modifications of synaptic strength are associated with bidirectional structural changes such as shrinkage, expansion, destabilization, and stabilization of synaptic elements *in vitro*. However, it still remains challenging to reveal the rules underlying long-lasting synaptic and functional modifications and their relevance for learning and memory formation *in vivo*. Especially, how initial plastic changes are transformed into stable circuit modifications is still far from being understood.

This symposium will highlight recent insights into the link between structural and functional synaptic plasticity, addressing the subject from different angles ranging from theoretical approaches, over experimental observations on structure-function interactions at individual synapses *in vitro*, to studies investigating the rules and consequences of circuit plasticity and stability *in vivo*.

Symposium 24

Friday, March 22, 2019
11:30 - 13:30, Lecture Hall 10

Chairs: Tobias Rose and J. Simon Wiegert,
Martinsried and Hamburg

- 11:30 **Opening Remarks**
- 11:35 Anthony Holtmaat, Geneva, Switzerland
SYNAPTIC MECHANISMS FOR PLASTICITY IN
THE SOMATOSENSORY CORTEX (S24-1)
- 12:00 Tara Keck, London, UK
STRUCTURAL DYNAMICS FOLLOWING
SENSORY DEPRIVATION IN MOUSE VISUAL
CORTEX (S24-2)
- 12:25 J. Simon Wiegert, Hamburg
THE SEQUENCE OF PLASTICITY INDUCING
EVENTS SETS THE LIFETIME OF HIPPOCAMPAL
SYNAPSES (S24-3)
- 12:50 Panayiota Poirazi, Heraklion, Greece
MEMORY LINKING THROUGH SYNAPSE
CLUSTERING IN ACTIVE DENDRITES (S24-4)
- 13:15 Brenna C. Fearey, Hamburg
MAPPING ACTION POTENTIAL BACK PRO-
PAGATION USING SYNTAGMA (S24-5)
- 13:25 **Concluding Remarks**