

Introductory Remarks to Symposium 25

Spike timing-dependent plasticity (STDP): from functions in circuits towards possible treatment of humans

Elke Edelmann and Volkmar Leßmann, Magdeburg

STDP is a physiological relevant stimulation protocol to induce bidirectional synaptic plasticity and serves as a cellular model for different types of learning and memory. Timed causal or anti-causal pairings of activity in synaptically connected neurons lead to either long-lasting synaptic enhancement (timing-dependent long-term potentiation, t-LTP) or depression (t-LTD). T-LTP and t-LTD like changes can be observed in different experimental systems ranging from cultured neurons up to complex behaviors in humans. Recently, computational neuroscience has been proven to be a powerful and versatile tool to better understand the complex function of STDP.

In our symposium we aim at presenting recent progress in different areas of STDP research in a "bench-to-bedside" approach, including computational neuroscience. We will report about STDP-like mechanisms observed in distinct neuronal circuits in various brain areas. We will cover different aspects of STDP and STDP-like mechanisms, starting with a discussion on how STDP shapes neuronal circuits, networks and synaptic efficacies. Using those concepts, we will move on to STDP learning rules and underlying signaling cascades engaged by different STDP paradigms in brain slices. In the second part of our symposium, we will talk about timing-dependent plasticity mechanisms in the human motor system. Here we will address STDP-like mechanisms in motor learning in humans, which might lead to novel strategies to improve motor skill learning. Finally we will discuss novel experimental data, which indicate that repetitive transcranial magnetic stimulation may recruit STDP-like mechanisms to affect and regulate cortical excitability.

In our symposium, we will connect results from cutting edge STDP research in distinct fields of neuroscience that can be observed at different levels of neuronal complexity, ranging from theoretical considerations *in silico* to application in humans.

The symposium is supported by the DFG (SFB779).

Symposium 25

Friday, March 24, 2017
14:30 - 16:30, Lecture Hall 9

Chairs: Elke Edelmann and Volkmar Leßmann,
Magdeburg

- 14:30 **Opening Remarks**
- 14:35 Jochen Triesch, Frankfurt
STDP AND ITS FUNCTION IN NEURAL
CIRCUITS (S25-1)
- 15:00 Elke Edelmann, Magdeburg
HOW SPIKE PATTERNS SHAPE SPIKE TIMING-
DEPENDENT PLASTICITY RULES AND UNDER-
LYING SIGNALING MECHANISMS (S25-2)
- 15:25 Patrick Ragert, Leipzig
NON-INVASIVE ASSESSMENT OF TIMING-
DEPENDENT PLASTICITY IN THE HUMAN
MOTOR SYSTEM (S25-3)
- 15:50 Andreas Vlachos, Düsseldorf
REPETITIVE TRANSCRANIAL MAGNETIC
STIMULATION: ARE WE EXPLOITING SPIKE-
TIMING DEPENDENT PLASTICITY FOR THE
TREATMENT OF PATIENTS? (S25-4)
- 16:15 Aarti Swaminathan, Berlin
SYNAPTIC INPUT AND OUTPUT OF HILAR
MOSSY CELLS DURING SHARP WAVE RIPPLES
(S25-5)
- 16:25 **Concluding Remarks**

