# *COLLOQUIA IN CELLULAR SIGNALLING*

Venue: Medical University Vienna, Center for Physiology and Pharmacology,
Institute of Pharmacology, Waehringerstrasse 13a, 1090 Vienna, "**Leseraum**".
(Harald Sitte, Tel.: (01) 40160 31323, *harald.sitte@meduniwien.ac.at,*
Stefan Böhm, Tel.: (01) 40160 31200*, stefan.boehm@meduniwien.ac.at)*

---

**Friday** **10.01.2014 11:00 s.t.** **Peter Jonas (host: St. Böhm)**

Institute of Science and
Technology Austria
(IST Austria)
Am Campus 1
A – 3400 Klosterneuburg

## "Synapse-specific coupling between $Ca^{2+}$ channels and release sensors"

---

**Peter Jonas (**peter.jonas@ist.ac.at**)**

Abstract:
The coupling between presynaptic $Ca^{2+}$ channels and release sensors is a key factor that determines the efficacy and speed of synaptic transmission. Classical work at the young calyx of Held, a key synapse in the auditory pathway, suggested that the coupling between $Ca^{2+}$ channels and release sensors is loose, with a mean distance of approximately 100 nm. To probe the coupling configuration in mature synapses in cortical microcircuits, we examined GABAergic synapses between fast-spiking interneurons and granule cells in the dentate gyrus using the exogenous $Ca^{2+}$ chelators BAPTA and EGTA. We found that at these synapses coupling was very tight, with an average distance of 10–20 nm. Similarly, we found tight coupling at GABAergic synapses in the cerebellum. These results suggest that nanodomain coupling is much more prevalent than previously thought. To examine whether any synapse in the mature CNS makes use of loose coupling, we further probed the coupling distance at glutamatergic mossy fiber synapses, a key synapse in the trisynaptic circuit of the hippocampus. We found that coupling distance at this synapse was loose, with a mean distance of ~80 nm, and that loose coupling enabled presynaptic plasticity at these synapses. Thus, loose coupling is not a developmental phenomenon, as previously thought, but is regulated in a synapse-specific manner. Furthermore, loose coupling enables several forms of presynaptic plasticity.

References

Bucurenciu I, Kulik A, Schwaller B, Frotscher M, Jonas P (2008) Nanodomain coupling between $Ca^{2+}$ channels and $Ca^{2+}$ sensors promotes fast and efficient transmitter release at a cortical GABAergic synapse. Neuron 57:536-545.

Eggermann E, Bucurenciu I, Goswami SP, Jonas P (2012) Nanodomain coupling between $Ca^{2+}$ channels and sensors of exocytosis at fast mammalian synapses. Nature Reviews Neuroscience 13:7-21.

Vyleta NP, Jonas P (2013). Loose coupling between $Ca^{2+}$ channels and release sensors at a plastic hippocampal synapse. Science, in press.