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Bonn Lecture Series in Neuroscience

Diving into structure and function of nervous systems with 3D-EM techniques

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Tuesday, September 5th 2017, 16:00h
Epileptology, Seminar Room, Ground Floor

The application of emerging light and electron microscopy techniques allow us to study architecture and function of nervous systems in unprecedented detail. My group applies electron tomography as ultra high 3D resolution imaging technology to study synaptic architecture. We use a synergistic combination of two highly tractable models where most appropriate: The C. elegans nervous system for efficient candidate identification and manipulation and the nervous system of the zebrafish larva as vertebrate model to allow a view on evolutionary conservation of function. In the C. elegans model we recently added a focus of research directed to the Dauer larva which represents an alternative route in the life cycle of the nematode when facing adverse environmental conditions. A further special interest of our research is to combine microscopy techniques in a so called correlated light and electron microscopy (CLEM) approach. Thereby one can profit from the advantages of both techniques, allowing access to the ultrastructural context and the precise localisation of multiple molecular factors. Recently, we also adapted our sample preparation protocols for Focused Ion Beam Scanning Electron Microscopy (FIB/SEM) in order to understand architectural building principles of nervous systems at a larger scale than possible with electron tomography.

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Selected Publications

Markert SM, Bauer V, Muenz TS, Jones NG, Helmprobst F, Britz S, Sauer M,Rössler W, Engstler M, **Stigloher C.** 3D subcellular localization withsuperresolution array tomography on ultrathin sections of various species.Methods Cell Biol. 2017;140:21-47. doi: 10.1016/bs.mcb.2017.03.004. Epub 2017 Apr19. PubMed PMID: 28528634.

Kaltdorf KV, Schulze K, Helmprobst F, Kollmannsberger P, Dandekar T, **Stigloher C.** FIJI Macro 3D ART VeSElecT: 3D Automated Reconstruction Tool for VesicleStructures of Electron Tomograms. PLoS Comput Biol. 2017 Jan 5;13(1):e1005317.doi: 10.1371/ journal.pcbi.1005317. eCollection 2017 Jan. PubMed PMID: 28056033;PubMed Central PMCID: PMC5289597.

Markert SM, Britz S, Proppert S, Lang M, Witvliet D, Mulcahy B, Sauer M, Zhen M, Bessereau JL, **Stigloher C.** Filling the gap: adding super-resolution to arraytomography for correlated ultrastructural and molecular identification of electrical synapses at the C. elegans connectome. Neurophotonics. 2016 Oct;3(4):041802. doi: 10.1117/1.NPh.3.4.041802. Epub 2016 May 4. PubMed PMID:27175373; PubMed Central PMCID: PMC4855082.

Helmprobst F, Frank M, **Stigloher C.** Presynaptic architecture of the larvalebrafish neuromuscular junction. J Comp Neurol. 2015 Sep 1;523(13):1984-97. doi:10.1002/cne.23775. Epub 2015 Apr 9. PubMed PMID: 25766140.

Pinan-Lucarré B, Tu H, Pierron M, Cruceyra PI, Zhan H, **Stigloher C**, Richmond JE, Bessereau JL. C. elegans Punctin specifies cholinergic versus GABAergicidentity of postsynaptic domains. Nature. 2014 Jul 24;511(7510):466-70. doi:10.1038/ nature13313. Epub 2014 Jun 1. PubMed PMID: 24896188.