Neurobiology

LS.5.P139
Studying the Wiring and Connectivity of Visual Interneurons in a Locust

G. Leitinger[1], S. Wernitznig[1], A. Zankel[2], F.C. Rind[3], E. Bock[1], E. Pritz[1], P. Pölt[2]

[1]Medical University of Graz, Institute of Cell Biology, Histology and Embryology, Graz, Austria
[2]University of Technology, Institute of Electron Microscopy and Nanoanalysis, Graz, Austria
[3]Newcastle University, Institute of Neuroscience, Newcastle upon Tyne, United Kingdom

Gerd.leitinger@medunigraz.at
Keywords: Serial Block Face SEM, insect, lobula

Knowledge about the wiring and connectivity of neurons is a prerequisite if we aim to understand how these neurons interact with each other. We are studying already identified neurons underneath the eye of locusts that function as a collision sensor [1]. If an object approaches the eye on a collision course, the animals automatically avoid the collision with either steering manoeuvres during flight, or with jumps, or by taking cover. This sensor is robust and simple: only two neurons, the lobula giant movement detectors (LGMD) 1 and 2, are responsible for triggering this response. Whereas the anatomy of the LGMDs, and their response to images of approaching objects have been well described (reviewed in reference [2]), little is known about the wiring and connectivity of so-called afferent neurons, which convey information about changes in light intensity to the LGMDs.

To study the wiring and connectivity of identified neurons, it is necessary to reconstruct their shape and to localise their synaptic connections. Serial block face scanning electron microscopy, a novel technique developed for automated serial sectioning and imaging of soft materials, is being used for this purpose [2,3]. For this aim, tissue samples are embedded in resin, series of micrographs are automatically recorded, and thereafter, the neuronal processes and their synapses are 3D-reconstructed. The micrographs stretch across several hundreds of sections with a section thickness of 70nm.

Results presented in this poster will show how hundreds of afferent neurons are connected with a sample taken from the dendritic arbour of the lobula giant movement detectors (Figure 1). The locations of their synaptic connections will be displayed in 3D, and it will be shown which part of the dendritic arbour appear to be the main input regions.

1. F.C. Rind, D.I. Bramwell, J Neurophysiol. 75 (1996), p. 967.
2. F.C. Rind, P.J. Simmons Trends Neurosci.;22 (1999), p. 215.
3. W. Denk, H. Horstmann, PLoS Biol. 2 (2004). P. e329.
4. A. Zankel et al., J Microsc. 233 (2009). P.140.
5. Grant Sponsor: Das Land Steiermark, HTI:SMApp Programme 2012.
6. We thank Bernhard Robinig and Peter Schönbacher for reconstructing the neurons.

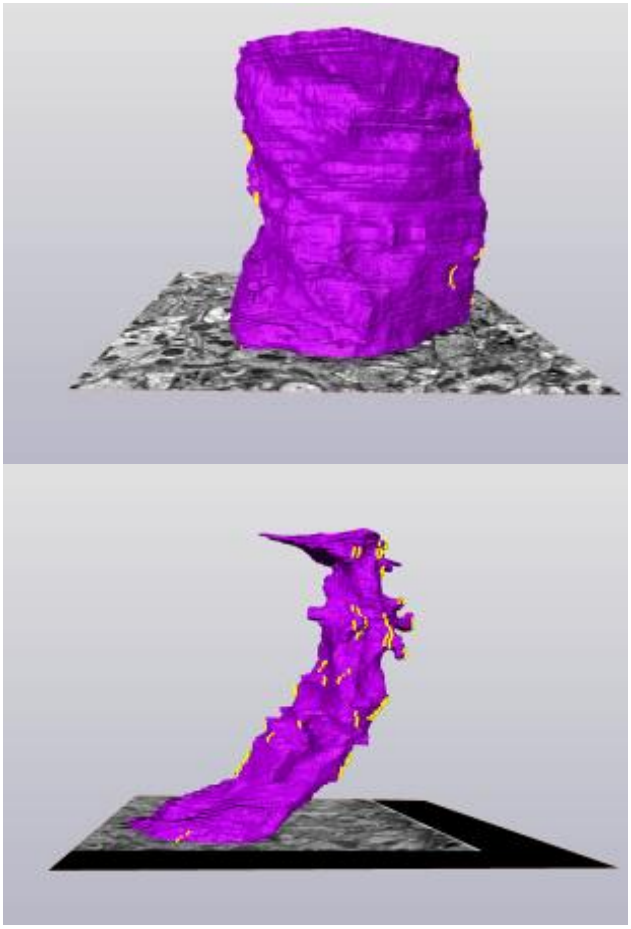

Figure 1. Reconstructions of two 8.4µm long samples of the dendritic tree of the LGMD2 (purple) carried out with Amira® software. Yellow: Locations of synaptic connections of afferent neurons onto the LGMD2.