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**Postdoctoral opportunity**

UCSD

# Dense reconstruction of behavioral circuits

**The Wagenaar Lab** is seeking to hire up to two postdocs to participate in the next generation of our efforts to establish a functional connectome of the nervous system of the medicinal leech, a well-established model organism in electrophysiology. Segmental ganglia of invertebrates such as the medicinal leech represent **a unique opportunity to connect network anatomy at the single-synapse level with functional significance at the level of the animal**, since individual neurons in these ganglia play well-defined roles in behavior that are preserved from animal to animal. We have already demonstrated we can obtain **anatomical data at the nanometer scale** using **serial block-face electron microscopy (SBEM)** from an individual animal in which we also recorded neuronal activity using a double sided microscope and **voltage-sensitive dyes (VSD)** during several important behaviors. Our next target is to image a second ganglion at even higher resolving power and completeness. The resulting anatomical and functional data will allow us to understand how the animal's nervous system supports its behavior. The project consists of the following parts:

1. **Voltage-sensitive dye imaging as the leech generates neuronal activity driving behavior;**
2. **Sample preparation for electron microscopy;**
2. **Development and application of automated or semi-automated circuit reconstruction strategies**;
3. **Electrophysiological and/or VSD imaging experiments to further our understanding of various neural circuits underlying leech behavior**.

Successful applicants could focus on any (combination) of those steps. We also have an ongoing project on crossmodal sensory integration, but the project above would be of higher priority.

Successful candidates will have the opportunity to interact closely with **Dr. Mark Ellisman** and his team at the **National Center for Microscopy and Imaging Research (NCMIR)** at the University of California, San Diego, our main collaborator on the project. You will also have the opportunity to present your work at relevant national or international conferences and to fully participate in the richness of academic life at Caltech.

Applicants should have:

- **A Ph.D. in neuroscience** or **computer science**, or a closely related field relevant to the respective part of the project;
- **Strong technical skills** in electron microcopy, EM image analysis, and/or electrophysiology as well as in general data analysis and interpretation;
- The ability to work independently, set priorities, multitask, seek technical input from diverse sources, and maintain good familiarity with related scientific literature.

To apply, please send a CV including a list of publications and a statement of research interests to Daniel Wagenaar (**daw@caltech.edu**). Please include information for three references. Review of applications will start immediately and continue until the positions are filled.

More information about our lab is at **http://wagenaarlab.caltech.edu**.

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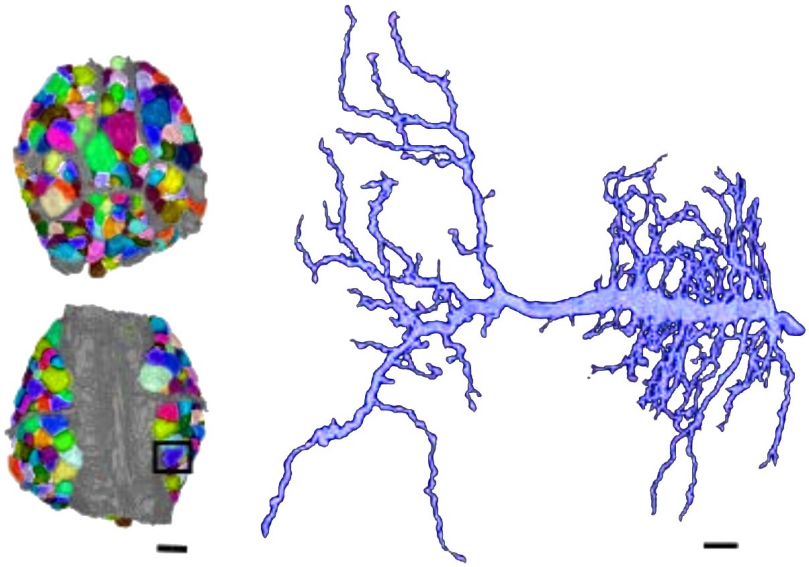
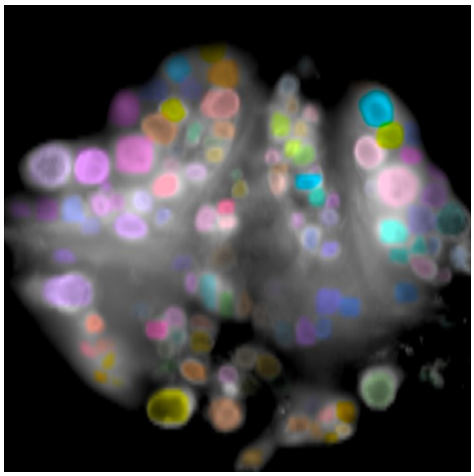
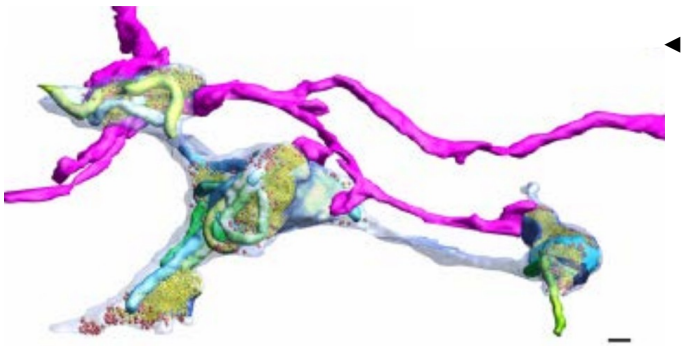


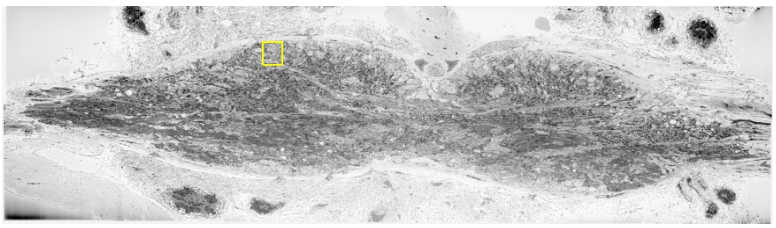
▲ Cell bodies on the ventral and dorsal surfaces of a juvenile ganglion and reconstructed arborization of a motor neuron. Scale bars: 40 µm; 10 µm.



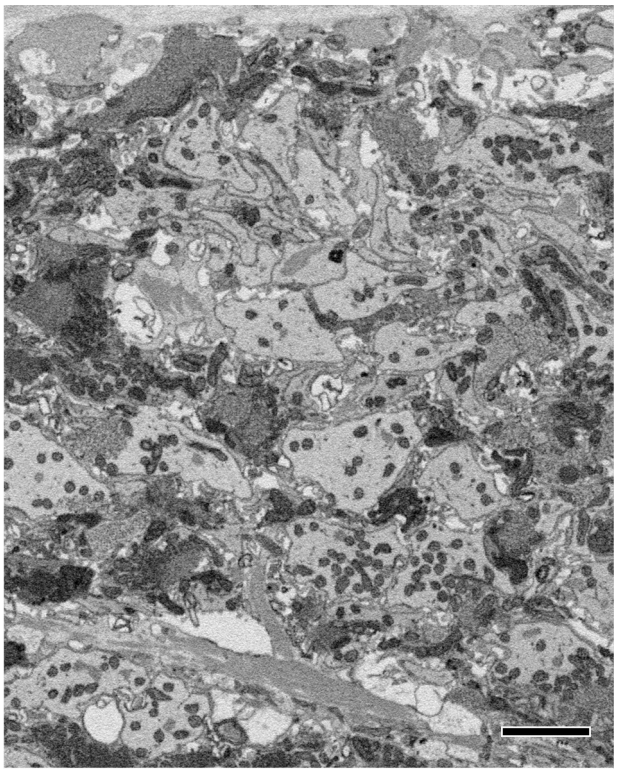
▲ Ventral aspect of a ganglion with cell bodies colored based on the phase of their electrical activity during swimming.



◄ Synaptic boutons and postsynaptic processes. Scale bar: 500 nm.



▲ Transverse section through the neuropil of an adult ganglion.



Small portion of an SBEM slice of a VSD-imaged ganglion with several neuronal processes clearly visible. Scale bar: 2 µm. ►