Prof. Dr. Marion Silies, Dr. Carlotta Martelli, Dr. Christopher Schnaitmann

Background

How is information processed in the brain? The brain follows one ultimate goal: to enable the animal to elicit a behavioral response that successfully deals with environmental challenges. Sensory systems act like interfaces between the world and the brain itself. They capture and transform physical or chemical inputs like light, sound, odorants and tastants into electrical signals.

In this module we introduce the neural circuits that mediate sensory perception and describe the tools that can be use to investigate circuit architecture and function. You will learn a range of neuroscience techniques (physiology / imaging / behavior), data analysis, and molecular methods.

Methods covered in the module In vivo recordings of neuronal activity





We will measure neuronal activity in living flies, while we present them specific stimuli. For example, we use in vivo two photon microscopy to measure the responses in neurons of the fly visual system in response to visual stimuli. We can do this with cell type specificity, by expressing genetically-encoded calcium or voltage indicators in our cell types of interest, using the genetic tools availabe in flies.



Alternatively we use in vivo electrophysiology to quantify the electrical signals that are generated by a stimulus in specific neurons. For example, we can measure the response of single olfactory receptor neurons located on the fly antenna to puffs of odors or to optogenetic activation.

Important facts

time capacity modules module A

summer semester

max. 12 students

module **B**

moudle C

lecture + seminar + practical course (3 wk) research practical in the Silies, Martelli, or Schnaitmann lab. You will work on a current research topic within the lab (5+ wk) lecture + seminar





By combining precisely controlled behavioral assays with genetic manipulation of neural activity, we directly link neural activity to behavior. For example, by silencing neurons in the visual pathway, we can interfere with the way the fly responds to a moving stimulus.



Institute of Developmental **Biology and Neurobiology**

More info



Martelli lab Silies lab

mrtlllab.uni-mainz.de/ ncl-idn.biologie.uni-mainz.de/ Schnaitmann lab schnaitmannlab.uni-mainz.de/



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Molecular tools and genetics



To understand the molecular basis of specific neuronal properties and circuit function, we use molecur biology and genetic techniques, incl. RNAseq, ChipSeq, and transgenesis for analysis of candidates genes

Data processing and analysis





We will introduce you to basic programming and data science, using MATLAB or Python, allowing you to process, analyze and display physiological and behavioral data.

Linking circuit properties to behavior

control L3 block

L2 block

1.5