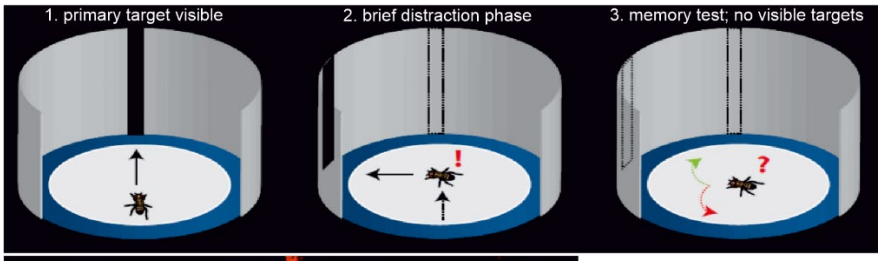
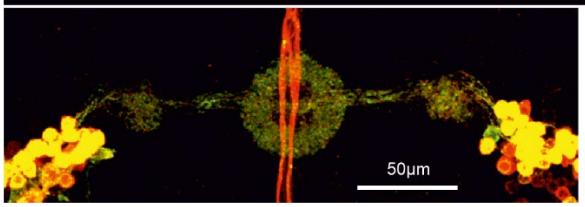
Neuronal Basis of Behavior

Institute of Developmental Biology and Neurobiology

Content and Qualification Goals of Module 11

The fly *Drosophila* offers a unique combination of a rich behavioral repertoire and the tools for precise manipulation of its nervous system. This fosters analysis of the neural basis of motivation control, depression and stress-resilience, attention, learning and memory, locomotor and orientation behavior. The study of disease- and age-related changes in flies bears relevance for understanding and curing the human nervous system, because many signaling pathways are conserved. The **A-module** offers rotation through stations such as inspection of fly brains using immunohistochemistry and laser-scanning microscopy, quantification of motivation and attention in flies, of short- and long-term memories and orientation behavior while applying different neurogenetic methods such as RNA interference, thermo- or optogenetics. Accompanying lectures will explain the theoretical background. In the consecutive **B-module** we offer 4-weeks scientific projects out of our current research under the guidance of one of our PhD students. Examples are depicted below, for instance the study of the neuronal basis of motivation control, a depression-like state, or stress resilience, of attention control and the role of the dopaminergic system thereby. The **lecture** for **A-** and **C-module** will cover - in a comparative approach between man and model animals - learning and memory, motivation and depression, attention control, vertebrate motor control from spinal reflexes and brain stem to cortical areas, the mirror neuron system, the basal ganglia and the cerebellum. The **literature seminar** for **A-** and **C-module** will cover *Drosophila* behavioral and neurogenetic methods background.



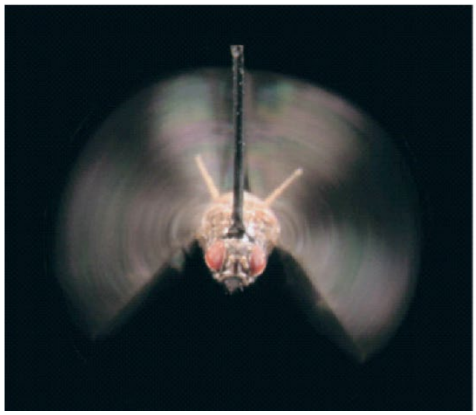


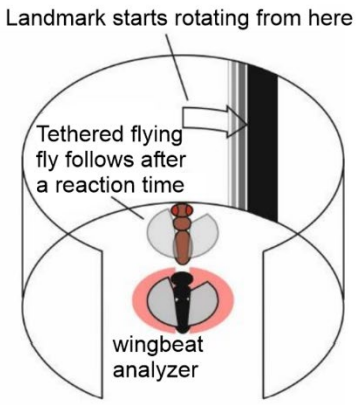
Test for a visual working memory of flies and the brain structure 'ellipsoid body' storing directional information. This memory requires the "Alzheimer protein" APPL: here double-tagged: N-terminus, green; C-terminus, red; unprocessed APPL, yellow.

Responsible Persons / Tutors
Prof. Dr. Roland Strauss / Dr. Burkhard Poeck, Dr. Jürgen Schramme, Teuta Wille, the PhD students of our group.

Tethered flight and the fly as a model for AD(H)S. Normal flies follow a landmark that catches their attention. Overstimulation in critical phases of life can challenge their attention, which can be restored by manipulations of dopaminergic neurons or the dopamine level.

Module 11 is offered in summer terms. A/B 11/14 CP, capacity 12 students. **C** 5 CP, cap. 12 students.





Flies in a depression-like state refrain from climbing wide gaps. Antidepressants and sugar reward can restore the active state. The motivation control systems of humans and flies show common features; both are using serotonin and dopamine for signaling stressful and rewarding events.