DANDRITE
Danish Research Institute of Translational Neuroscience
Nordic EMBL Partnership for Molecular Medicine

AARHUS UNIVERSIT
INSTITUT FOR MOLEKYLÆR BIOLOGI OG GENETIK

Drosophila neurogenetics and circuit neuroscience

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We are a small international english-speaking lab with a friendly atmosphere. Motivated and skilled Bachelor, Master or Erasmus students with strong interest in neuroscience and animal behaviour are welcome to apply.

How do genes, neurons and neuronal circuits control and coordinate behavior? How do interconnected neurons process information and compute behavioral decisions?
Fruit flies are a great model system to study these fascinating questions. They show complex behavior, but have a small brain, which can be elegantly manipulated with genetic tools.
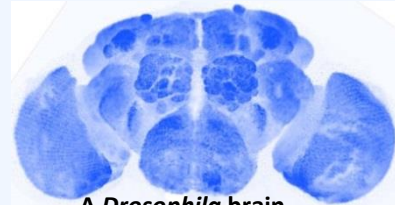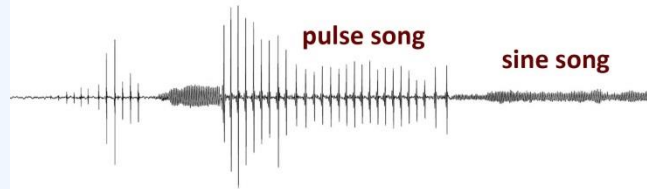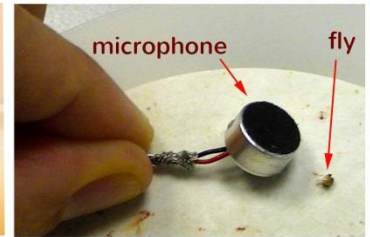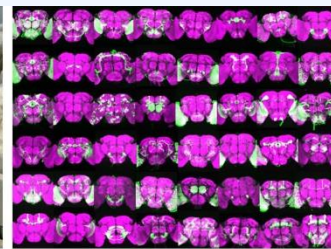

A *Drosophila* brain

Our model system/Techniques:

Model organism: We keep over 1000 transgenic fly lines for various behavioral studies. With these, we can visualize individual neurons in the nervous system, silence or activate them and manipulate gene expression.

Drosophila courtship song: When a male fly meets a female, he shows courtship behavior and sings a song to her by vibrating his wing. Courtship song requires complex sensory processing and exquistite motor control. In the lab, we can record song with a custom made system and analyse it, in order to understand how this behaviour is generated in the nervous system and which genes and neurons are involved.

Techniques:
- *Drosophila* culture and genetics
- Nervous system dissection, confocal microscopy, 3 D reconstruction of neurons
- Genetic silencing and activation of neurons (Optogenetics), RNAi
- Behavioral experiments, song recordings
- Molecular biology, genotyping

pulse song   sine song

microphone   fly

Drosophila stocks, brains with Gfp expressing neurons, a singing male, microphone for recording song and courtship song.

Possible projects address:
- What are circuit mechanisms of multifunctional motor control and pattern generation? Anatomical and functional analysis of wing muscle motor neuron circuits.
- Parkinson disease model in *Drosophila*.
- Optogenetics: Red-shifted Channelrhodopsin to activate neurons and control behavior.
- How do different behaviours interact and influence each other on a circuit level?
- What is the genetic and neuronal basis of specific forms of memory/learning?
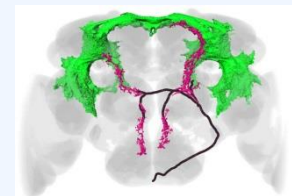
Reconstructed neurons

Publications:
M.N. Verzijden, J. K. Abbott, A.C. von Philipsborn, V. Loeschcke; **Male Drosophila melanogaster learn to prefer an arbitrary trait associated with female mating status.** *Current Zoology* 2015, 61 (6): 1036-1042.
A.C. von Philipsborn, S. Jörchel, L. Tirian, E. Demir, T. Morita, D. L. Stern, B. J. Dickson; **Cellular and Behavioral Functions of fruitless Isoforms in Drosophila Courtship.** *Current Biology* 2014, 24 (3): 242-251.
A.C. von Philipsborn, T. Liu, J.Y. Yu, C. Masser, S.S. Bidaye, B.J. Dickson; **Neuronal control of Drosophila courtship song.** *Neuron* 2011, 69(3): 509-522.