

## Bachelor/Master project

### Biological pest control – Cross-sectioning & TEM analysis of genetically modified insects

#### Research Area

Insects – pest control, sample preparation and detailed electron microscopic microstructure analyses

#### Aspects & Methods

- Literature research
- Material research (biology/chemistry)
- Life science
- Method-/instrument development
- Construction
- Modelling and visualization
- X-ray methods
- FIB/SEM
- TEM

#### Start of Project

Immediately

#### Contact Person

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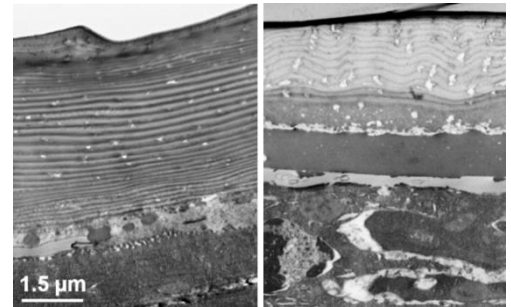
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## The Chitin Lab



#### Motivation

The cuticle of insects is the out-most barrier to the environment, which protects against various harms. It has a very complex composition. In principle, it is composed of hierarchically arranged building elements formed by chitin fibrils and



various chitin-organizing proteins. An analysis of the structure-function relationship by means of scanning and transmission electron microscopy can provide valuable insight with regard to whether individual genes are involved in the formation of different cuticle structures.

To manipulate gene expression, we will use the red flour beetle *Tribolium castaneum* as a model. This pest beetle is amenable to systemic RNA interference (RNAi), which allows specific silencing of the genes of interest. We expect to see ultrastructural changes in the cuticle, when genes involved in cuticle formation are silenced. The insect cuticle usually has a multi-lamellate structure (left figure). Silencing of genes that are critical for cuticle formation leads to structural changes and to the loss of cuticle function (right figure). Therefore, genes involved in maintaining cuticle ultrastructure are candidates for biological pest control by RNAi.

#### Objectives

To enable electron microscopic studies of insect cuticles, cross-sectional SEM/TEM sample preparation by ultramicrotomy, i.e. nanoscopic cutting with an a few nm sharp diamond knife, will be employed (fixation of those samples already established). The morphology of those cross-sections will be investigated in detail by SEM and TEM, and will be correlated to the expression of specific genes involved in cuticle formation.

#### Procedure

- Literature survey
- Development of embedding method for insect cuticles
- Cross-sectional preparation by ultramicrotomy
- Evaluation of cross-section quality by optical microscopy
- Investigation of cuticle microstructure by (scanning) TEM
- Summary of findings in thesis