

[B.Sc. or M.Sc. thesis] Asymmetry in insect head structures: Evolution and functional consequences.

Bilaterian animals are characterized, as their name implies, by a left-right mirror symmetry of their body structures. In some bilaterian species however, systematic deviations appear, which are termed “directional asymmetry”. Two classical examples are the male violin crabs’ claws and the more subtly asymmetric skulls of many Cetaceans (Coombs et al. 2020). The evolution of directional asymmetry is supposed to be driven by function or sexual selection. Some groups of biting chewing insects show an asymmetry in their mandible morphology. In addition, recent results by our group and others (Weihman & Wipfler 2019) have highlighted for the first time that the biting and chewing muscles are also asymmetric in at least two distantly related species. However, we do not know whether this musculo-skeletal asymmetry is widely distributed in other insects, and we do not know about the functional (biomechanical) consequences of this asymmetry.

The goal of this thesis will be to sample several biting-chewing insects across the phylogeny, and assess the presence or absence of directional asymmetry in the mandibles and their muscles. To do so, the applicant will collect specimens, produce microCT scans (and/or use available ones), to reconstruct the anatomy of the specimens in 3D. In addition, he/she will also collect *in vivo* bite force data (and/or use available data from our group). With this, he/she will be able to map mandible and muscle asymmetry along the phylogenetic tree of insects, check whether it evolved several times independently, test the expected correlation between muscle and mandible asymmetry, and highlight potential links with a functional advantage and dietary ecology.

It is advantageous if prospective candidates have already acquired skills/knowledge in two or more of the following topics during their study program:

- basic knowledge about insect morphology, systematics and evolution
- basic knowledge of statistics
- basic knowledge in a programming language

In addition, at least some fluency in English is required to interact with the supervisors.

Applicants can expect to gain skills in 3D data acquisition and image analysis, phylogenetic comparative methods, and statistics, all of which will be beneficial for a career in science or the industry.

Applications should contain your CV, your transcript of records and a short statement (max. 1/2 page) about your motivation to work on the depicted topic in one PDF file.

Contact can be made in English with Dr. Samuel Ginot (sginot@uni-bonn.de) and in English or German with Prof. Dr. Alexander Blanke (group leader; blanke@uni-bonn.de). Information about the workgroup can be found online at <https://www.evolution.uni-bonn.de/de/arbeitsgruppen/prof.-dr.-a.-blanke>.

We look forward to hearing about you!