**Allgemeine Zoologie ‚Wahlkpflicht-Modul‘. Projects 2020**

**1. Impact of honey bee viruses on bumble bees in the field.** Honey bee viruses exert a high fitness cost on their reservoir hosts. They are also known to infect other bee species, including bumble bees. Our previous experiments have shown that the fitness costs of these viruses in commercial bumble bees (*Bombus terrestris*) held in the laboratory is negligible. Nothing is known of the costs of these viruses for bumble bees foraging the field. In this project, the student will use experimental colonies of one common bumble bee species, *Bombus terrestris*,and viral inocula to evaluate the costs of infection for bumble bees foraging in the vicinity of Hoher Weg 8.

**2. Do bumble bee species vary in their susceptibility to honey bee viruses.** This project is closely aligned with the first project. Please read the first three sentences of that project. In this project, the susceptibility of different bumble bee species will be determined in the laboratory, using field-caught bumble bees from around Halle and experimental viral inocula. The overall idea is to test for variation among bumble bee species in their susceptibility to viral infection.

**3. Consequences of a social parasitic lifestyle on behavioural immune defence traits.** Evolutionary transitions to a symbiotic lifestyle, be it beneficial, mutualistic or parasitic, have led to striking reciprocal adaptations of the interacting organisms. Social parasitism, i.e. the parasitic dependence of a social insect species on one or several free-living social species, is frequently found in social Hymenoptera. These parasites enter insect societies where they either exploit one or several of their hosts’ resources, i.e. stored food or developing host offspring as food, the hosts’ nest as shelter or the hosts’ workforce. These resources are well protected against the microbial environment in social insect societies via the use of behavioural immune defence traits. The candidate will analyse the expression of behavioural immune defence traits in video material from an experimental setup to investigate whether social parasites show signs of reduced expression of behavioural immune defence traits that are essential for free-living social species and rely instead on behavioural immune defence traits of their social host for protection.4. Antonella

**4. Body size and urbanization.** Body size is a key species trait linked to metabolism, life-history and dispersal. It is expected to increase in more fragmented landscapes and to decrease in warmer environments. Urbanisation is a global phenomenon notoriously associated with high level of fragmentation and warmer temperatures. If you choose this project you will measure the body size of male individuals of an orchid bee, *Euglossa dilemma,* which we sampled from 5 different regions in the Yucatan peninsula (Mexico), using a well-replicated urban-rural sampling. The questions are: 1) Is there a difference in body size between urban and rural individuals of *Euglossa dilemma*? 2) If so, are the observed differences consistent with the increase in fragmentation of urban sites or with an increase of temperature?

**5. Genetic diversity, genetic structure and demography of geographically widespread *versus* restricted bumble bee species in Germany.** Wild bees are declining worldwide due to land use intensification, climate change, pathogen spread and non-native invasive species. Population genetic analyses can aid conservation management practise by identifying species of particular conservation concern, i.e. species having a higher extinction risk due to a low genetic diversity, a low effective population size and pronounced population genetic differentiation. Species of restricted distribution are considered more vulnerable to extinction because of low levels of genetic variation relative to widespread taxa. In this project the respective student will use sequence data to address the genetic diversity, genetic structure and demography of bumblebees with contrasting geographic distributions in Germany and test if there are differences in genetic measurements between geographically widespread *versus* restricted species.

**6. Effects of urbanisation on bumblebee foraging behaviour.** Urbanization is a global change phenomenon that leads to greater habitat loss, fragmentation and degradation, increased air, water, light, and noise pollution and more impervious surfaces compared to nearby non-urban habitats. To investigate the effects of urbanisation on bumblebee colony performance, in 2018 we placed 20 commercial *Bombus terrestris* colonies in 10 sites in the city of Halle, spanning from the edges of the city and into the city’s core. We then monitored bumblebee colony growth and foraging behavior using video cameras across the entire colony cycle. The candidate will analyse the video recordings from our experimental setup to explore multiple potential drivers operating locally and at the landscape levels that could affect bumblebee foraging behavior. This information will contribute to our understanding of the effects of urbanization in a major pollinator group, the bumblebees.