iomE
Institut für Organismische und Molekulare Evolutionsbiologie

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Master thesis:

Learning and orientation in ants – how do chemical cues affect ant behaviour?

Social insects have evolved manifold ways to achieve efficient foraging. Ants are particularly famous for their system of trail pheromones, which ensures that individual ants who found a food source can direct their fellows to a good food source in the most efficient way (Czaczkes et al. 2014). This method has even inspired routing algorithms in the world wide web and are crucial for an efficient connection between server and client (Bonabeau et al. 2000).

Foraging *Linepithema humile* ants on a trail. Photo: Alex Wild.

But ants do not blindly follow trail pheromones. They also take into account chemical 'footprints' of nestmates and individuals from other colonies or species. These footprints are chemical traces that are left by every walking insect – unintentionally, the insects cannot avoid leaving them. Recent results show that some ants specifically respond to footprints of other colonies. They may approach some cues (e.g. to exploit food found by others), but also avoid them (Wüst & Menzel 2017, Menges & Arz unpublished data). Recently, we discovered that such a response can be learned. If they were attacked by an aggressive other ant, they learn to avoid their footprints. But how specific is this learning response? Can ants learn to avoid one species, but approach others? And how is the response to footprints linked to trail pheromones?

We search for a highly motivated master student to investigate these questions. We want to know if ants can be conditioned to follow, avoid or ignore traces of certain ant species, and how this affects their reactions to cues of other species. The project involves behavioural experiments with ant colonies, but also field work around Mainz and (if wished) chemical analyses.

Starting date is flexible, from March 2022 or later. If you are interested or have further questions, please do not hesitate to contact Dr. Florian Menzel (menzelf@uni-mainz.de; Biocentre I, Room 01-474).

References

Bonabeau, E., Dorigo, M., & Theraulaz, G. (2000). Inspiration for optimization from social insect behaviour. Nature, 406(6791), 39-42.

Czaczkes, T. J., Grüter, C., & Ratnieks, F. L. (2015). Trail pheromones: an integrative view of their role in social insect colony organization. Annual review of entomology, 60, 581-599.

Wüst, M., & Menzel, F. (2017). I smell where you walked–how chemical cues influence movement decisions in ants. Oikos, 126(1), 149-160.