The global ecological success of ants can be credited to the evolution of sociality, providing benefits such as cooperative brood care and foraging [1]. However, group-living in high density also has associated fitness costs, such as increased risk of disease epidemics. Ants have evolved a series of cooperative disease defence mechanisms to prevent a pathogen establishing and spreading through the colony, providing a social immunity [1-3]. While this emergent trait is well studied, the mechanisms of spreading disease-related information are less known. A novel body-shake behaviour was observed in the black garden ant, *Lasius niger*, after exposure to the pathogenic fungus *Metarhizium brunneum*. These preliminary results indicate that body shakes act as an alarm behaviour, initially displayed by pathogen-exposed ants and relayed by healthy nestmates. However, as yet it is still unclear how the alarm signal spreads across larger groups, and whether body shakes act as a generic, non-specific alarm signal, or whether specific characteristics such as the amplitude, repetition and/or frequency of body shaking encode particular information.

The first aim of the project will be to experimentally investigate how ants respond to different environmental stressors, such as disease challenge, disturbance, bright light exposure, or intrusion by a competitor or predator. This will be done by quantitatively characterising the body shakes produced by the ants in different conditions using a high-speed camera. The second aim of the project will be to study how the alarm behaviour spreads across groups of 20 to 50 workers. The project will involve caring for ant colonies, designing and running behavioural experiments, making behavioural observations on videos, and automatically extracting individual trajectories and body shakes using the automatic tracking software DeepLabCut (figure 1) [4]. The findings will aid in understanding how ant colonies can communicate efficiently for collective responses to stressors.

Candidate requirements: N/A

Background reading and references