How pollinating insects find and learn sites in the landscape with their low-resolution eyes

Supervisory team:
Main supervisor: Prof Natalie Hempel de Ibarra (University of Exeter)
Second supervisor: Prof Karen Anderson (University of Exeter)
Non-academic supervisor: Mr Roger English (South Devon AONB)

Collaborators: Prof Andrew Philippides (University of Sussex), Dr Steven Hancock (University of Edinburgh)

Host institution: University of Exeter (Streatham)
CASE partner: South Devon Area of Outstanding Natural Beauty (AONB)

Project description:
Spatial learning plays a fundamental role in various mechanisms underpinning the excellent navigational capabilities of insects. Despite their low-resolution eyes, they are capable of quickly learn features and landmarks in the landscape in order to follow routes, but also for pinpointing goal locations with remarkable accuracy. An insect's performance results from a combination of stereotyped behavioural responses and cognitive mechanisms that influence decisions of when, where and how to move. This project will apply a uniquely interdisciplinary approach to uncover how the bee's spatial responses and use of views are influenced by large-sized landmarks.

The project offers the opportunity to gain a deeper understanding of the mechanistic interactions between vision, multimodal sensory integration and learning that underlie view-based navigation in flying insects, including those that are essential for the pollination of crops in fragmented landscapes. Large-scale landmarks, such as the traditional Devon hedges, high hedges grown on earth banks that separate many small and diverse agricultural holdings, are important for the behaviour and survival of pollinating insects.

We are looking for a highly motivated graduate with a broad background in natural science disciplines and with an interest in both experimental and analytical work. Strong skills in quantitative analysis of experimental data (flight trajectories, video, images) and measurements are essential, and understanding of spatial methods is desirable. We welcome an interest in ecological and mathematical modelling. The project offers the opportunity to conduct learning tests in both lab and field settings and to investigate navigational scenarios based on novel remote sensing data and simulations of active movement choices by bees. You will benefit from working within a lively and interdisciplinary research environment at the College of Life and Environmental Sciences of the University of Exeter and access to sophisticated experimental facilities and equipment, including established behavioural labs, setup and analysis protocols and the Environment and Sustainability Institute's DroneLab research facility. Although the base location will be with the main supervisor, Natalie Hempel de Ibarra, at CRAB (https://psychology.exeter.ac.uk/research/centres/crab/) in Exeter, you will also work closely with the second supervisor, Karen Anderson at the ESI (http://www.exeter.ac.uk/business/consulting/dronelab/) in Penryn. Together with collaborators in Informatics from the University of Sussex and Edinburgh they will provide complementary, world-class expertise in animal behaviour, neuroscience and physical geography. The studentship includes an industrial placement at the South AONB management unit.