Studying the gut-brain connection in a marine worm model using a novel high-throughput imaging system.

Supervisory team:
Main supervisor: Dr Elizabeth Williams (University of Exeter)
Second supervisor: Dr Alex Corbett (University of Exeter)
Dr David Horsell (University of Exeter)

Collaborators: Dr Jeremy Graham (Cairn Research Limited)

Host institution: University of Exeter (Streatham)

Project description:
This project is composed of behavioural biology component and an instrument development component. Both of these components have already been developed to a relatively mature level through previous collaborations and the goal of this project is apply the high throughput imaging tools to the animal models that have been developed to understand the complex signalling that takes place between the gut and the brain and how we can modulate those interactions.

The project will begin by familiarising the student with the 'Multiscope' which is a novel type of microscope that is able to image multiple wells within a well plate at unprecedented rates. This allows the behaviour of multiple animals to be studied in parallel and increase the statistical power. High quality data can then be acquired quickly and enables multiple experiments to be completed at once. This component of the work will develop skills in programming with Raspberry Pi and applying image processing routines enable animal tracking.

Once competent with data acquisition, we will develop testable hypotheses for mechanisms controlling brain-gut signalling. We will develop the use of conserved and novel neuropeptides to control animal behaviour in well-defined ways, for example to increase and suppress appetite or to modulate nesting behaviours. The student will build confidence in animal handling and wet lab skills to maintain animal stocks and run experiments in physiologically relevant conditions.

As the project progresses, additional imaging modalities will be introduced, such as widefield fluorescence imaging which will aid the quantification of observed trends. For example, feeding behaviours can be monitored through the ingestion of autofluorescent algae and the distribution of fluorescently tagged neuropeptides can be monitored over time.

As many neuropeptide receptors are conserved between humans and the marine worm model, there is strong potential for the translation of the results delivered by this project to more complex animal models and by extension into clinical medicine.

Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.