The influence of variability and information on decision-making

Project ID: 226

Supervisory team

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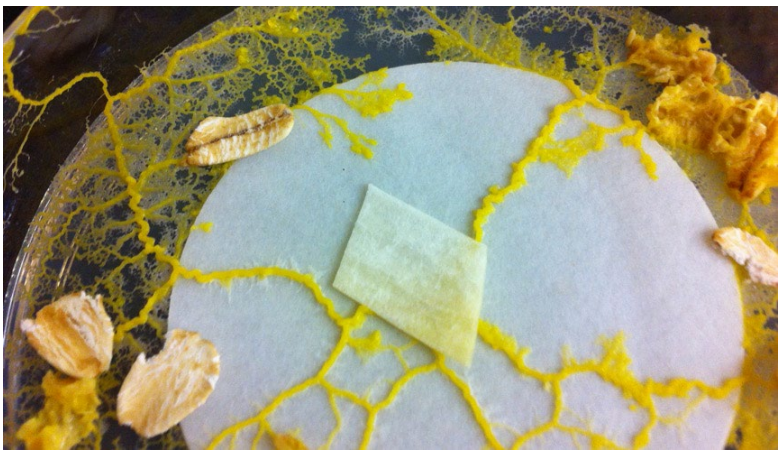

Project description: Understanding how organisms make decisions is a core focus in biology, and seemingly irrational decisions give insights into decision mechanisms. Many biases have been demonstrated, such as intransitive choice, the decoy effect, violation of regularity, and contrast effects in many species including bees, rats and humans. Recent research on the behaviour of slime moulds has provided evidence that these organisms can exhibit decision biases similar to those observed in humans and other vertebrates, despite not having a brain. This challenges traditional views in cognitive sciences about how decisions are made and has opened up new ways of understanding the mechanistic basis of decision making.We will develop computational models that predict behavioural choices between options that differ in their rewards and cost, where the availability of options, or their rewards and costs may vary and so be uncertain. These model will incorporate principles from behavioural economics and evolutionary biology to simulate how an organism might make decisions that appear irrational in specific conditions but result from decision-making mechanisms that are overall adaptive.We will then test predictions using the slime mould Physarum polycephalum choosing amongst food sources with differing light exposure (cost) and different concentrations of sugar (reward). The experiments will take advantage of using slime moulds' ability to learn from past experiences by changing the options available. In this way, we will be able to test for biases such as intransitive choice, the decoy effect, violation of regularity, and contrast effects in a non-neural organism. The models will predict under what conditions we expect such irrational behaviour, so the testing of specific predictions will shed light on how slime moulds make decisions, and thereby what aspects of the decision-making mechanisms of other organisms may lead to apparently irrational behaviour.The student will develop their skills in computer coding and mathematics, and the behavioural ecology approach to modelling behaviour. They will learn management of slime moulds in the laboratory, and design targeted experiments to test the theory they develop. As a result, they will become a leader in the field of the mechanisms of decision making using a organism that is becoming a model species in this field.

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.