Animal emotion and welfare: a decision-making and computational approach

Supervisory team:
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Project description:
An animal's welfare is strongly dependent on its emotional (affective) state. These states can be operationally defined as being elicited by rewarding and punishing events, allowing empirical study even though the conscious experience of such states in other species remains unknown. Long-term 'moods' (e.g. depressed states) are particularly important determinants of animal welfare and may also play a key role in guiding decision-making by biasing an individual's expectations of positive or negative outcomes, especially in ambiguous situations (Mendl et al. 2010. Proc. Roy. Soc. B. 277, 2895-2904). We have developed a 'judgement bias' (JB) assay of decision-making under ambiguity to test this idea and to provide an objective 'cognitive' measure of animal affect (Harding et al. 2004. Nature 427, 312). There are now over 100 studies using this assay, many supporting the hypothesis that individuals in a positive affective state behave as if anticipating positive outcomes under ambiguity, and vice versa for those in a negative state. However, there are also null and opposite results. One potentially important reason for these is that affective states have a variety of different influences on decision-making, leading to a variety of different responses.

This project will explore exactly how affective states alter decision-making, by combining operant studies of laboratory rodent decision-making behaviour with computational modelling of the resulting data. Using our JB assay and other operant tasks, data will be generated that can be analysed using conventional statistical approaches, and also modelled computationally to identify underlying parameters, such as response bias and reward sensitivity, that influence decision-making. Computational modelling will allow specific hypotheses to be tested, for example that short-term negative states generate negative biases about the outcomes of ambiguity but also increase reward sensitivity, and hence to clarify findings in the literature and advance theory on the relationship between affect and decision-making. There will also be opportunity to develop theoretical computational models to investigate our predictions, including that experience of rewards and punishments in the environment generates adaptive decision-making profiles.

The student will receive training in animal learning and behaviour, perceptual and affective psychology, and computational theory and modelling from a supervisory team with expertise in all areas. They will learn to design perceptual discrimination tasks, to programme and use automated operant equipment, to implement computational, statistical, and trial-by-trial analysis of complex datasets, and to build theoretical computational models. Such skills will be invaluable within the increasingly mathematical context of modern biology.