The origins of individual differences in learning and behaviour: Computational models and in vivo experimentation

Supervisory team:
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Project description:

Learning can be separated into two components: The knowledge that has been laid down in the brain as a result of experience, and the translation of that knowledge into observable behaviour. Both components – knowledge and behaviour – are fundamentally important. You might know the title of a song or the name of the person who performed it, but be incapable of providing the answer in a quiz. I might know the score of a Mozart piano concerto, but be incapable of playing the piano. Both of us have knowledge that is potentially useful, but in neither case is it immediately revealed in our behaviour.

In the laboratory, detailed analysis of how behaviour changes as a result of experience paved the way for precise theories of learning, which enabled the brain's role in learning to be better understood. This is a major success story, with people from different scientific fields collaborating with one another over an extended period. However, this success was built on a simple view about how knowledge is translated into observable behaviour: Increases in knowledge result in increases in behaviour. Recent evidence shows that this view cannot be sustained. There is dramatic variation in how acquired knowledge is expressed in the behaviour of different animals from the same species given identical training. This variation cannot be reconciled with extant theories, and exposes a significant gap in our understanding: How does knowledge affect behaviour? This project involves the development of a new computational model of learning together with iterative behavioural experimentation to test the model.