Probing the function of dopaminergic inputs to the cerebellum

Supervisory team:
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Project description:

"Shall I go and get something to eat?" At some point in the past few hours, this question may have crossed your mind. Our ability to move directedly towards our goals, and the motivational decisions that regulate these movements, define almost every aspect of our lives. However, understanding these signals remains a central challenge in neuroscience. Furthermore, this knowledge is critical for developing new therapies for neurodegenerative and psychiatric disorders in which these processes malfunction, such as Parkinson's, OCD, and depression.

Recent evidence has uncovered new connections between two major brain centres involved in movement and motivational learning, the cerebellum and dopaminergic regions of the basal ganglia. This discovery is important, because although these brain areas are involved in related functions, it has previously been thought that they work independently. Therefore, revealing the function of these newly discovered connections could hold a key to understanding how movements are generated and why we choose to move.

To tackle these fundamental questions, this project will use state of the art in vivo brain imaging, animal behaviour, and anatomical techniques, combined with computational models, to investigate the functional role of connections between the basal ganglia and cerebellum. We will use viral tracing strategies to uncover the identity and nature of the neurons involved and then use imaging techniques and opto/chemogenetic strategies to investigate their activity and role during different types of behaviour.

During the PhD, you will have the opportunity to work in the labs of Drs Paul Dodson, Jon Witton and Rui Ponte Costa as part of a multidisciplinary team spanning the Universities of Bristol and Exeter. Training will be provided in a range of translatable and highly sought-after biosciences skills including in vivo recording, animal behaviour, neuroanatomy and immunohistochemistry, microscopy, data analysis and programming, and computational modelling.

In summary, this project has the potential to redefine our understanding of how movement and related motivational signals are processed in the brain and will establish a conceptual framework for creating new treatments for motor and psychiatric diseases.