1 Advertisement

Post Title: Research Fellow in Neurodevelopment
School/department: Brighton and Sussex Medical School.
Hours: Full time considered up to a maximum of 1 FTE. Requests for flexible working options will be considered (subject to business need).
Location: Falmer campus, Brighton, United Kingdom
Contract: Fixed term for 3 years
Reference: 10892
Salary: starting at £36,333 to £43,155 per annum pro rata if part time
Placed on: 21 February 2023
Closing date: 04 April 2023. Applications must be received by midnight of the closing date.
Expected Interview date: 20 April and 21 April 2023.
Expected start date: May 2023 or as soon as possible thereafter.

Project: Hox genes and the diversification of neural networks

Applications are invited from highly motivated individuals who are interested in fundamental mechanisms of neuronal development. The Postdoctoral Research Fellow position is available to work with Dr. Jimena Berni and her group at the Brighton and Sussex Medical School, University of Sussex. The position is fully funded by the BBSRC for three years, to start in April 2023 or as soon as possible thereafter.

Our research objective is to radically push forward our understanding on the mechanism of circuit diversification. We use *Drosophila* as a model system and investigate how Hox genes orchestrate the diversification of motor circuits during nervous system development.
We approach this question at three levels:

1) Circuit: To define the fundamental differences subserving the specialization of circuits.
2) Function: To show how divergent connectivity patterns modify neuronal function.
3) Genetic: To analyse the role of Hox genes in the specification of circuit assembly and function.

The post provides an outstanding opportunity to develop and apply research skills in developmental neuroscience using a range of techniques pioneered in the lab (calcium imaging, thermo-/opto- genetics, CRISPR/cas9, behavioural experiments) as well as working with collaborators: Electron microscopy neuronal reconstructions with Prof. Albert Cardona (Univ. of Cambridge and MRC-LMB), and electrophysiology experiments with Prof. Richard Baines (Univ. of Manchester).

Candidates with a strong background in developmental neuroscience or neurobiology and with experience performing anatomical and functional neuronal analysis are encouraged to apply. Experience working with *Drosophila*, in genetics, imaging, behavioural experiments and/or molecular biology would be an advantage. The successful candidate should be capable of working independently on this project, whilst integrated into an interactive and supportive research group.

The Berni lab is part of Sussex Neuroscience, a highly collaborative and interdisciplinary community of over 50 neuroscience researchers that organises a wide range of scientific and career development activities.

Please contact Dr Jimena Berni (J.Berni@sussex.ac.uk) for informal enquiries.
Visit our website: https://www.bsms.ac.uk/about/contact-us/staff/dr-jimena-berni.aspx

The University is committed to equality and valuing diversity, and applications are particularly welcomed from women and black and minority ethnic candidates, who are under-represented in academic posts in Science, Technology, Engineering, Medicine and Mathematics (STEMM) at Sussex.

For full details and how to apply see our vacancies page

www.brighton.ac.uk/jobs www.bsms.ac.uk

The University of Sussex values the diversity of its staff and students and we welcome applicants from all backgrounds.

Please note: The University requires that work undertaken for the University is performed from the UK.

2. The School / Division

Please find further information regarding the school/division at
https://www.bsms.ac.uk/about/contact-us/staff/dr-jimena-berni.aspx

3. Job Description

Job Description for the post of:	Research Fellow in Neurodevelopment (postdoctoral)
Department:	Neuroscience
Section/Unit/School:	Brighton and Sussex medical School
Location:	Falmer campus, Brighton, United Kingdom
Grade:	7
Responsible to:	Senior Research fellow

Animals, mouse, fly or humans, generate different stereotyped movements associated with different specialized body parts along their body axes. Each specialised body part is matched and controlled by similarly specialised neural circuitry. How neural networks diversify remains unknown and is the centre of this investigation.

We will focus on the nature of regional differences within the central nervous system, and how during development the Hox genes act to determine the formation of distinct, specialised neuronal networks that generate a diverse behavioural repertoire at different

levels of the body axis. Drosophila will be used as the experimental model because the question of position specific diversification along the nervous system axis is simplified, both genetically and cellularly. In particular, each segmental unit of the Drosophila nervous system is derived embryonically from a common repeated groundplan of progenitors and early differentiating neurons. These equivalent sets of cells diversify to produce different circuits and will be the focus of our work.

The specific objectives of the BBSRC funded grant are:

1. To map the connectome of homologous networks controlling specialised behaviours in different Hox domains. We will use Electron Microscopy volume reconstructions to describe the presynaptic patterns of connectivity of specific neurons that are located in different Hox domains and support distinctive behavioural outputs.

2. To show how divergent connectivity patterns modify neuronal function. We will characterise the neurons identify in objective 1 using a combination of calcium imaging and electrophysiology to show how different regional changes in morphology and connectivity modify the network activity and its output.

3. To analyse the role of the Hox genes for the specification of circuits assembly and function. We will reveal to what extent modifying the Hox expression of individual neurons reconfigure their connectivity and the function of the circuit they from part to ultimately generate a specialised behaviour.

References:
1. David W. Sims, Nicolas E. Humphries, Nan Hu, Jimena Berni. Optimal search patterns generated autonomously in free-moving animals without brain activity. *eLife* 2019; 8:e50316.
2. Picao-Osorio J, Johnston J, Landgraf M, Berni J, Alonso CR. MicroRNA-encoded behavior in Drosophila. *Science*. 350(6262), 815-20 (2015).
3. Electrophysiological validation of monosynaptic connectivity between premotor interneurons and the aCC motoneuron in the Drosophila larval CNS. Carlo N G Giachello, Iain Hunter,,, Richard A Baines. *J Neurosci.* 6724-6738 (2022).
4. The complete connectome of a learning and memory centre in an insect brain. Eichler K,,, Cardona A. Nature. 175-182 (2017).
5. Pulver SR, Bayley TG, Taylor AL, Berni J, Bate M, Hedwig B. Imaging fictive locomotor patterns in larval Drosophila. *Journal of Neurophysioly* 114(5), 2564-77 (2015)
6. Berni J. Genetic dissection of a regionally differentiated network for exploratory behavior in Drosophila larvae. *Current Biology* 25(10), 1319-26 (2015)

4. Person Specification

Essential Experience/Attributes
- Relevant PhD degree (or PhD thesis submitted) in a bio-medical sciences subject.
- A strong background in developmental/cell biology or neurobiology.
- Experience in neuronal anatomy (neuronal reconstruction or immunostaining, confocal and image analysis)
- Experience analysis neuronal activity (ideally (patch) electrophysiology or alternatively calcium imaging).
- Excellent rigorous analytic, design, and scientific skills.
- Desire to understand circuit basis of brain function and behaviour.
- Experience in analysing and writing scientific results.
- Good communication skills (written and oral).
- Ability to work on own initiative, as well as collaboratively in a supportive research team.

Desirable
- Previous experience working with *Drosophila.*
- Experience working in genetic specification (including Hox genes).
- Experience performing behavioural experiments.