

Dr. Alexander Shakeel Bates

Neuroscientist & Computational Biologist

I am a neuroscientist and computational biologist specialising in neuroanatomy, neurophysiology and connectomics of the insect brain. My research focuses on understanding how neural circuits wire and fire to generate complex behaviours, including olfactory processing and animal navigation. I develop open-source tools for neuroanatomical analysis and collaborate internationally on connectomics projects. In the wetlab, I use virtual reality and calcium imaging experiments to interrogate neurobiological circuits in living, behaving flies.

Contact: alexander_bates@hms.harvard.edu | **ORCID:** [0000-0002-1195-0445](https://orcid.org/0000-0002-1195-0445) | **GitHub:** [alexanderbates](https://github.com/alexanderbates)

Metrics: 3910 citations | h-index: 21 | i10-index: 23 | 7 peer reviews

Professional Research

Postdoctoral Fellow in Neurobiology • Harvard Medical School • Boston, US • present - 01/10/2020

Investigating navigational circuitry using calcium imaging, neurophysiology and behavioural studies involving virtual reality with *Drosophila melanogaster*, in the laboratory of **Prof. Rachel Wilson** • Co-leading an international collaboration with **Prof. Wei-Chung Allen Lee**, **flywire** and a network of international research groups on the first whole fly central nervous system connectome, open-access

Visiting Scientist • Dept. Zoology, University of Cambridge • remote • 01/03/2024 - 01/10/2020

Neuroinformatics work with the **Drosophila Connectomics Group** • Developed R tools for neuroanatomy and connectomics, organised international collaborators

Fellowships & Grants

Sir Henry Wellcome Fellowship • Wellcome Trust & University of Oxford • UK • 01/02/2026 - 01/06/2022

300,000 GBP towards my current research • Collaboration between groups of Rachel Wilson, Wei Lee, Scott Waddell and Shaul Druckmann • Also accepted as Life Science Research Foundation fellow

EMBO fellow • European Molecular Biology Organization • Europe • 01/06/2022 - 01/04/2021

Also accepted as a International Human Frontier Science Program fellow

Herchel Smith PhD Scholarship • Herchel Smith Foundation • Cambridge, UK • 30/09/2019 - 01/08/2015

Boehringer Ingelheim PhD Scholarship • Boehringer Ingelheim Foundation • European • 01/08/2018 - 01/08/2016

Education

Neuroscience PhD • **MRC LMB**, University of Cambridge • Cambridge, UK • 30/02/2021 - 01/09/2015

PhD student with **Dr. Greg Jefferis** • **Thesis:** The lateral horn, a brain region in the fly, primes innate olfactory behaviours by combining patterns of second-order olfactory projection neuron activity. In my work, I developed tools and analyses, and reconstructed neural networks from electron microscopy data, in order to better understand this brain region and how memory systems interact with it • Neuroinformatics, data science, R programming • **Awards:** **Honorary Vice Chancellor's Award**, **MRC LMB Max Perutz Prize 2019**, Winner of the **British Neuroscience Association Postgraduate Prize 2020**

Neuroscience BSc • University College London • London, UK • 01/07/2015 - 01/09/2012

1st class degree with honours • Modules taken listed on **LinkedIn** • **Awards:** **Burnstock Sessional Prize in Neuroscience BSc** (ranked first in year) (2012–2013) (2013–2014) (2014–2015), Dean's list for the Faculty of Life Sciences (2013–2014) (2014–2015), **Rob Clarke Award** from the Society of Physiology

Presentations

Selected Talks: ECRO meeting (2019) • Boehringer Ingelheim Meeting (2018) • MPI Connectomics meeting (2017) • ECRO meeting (2017) • Boehringer Ingelheim Meeting (2017) • Brains and Roses (2016)

Selected Posters: HHMI Investigators' Meeting (2023) • UK Neural Computation (2019) • Boehringer Ingelheim Fonds communication workshop (2017) • Maggot Meeting (2016) • High-resolution circuit reconstruction meeting (2016) • LMB GSA Symposium (2016)

Leadership Experience

President of BlueSci (01/10/2019 - 01/01/2016) • Mentored summer student (2018) • Mentored undergraduate student (01/05/2018 - 01/09/2017) • Mentored summer student (2017) • LMB graduate symposium lead organiser (2017) • LMB graduate symposium organiser (2016) • President of the UCLU Writer's Society (01/10/2015 - 01/10/2014) • Science Editor, Pi Magazine (01/10/2015 - 01/10/2014) • UCL iGEM 2014 Advisor (2014)

Other Experience

Research Visits: Janelia Research Campus (2019) | Worked in FlyEM, [Dr. Gerry Rubin's Group](#), Worked on the hemibrain connectome • Janelia Research Campus (2016) | Worked with [Dr. Albert Cardona's Group](#), Worked on the L1 larval connectome • University of Queensland (2015) | Worked on tectal activity in zebrafish larvae, light sheet imaging, [Dr. Ethan Scott's Group](#) • Dept. Zoology, University of Cambridge (2014) | Worked on neuronal structural plasticity in *Drosophila melanogaster* larvae, [Dr. Landgraf's group](#)

Training: Paris Spring School in Neuroscience Techniques, Paris Descartes University (2018) | [A course in Optical Imaging and Electrophysiological Recording in Neuroscience](#) • UCL iGEM 2013 team member, University College London (2013) | Team member, cloning, cell culture, project planning, Gold medallist • Summer student in the biomolecular modelling laboratory, Cancer Research UK, London Research Institute (2013) | Student Placement with [Dr. Tammy Cheng](#), python programming

Technical Skills: R • python • MATLAB • github • git • markdown • Illustrator • InDesign • communication • text editing • journalistic writing • creative writing • open access

Selected Open Source Software: [natverse](#) • [neuromorphr](#) • [neuprinter](#) • [bancr](#) • [insectbrainr](#)

Selected Publications

Distributed control circuits across a brain-and-cord connectome (2025). *AS Bates*, JS Phelps, M Kim, HH Yang, A M... *bioRxiv*

Neurotransmitter classification from electron microscopy images at synaptic sites in *Drosophila melanogaster* (2024). N Eckstein, *AS Bates*, A Champion, M Du, ... *Cell* (181)

Information flow, cell types and stereotypy in a full olfactory connectome (2021). P Schlegel, *AS Bates*, T Stürner, SR Jaga... *Elife* (142)

Complete connectomic reconstruction of olfactory projection neurons in the fly brain (2020). *AS Bates*, P Schlegel, RJV Roberts, N Dru... *Curr. Biology* (194)

The natverse, a versatile toolbox for combining and analysing neuroanatomical data (2020). *AS Bates*, JD Manton, SR Jagannathan, M C... *Elife* (194)

Analysis and optimization of equitable US cancer clinical trial center access by travel time (2024). H Lee, *AS Bates*, S Callier, M Chan, N Chambwe, A Mars... *JAMA oncology* (12)

Functional and anatomical specificity in a higher olfactory centre (2019). S Frechter, *AS Bates*, S Tootoonian, MJ Dolan, J Manto... *eLife* (107)

Neural circuit mechanisms for steering control in walking *Drosophila* (2025). A Rayshubskiy, SL Holtz, *AS Bates*, QX Vanderbeck, LS ... *ELife* (96)

Quantitative Attributions with Counterfactuals (2024). DY Adjavon, N Eckstein, *AS Bates*, GSXE Jefferis, J Funke *bioRxiv*
Whole-brain annotation and multi-connectome cell typing of *Drosophila* (2024). P Schlegel, Y Yin, *AS Bates*, S Dorkenwald, K Eichler,... *Nature* (271)

Discriminative attribution from paired images (2022). N Eckstein, H Bukhari, *AS Bates*, GSXE Jefferis, J Funke *Euro. Conf. on Computer Vision* (8)

BACTrace, a tool for retrograde tracing of neuronal circuits in *Drosophila* (2020). S Cachero, M Gkantia, *AS Bates*, S Frechter, L Blackie... *Nature methods* (43)

+13 more on [Scholar](#), italics=first author*

Review Articles

Systems neuroscience: Auditory processing at synaptic resolution (2022). *AS Bates*, G Jefferis *Curr. Biology* (1)

Neuronal cell types in the fly: single-cell anatomy meets single-cell genomics (2019). *AS Bates*, J Janssens, GS Jefferis, S Aerts *Curr. opinion in neurobiology* (70)

Referees

Postdoc Supervisor: Prof. Rachel Wilson, Harvard Medical School, Rachel_Wilson@hms.harvard.edu

PhD Supervisor: Dr. Gregory Jefferis, MRC Laboratory of Molecular Biology, Cambridge, jefferis@mrc-lmb.cam.ac.uk

BSc Tutor: Dr. Marco Beato, UCL Neuroscience, m.beato@ucl.ac.uk

Supervisee: Serene Dhawan, Princeton PhD student, serenedhawan@gmail.com