

DR. ALEXANDER SHAKEEL BATES

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. I am a UK citizen.



total cites h index i10 index peer reviews

4175 21 23 7

PROFESSIONAL RESEARCH

present			
1/10/2020	Postdoctoral Fellow in Neurobiology ↗	Boston, US	
	Harvard Medical School		
	• Investigating navigational circuitry using calcium imaging, neurophysiology and behavioural studies involving virtual reality with <i>Drosophila melanogaster</i> , in the laboratory of Prof. Rachel Wilson ↗		
	• Co-leading an international collaboration with Prof. Wei-Chung Allen Lee ↗, <i>flywire</i> ↗ and a network of international research groups on the first whole fly central nervous system connectome, open-access		
01/03/2024	Visiting Scientist	remote	
1/10/2020	Dept. Zoology, University of Cambridge		
	• Neuroinformatics work with the Drosophila Connectomics Group ↗		
	• Developed R tools for neuroanatomy and connectomics, organised international collaborators		

FELLOWSHIPS

01/02/2026	Sir Henry Wellcome Fellowship ↗	UK
1/06/2022	Wellcome Trust & University of Oxford	
	• 300,000 GBP towards my current research	
	• Collaboration between groups of Rachel Wilson, Wei Lee, Scott Waddell and Jan Drugowitsch	
	• Also accepted as Life Science Research Foundation fellow	
01/06/2022	EMBO fellow ↗	Europe
1/04/2021	European Molecular Biology Organization	
	• Also accepted as a International Human Frontier Science Program fellow	
30/09/2019	Herchel Smith PhD Scholarship ↗	Cambridge, UK
1/08/2015	Herchel Smith Foundation	
01/08/2018	Boehringer Ingelheim PhD Scholarship ↗	European
1/08/2016	Boehringer Ingelheim Foundation	

EDUCATION

30/02/2021	Neuroscience PhD	Cambridge, UK
1/09/2015	MRC LMB ↗, University of Cambridge	
	• 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 ↗	
01/07/2015	Neuroscience BSc	London, UK
1/09/2012	University College London	
	• 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	

PRIMARY RESEARCH

title	author	journal	year	cites
Distributed control circuits across a brain-and-cord connectome ↗	AS Bates, JS Phelps, M Kim, HH Yang, A Matsliah, Z Ajabi, E Perlman, ...	bioRxiv	2025	6
Neurotransmitter classification from electron microscopy images at synaptic sites in <i>Drosophila melanogaster</i> ↗	N Eckstein, AS Bates, A Champion, M Du, Y Yin, P Schlegel, AKY Lu, ...	Cell	2024	196
Information flow, cell types and stereotypy in a full olfactory connectome ↗	P Schlegel, AS Bates, T Stürner, SR Jagannathan, N Drummond, J Hsu, ...	Elife	2021	152
Complete connectomic reconstruction of olfactory projection neurons in the fly brain ↗	AS Bates, P Schlegel, RJV Roberts, N Drummond, IFM Tamimi, ...	Curr. Biology	2020	202
The natverse, a versatile toolbox for combining and analysing neuroanatomical data ↗	AS Bates, JD Manton, SR Jagannathan, M Costa, P Schlegel, T Rohlfing, ...	Elife	2020	203
Analysis and optimization of equitable US cancer clinical trial center access by travel time ↗	H Lee, AS Bates, S Callier, M Chan, N Chambwe, A Marshall, MB Terry, ...	JAMA oncology	2024	14
Functional and anatomical specificity in a higher olfactory centre ↗	S Frechter, AS Bates, S Toootonian, MJ Dolan, J Manton, AR Jamasib, ...	Elife	2019	110

Media

- ✉ alexander_bates @hms.harvard.edu ↗
- cloud @asbates.bsky.social ↗
- twitter as_bates ↗
- 👤 alexanderbates ↗
- 🔗 asbates.com ↗
- 👤 linkedIn ↗
- 🔗 google scholar ↗
- DOI 0000-0002-1195-0445 ↗
- R⁺ researchgate ↗
- P GQQ-6852-2022 ↗

Skills

- 💻 R
- 💻 python
- 💻 MATLAB
- 💻 github
- 💻 git
- 💻 markdown
- 💻 Illustrator
- 💻 InDesign
- 💻 communication
- 💻 text editing
- 💻 journalistic writing
- 💻 creative writing
- 🌐 open access

Software

- natverse ↗
- neuromorph ↗
- nat.ggpplot ↗
- neuronbridger ↗
- neuprint ↗
- hemibrainr ↗
- mouselightr ↗
- insectbrainr ↗
- crantr ↗
- bancr ↗

Referees

- ✉ PhD Supervisor: Dr. Gregory Jefferis, MRC Laboratory of Molecular Biology, Cambridge, jefferis@mrc-lmb.cam.ac.uk ↗
- ✉ Current Supervisor: Prof. Rachel Wilson, Harvard Medical School, Rachel_Wilson@hms.harvard.edu ↗
- ✉ Key Collaborator: Prof. Wei-Chung Allen Lee, Harvard Medical School, Wei-Chung_Lee@hms.harvard.edu ↗
- ✉ BSc Tutor at UCL: Dr. Marco Beato, UCL Neuroscience, Physiology and Pharmacology, m.beato@ucl.ac.uk ↗
- ✉ Supervisor: Serene Dhawan, Princeton, PhD student, serenedhawan@gmail.com ↗

Publication table displays first six authors, my name in bold, underlining indicates (co-)first authorship

title	author	journal	year	cites
Neural circuit mechanisms for steering control in walking Drosophila ↗	A Rayshubskiy, SL Holtz, AS Bates, QX Vanderbeck, LS Capdevila, ...	eLife	2025	100
Quantitative Attributions with Counterfactuals ↗	DY Adjavon, N Eckstein, AS Bates, GSXE Jefferis, J Funke	bioRxiv	2024	0
Whole-brain annotation and multi-connectome cell typing of Drosophila ↗	P Schlegel, Y Yin, AS Bates, S Dorkenwald, K Eichler, P Brooks, DS Han, ...	Nature	2024	313
Discriminative attribution from paired images ↗	N Eckstein, H Bukhari, AS Bates, GSXE Jefferis, J Funke	Euro. Conf. on Computer Vision	2022	8
BATrace, a tool for retrograde tracing of neuronal circuits in Drosophila ↗	S Cachero, M Gkantia, AS Bates, S Frechter, L Blackie, A McCarthy, ...	Nature methods	2020	45
Neurogenetic dissection of the Drosophila lateral horn reveals major outputs, diverse behavioural functions, and interactions with the mushroom body ↗	MJ Dolan, S Frechter, AS Bates, C Dan, P Huoviala, RJ Roberts, ...	eLife	2019	164
Communication from learned to innate olfactory processing centers is required for memory retrieval in Drosophila ↗	MJ Dolan, G Belliard-Guérin, AS Bates, S Frechter, A Lampin-Saint-Amaux, ...	Neuron	2018	114
Automated reconstruction of a serial-section EM Drosophila brain with flood-filling networks and local realignment ↗	PH Li, LF Lindsey, M Januszewski, Z Zheng, AS Bates, I Taisz, M Tyka, ...	bioRxiv	2019	104
Comparative connectomics of Drosophila descending and ascending neurons ↗	T Stürner, P Brooks, L Serratos Capdevila, BJ Morris, A Javier, S Fang, ...	Nature	2025	32
Sexual dimorphism in the complete connectome of the Drosophila male central nervous system ↗	S Berg, IR Beckett, M Costa, P Schlegel, M Januszewski, EC Marin, ...	bioRxiv	2025	2
A Drosophila computational brain model reveals sensorimotor processing ↗	PK Shiu, GR Sterne, N Spiller, R Franconville, A Sandoval, J Zhou, ...	Nature	2024	71
Network statistics of the whole-brain connectome of Drosophila ↗	A Lin, R Yang, S Dorkenwald, A Matsliah, AR Sterling, P Schlegel, S Yu, ...	Nature	2024	103
Neuronal wiring diagram of an adult brain ↗	S Dorkenwald, A Matsliah, AR Sterling, P Schlegel, SC Yu, CE McKellar, ...	Nature	2024	446
The connectome of the adult Drosophila mushroom body provides insights into function ↗	F Li, JW Lindsey, EC Marin, N Otto, M Dreher, G Dempsey, I Stark, ...	eLife	2020	374
A connectome and analysis of the adult Drosophila central brain ↗	LK Scheffer, CS Xu, M Januszewski, Z Lu, S Takemura, KJ Hayworth, ...	eLife	2020	1094
Connectomics analysis reveals first-, second-, and third-order thermosensory and hygrosensory neurons in the adult Drosophila brain ↗	EC Marin, L Büld, M Theiss, T Sarkissian, RJV Roberts, R Turnbull, ...	Curr. Biology	2020	105
Input connectivity reveals additional heterogeneity of dopaminergic reinforcement in Drosophila ↗	N Otto, MW Pleijzier, IC Morgan, AJ Edmondson-Stait, KJ Heinz, I Stark, ...	Curr. Biology	2020	77
Neural circuit basis of aversive odour processing in Drosophila from sensory input to descending output ↗	P Huoviala, MJ Dolan, FM Love, P Myers, S Frechter, S Namiki, ...	bioRxiv	2018	48
Combinatorial encoding of odors in the mosquito antennal lobe ↗	P Singh, S Goyal, S Gupta, S Garg, A Tiwari, V Rajput, AS Bates, ...	Nature Comm.	2023	17

Peer Review	
journal	reviews
PLoS Comp. Bio.	3
eLife	3
Nature Comm.	1

REVIEWS

title	author	journal	year	cites
Systems neuroscience: Auditory processing at synaptic resolution ↗	AS Bates, G Jefferis	Curr. Biology	2022	1
Neuronal cell types in the fly: single-cell anatomy meets single-cell genomics ↗	AS Bates, J Janssens, GS Jefferis, S Aerts	Curr. opinion in neurobiology	2019	72

SELECTED TALKS

2025	CSHL Neurobiology of Drosophila	📍 Cold Spring Harbor, NY
2024	CSHL Neuronal Circuits	📍 Cold Spring Harbor, NY
2019	ECRO meeting European Chemoreception Research Organization	📍 Trieste, Italy
2018	Boehringer Ingelheim Meeting Boehringer Ingelheim Fonds	📍 Hirschegg, Austria
2017	MPI Connectomics meeting Max Planck Institute	📍 Berlin, Germany
2017	ECRO meeting European Chemoreception Research Organization	📍 Cambridge, UK
2017	Boehringer Ingelheim Meeting Boehringer Ingelheim Fonds	📍 Hirschegg, Austria
2016	Brains and Roses Schaeffer and Datta group organised	📍 Montserrat, Catalonia

SELECTED POSTERS

2023	HHMI Investigators' Meeting HHMI HQ	📍 Chevy Chase
2019	UK Neural Computation University of Nottingham	📍 Nottingham, UK

2017	Boehringer Ingelheim Fonds communication workshop Boehringer Ingelheim Foundation	 Mainz, Germany
2016	Maggot Meeting Janelia Research Campus	 Ashburn, US
2016	High-resolution circuit reconstruction meeting Janelia Research Campus	 Ashburn, US
2016	LMB GSA Symposium MRC LMB, University of Cambridge	 Cambridge, UK
LEADERSHIP		
01/10/2019	President of BlueSci ↗ University College London	 London, UK
01/01/2016	· Lead BlueSci ↗, the University of Cambridge's science media society, through 15 issues of the magazine ↗	
2018	Mentored summer student MRC LMB, University of Cambridge	 Cambridge, UK
01/05/2018	Mentored undergraduate student Dept. Zoology, University of Cambridge	 Cambridge, UK
01/09/2017	· Student won best thesis in year award and two authorships	
2017	Mentored summer student MRC LMB, University of Cambridge	 Cambridge, UK
2017	LMB graduate symposium lead organiser ↗ MRC LMB, University of Cambridge	 Cambridge, UK
2016	LMB graduate symposium organiser ↗ MRC LMB, University of Cambridge	 Cambridge, UK
01/10/2015	President of the UCLU Writer's Society ↗ University College London	 London, UK
01/10/2014		
01/10/2015	Science Editor, Pi Magazine ↗ University College London	 London, UK
01/10/2014		
2014	UCL iGEM 2014 ↗ Advisor University College London	 London, UK
	· Project planning, oversight, team selection and management	
	· Gold medallist	
OTHER		
2019	Visiting Scholar Janelia Research Campus	 Ashburn, US
	· Worked in FlyEM, Dr. Gerry Rubin's Group ↗	
	· Worked on the hemibrain connectome	
2018	Paris Spring School in Neuroscience Techniques Paris Descartes University	 Paris, France
	· A course in ↗ Optical Imaging and Electrophysiological Recording in Neuroscience	
2016	Visiting Scholar Janelia Research Campus	 Ashburn, US
	· Worked with Dr. Albert Cardona's Group ↗	
	· Worked on the L1 larval connectome	
2015	University of Queensland Winter Scholarship University of Queensland	 Brisbane, Australia
	· Worked on tectal activity in zebrafish larvae, light sheet imaging, Dr. Ethan Scott's Group ↗	
2014	Amgen Scholarship ↗ Dept. Zoology, University of Cambridge	 Cambridge, UK
	· Worked on neuronal structural plasticity in <i>Drosophila melanogaster</i> larvae, Dr. Landgraf's group ↗	
2013	UCL iGEM 2013 ↗ team member University College London	 London, UK
	· Team member, cloning, cell culture, project planning	
	· Gold medallist	
2013	Summer student in the biomolecular modelling laboratory Cancer Research UK, London Research Institute	 London, UK
	· Student Placement with Dr. Tammy Cheng ↗, python programming	

Rx Most of my work has first been published on bioRxiv

⑧ Much of my work comes with open source R code

Updated on 03/11/2025