

Sanjay Manohar MA MRCP PhD

PERSONAL DETAILS

Name Sanjay George MANOHAR Nationality: British
Address: Nuffield Department of Clinical Neurosciences, OX3 9DU GMC: 6065120

QUALIFICATIONS

| | | |
|------|----------------------------------|---|
| 2015 | PhD (Cognitive Neurology) | UCL |
| 2006 | MRCP (UK) | Royal College of Physicians |
| 2004 | Master of Arts | Gonville & Caius College Cambridge University <i>(Academic Scholarship)</i> |
| 2003 | MB, BChir | |
| 2000 | BA Hons. Psychology & Physiology | |
| 1999 | Medical Sciences Tripos | |

EMPLOYMENT

Current Positions

| | | |
|------------|---|---|
| Feb 2017 – | MRC Clinician Scientist Fellowship | Nuffield Department of Clinical Neurosciences, Oxford |
| Sep 2017 – | Associate Professor | University of Oxford |
| Aug 2014 – | Honorary Consultant Neurologist | John Radcliffe Hospital |
| Apr 2017 – | Honorary Senior Research Associate | UCL |

Previous Employment

| | | |
|-----------------|--|--|
| Sep 15 – Sep 18 | Junior Research Fellow | Lady Margaret Hall, Oxford |
| May 14 – Feb 16 | Clinical Research Fellow | Department of Experimental Psychology, University of Oxford |
| Aug 07 – May 14 | Specialist Registrar in Neurology | Imperial College NHS Trust |
| May 10 – Aug 13 | Wellcome Trust Clinical Research Training Fellowship | Institute of Cognitive Neuroscience, Queen Square, UCL |
| Feb 07 – May 10 | Academic Clinical Fellowship | Cognitive Neurology, Imperial College, London |
| Feb 03 – Dec 06 | Senior House Officer & Pre-registration House Officer | Hammersmith Hospital, Addenbrooke's Hospital, Kings College Hospital |

AWARDS

| | |
|------------|---|
| 2020 | Thomas Willis Intermediate Career Research Prize (University of Oxford, £500) |
| 2019-2020 | Nuffield Oxford Hospitals Fund (co-applicant, £9,187) |
| 2019-2020 | Oxford-Berlin seed grant (co-applicant, £30,000) |
| 2019-2022 | Oxford University Hospitals Local Clinical Excellence Award |
| 2019-2021 | Leverhulme Trust Research Grant, PI (£102,941) |
| 2017-2021 | MRC Clinician Scientist Fellowship (£1,291,319) |
| 2015 | Fellowship of the Software Sustainability Institute (RCUK, £3000) |
| 2015-2018 | Junior Research Fellowship at Lady Margaret Hall, Oxford (3 years, £15,000) |
| 2015-2016 | University Staff Innovation Seed Fund award (£18,769) |
| 2013 | UCL Queen Square Symposium Prize |
| 2013 | Oxford Learning Institute Teaching Award |
| 2013 | Oxford University OxTALENT Prize for innovation (2 prizes) |
| 2012 | Guarantors of Brain Travel Grant (£1000) |
| 2010 | Wellcome Trust Clinical Fellowship (awarded £231,790) |
| 2007 | NIHR Academic Clinical Fellowship (3 years, value £30,750) |
| 1998, 1999 | Academic Scholarship at Gonville and Caius College (×2) |
| 1997–2000 | Choral Scholarship at Gonville & Caius College (Countertenor) |
| 2000 | Sir Rudolph Peters Prize |

PUBLICATIONS

Summary

37 peer reviewed publications since 2017, of which

6 were senior author, 5 first author,

6 × *Brain*, 2 × *eLife*, 5 × *Cortex*, and others in *Current Biology*, *PNAS*, *Nature Human Behaviour* and *Lancet Psychiatry*

H-index 23, citations 1667 (Google scholar). Total publications = 59.

Manuscripts under review

1. van Swieten M, Bogacz R, **Manohar SG**, “Gambling on an empty stomach”, (under review)
2. van Swieten M, Bogacz R, **Manohar SG**, “Hunger improves reinforcement-driven but not planned action” (under review)
3. Grogan J, Randhawa G, Kim M, **Manohar SG**, “Motivation improves working memory by two processes” (under review)
4. Moeller M, Grohn J, **Manohar SG***, Bogacz R*, “Reward prediction errors induce risk-seeking” [Corresponding and Joint senior author] (under review)
5. Tabi Y, Maio MR, Attallah B, Dickson S, Drew D, Idris MI, Kienast A, Klar V, Nobis L, Plant O, Saleh Y, Sandhu T, Slavkova E, Toniolo S, Zokaei N, **Manohar SG**, Husain M, “Visual imagery and its relationship to visual short-term memory”, (submitted)
6. Tabi Y, Bocincova A, Husain M, **Manohar SG**, “Recency but not retro-cued shifts of attention protects working memory from interference”, (submitted)
7. Printzlau F, Myers N, Muhle-Karhe P, **Manohar SG**, Stokes MG, “Prospective task knowledge improves working memory-guided behavior”, *PsyArXiv* doi:10.31234/osf.io/qhku6

8. Khalighinejad N, **Manohar SG**, Husain M, Rushworth MFS, “Complementary roles of cholinergic and serotonergic systems in decision about when to act” (submitted)
9. and... **Manohar SG**, “Good Coding Practices for Scientists” – book commissioned by OUP

2021

1. Pettit P, Attaallah B, **Manohar SG**, Husain M, “The computational cost of active information sampling prior to decision making under uncertainty”, *Nature Human Behaviour* (2021)
2. **Manohar SG**, Lockwood P, Drew D, Fallon SJ, Chong, TJ, Jeyaretna DS, Baker I, Husain M, “Reduced decision bias and more rational decision making following ventromedial prefrontal cortex damage”, *Cortex* (in press)
3. Veldsman M, Nobis L, Almagro FA, Smith S, **Manohar SG**, Husain M, “The human hippocampus and its subfield volume across age, sex and APOE e4 status” *Brain Comms.* (2021)
4. Saleh Y, Le Heron C, Veldsman M, Drew D, Plant O, Schulz U, Sen A, **Manohar SG**, Rothwell PM, Husain M, “Distinct white matter tract changes associated with apathy in cerebrovascular small vessel disease” *Brain* (2021)
5. Pettit P, Scholl J, Attallah B, Drew D, **Manohar SG**, Husain M, “The relationship between apathy and impulsivity in large population samples”, *Scientific Reports* (in press)

2020

6. Grogan J, Sandhu T, Hu M, **Manohar SG**, “Dopamine promotes instrumental motivation, but reduces reward-related vigour”, *eLife* (2020)
 - ▶ **Dopamine has opposite effects on two types of motivation in PD.** This is a major output of my own group’s work. We found that medications reduce the general energization of actions by expecting reward, but accentuate selective instrumental motivation.
7. Drew D, Muhammed K, Baig F, Kelly MJ, Saleh Y, Soundarajan R, Hu M, Okai D, **Manohar SG***, Husain M*, “Dopamine and reward hypersensitivity in Parkinson’s disease with impulse control disorder”, *Brain* (2020)
 - ▶ **Predicting impulse control disorders with pupil dilation [Joint senior author – I was the direct supervisor for most aspects].** Joint senior author and direct supervisor. This clinical study develops pupillometry to index impulse-control disorders. In impulsive patients, chronic dopamine use sensitised reward responses to drug withdrawal. We provide preliminary evidence that pupil size could predict who will develop impulse control disorders many years later.
8. Bocincova A, Olivers CNL, Stokes MG, **Manohar SG**, “A common neural architecture for visual search and working memory” *Visual Cognition* (2020)
9. Codol O, Holland PJ, **Manohar SG**, Galea J, “Reward-based improvements in motor control are driven by multiple error-reducing mechanisms” *J Neurosci.* (2020)
 - ▶ **Collaboration with Birmingham to test my model of motivational costs.**
10. Veldsman M, Tai XY, **Manohar SG**, Husain M, “The impact of cerebrovascular risk factors on frontoparietal network integrity and executive function in healthy ageing” *Nature Comms.* (in press)
11. Grogan JP, Fallon SJ, Zokaei N, Husain M, Coulthard EJ, **Manohar SG**, “A new toolbox to distinguish the sources of spatial memory error” *J Vision* (in press)
12. Muhammed K, Dalmaijer E, **Manohar SG**, Husain M, Voluntary modulation of saccadic peak velocity associated with individual differences in motivation, *Cortex* (2020)
 - ▶ **We report the unexpected finding that eye movements can be volitionally energised**
13. Sadnicka A, Daum C, Meppelink A, **Manohar SG**, Edwards M, “Reduced drift rate: a biomarker of impaired information processing in functional disorders”, *Brain* (2020)
 - ▶ **Abnormal evidence accumulation in psychogenic motor disorders.** Independent collaboration with St George’s, applying psychophysics to functional neurological disorders. I

was the direct supervisor. Functional patients down-weighted somatosensory evidence during decision-making. This generalised across various subtypes, providing a common mechanistic marker.

14. Zokaei N, Grogan JP, Fallon SJ, Slavkova E, Hadida J, **Manohar SG**, Nobre AC, Husain M, “Short-term memory advantage for brief durations in human ApoE e4 carriers”, *Scientific Reports* (2020)
15. Zokaei N, Sillence A, Kienast A, Drew D, Plant O, Slavkova E, **Manohar SG**, Husain M, “Different patterns of short-term memory deficit in Alzheimer’s disease, Parkinson’s disease and subjective cognitive impairment”, *Cortex* doi:10.1016/j.cortex.2020.06.016 (2020)

2019

16. **Manohar SG**, Zokaei N, Fallon SJ, Vogels T, Husain M, “Neural mechanisms of attending to items in working memory”, *Neuroscience & Biobehavioral Reviews* (2019)
 - ▶ **I devised the first neural model of how we shift our attention between items in memory.** The model was the product of 5 years’ work, and unites two disparate views of short-term memory. It explains a range of puzzling fMRI, MEG and single-unit data. The surprising new principle here is that neural patterns change their meaning over seconds, calling for re-evaluation of much single-neuron data. This led to invited talks (Zurich, Brown, UCL) and formed the basis for my Leverhulme grant. It has already been cited in 5 review articles (Ort & Olivers 2020; Lindsay 2020; Saday & Pertzov 2020; Abdelkarim et al. 2019; de Vries et al 2020), and won the Thomas Willis Intermediate Career Research Prize (University of Oxford).
17. Zokaei N, Board AG, **Manohar SG**, Nobre AC, “Adjusting the aperture of the mind’s eye: modulation of the pupillary response by the content of visual working memory”, *PNAS* (2019)
 - ▶ **Pupil size reflects the brightness of what we are remembering.** Together with Kia Nobre’s lab, I studied shifts of attention in memory using pupillometry. We find that pupil size reflects the brightness of what we are currently thinking of. In line with my model, this indicates that sensory circuits – even in the brainstem – are recruited when we hold information in mind.
18. Tabi Y, Husain M, **Manohar SG**, Recall cues interfere with retrieval from visuospatial working memory, *Brit J Psychol* (2019)
19. Fallon SJ, Kienast A, Muhammed K, Ang Y, **Manohar SG**, Husain M, “Dopamine D2 receptor stimulation modulates the balance between ignoring and updating according to baseline working memory ability”, *J. Psychopharmacol.* (2019)
20. Nobis L, **Manohar SG**, Smith SM, Alfaro-Almagro F, Jenkinson M, Mackay CE, Husain M, Hippocampal volume across age: Nomograms derived from over 19,700 people in UK Biobank, *Neuroimage: Clinical* (2019)
 - ▶ **Open online tool with normalised quantiles for brain volume**
21. Al Diwani A, Handel A, Lennox B, Okai D, **Manohar SG**, Irani S, The psychopathology of NMDAR-antibody encephalitis in adults, *Lancet Psychiatry* (2019)
 - ▶ **Computational phenotyping in neurology.** I applied computational phenotyping for diagnosing a recently-described treatable neuro-immune disease, collaborating with psychiatry. Using a 50-dimensional clinical fingerprint, I showed that NMDAR-encephalitis manifests a unique neuropsychiatric profile to non-organic psychoses. It achieved impact through citations in a clinical update (Dalmau 2019), an international consensus (Pollak 2020), consensus-based practice recommendations (Zuliani 2019), and evidence-based guidelines for treatment (Barnes 2020). IF 18.3
22. Ariga R, Tunnicliffe EM, **Manohar SG**, Mahmood M, Raman B, Piechnik SK, Francis JN, Robson MD, Neubauer S, Watkins H, Identification of Myocardial Disarray in Patients With Hypertrophic Cardiomyopathy and Ventricular Arrhythmias, *J Am Coll Cardiol* 73 (20), 2493-2502 (2019)
 - ▶ **Applying brain imaging methods to cardiology.** Collaborating across departments, I transferred expertise in analysis of brain imaging to assess myocardial disarray, previously only measurable on biopsy or post-mortem. The work has won international prizes, was highlighted

in the Editor-in-Chief's Top Picks (Fuster 2019) and European Heart Journal "The year in cardiology" (Pennell 2019), and was cited in a clinical update (Kolentinis et al. 2020). IF 16.8

2018

23. Fallon SJ, Drew D, Muhammed K, **Manohar SG**, Husain M, Dopamine guides competition for cognitive control: Common effects of haloperidol on working memory and response conflict, *Cortex* (2018)
24. **Manohar SG**, Muhammed K, Fallon SJ, Husain M, "Motivation dynamically increases noise resistance by internal feedback", *Neuropsychologia* (2018)
 - ▶ **Quantitative test of a feedback-control model of motivation.** Motivation can make us both faster and more accurate, violating the speed-accuracy trade-off. Why can't we do this all the time? I developed a quantitative feedback-control model of motivation, and tested it using eye movements. To improve performance, motivation stabilizes motor plans by online attenuation of noise, but at a cost.
25. Le Heron C, **Manohar SG**, Plant O, Muhammed M, Griffanti L, Nemeth A, Douaud G, Markus HS, Husain M, Dysfunctional effort-based decision-making underlies apathy in genetic cerebral small vessel disease, *Brain* (2018)
26. Ang YS*, **Manohar SG***, Plant O, Kienast A, LeHeron C, Muhammed K, Husain M, "Dopamine modulates option generation for behavior", *Current Biology* (2018)
 - ▶ **I developed precise measure of our ability to produce new ideas [Joint first author].** Generating new ideas is usually studied using imprecise linguistic or cognitive tasks. Here I devised a carefully controlled task that measures the speed and novelty of idea generation, and shows how it is under dopaminergic control.
27. Le Heron C, Plant O, **Manohar SG**, Ang YS, Jackson M, Lennox G, Hu MT, Husain M, "Distinct effects of apathy and dopamine on effort-based decision-making in Parkinson's disease", *Brain* 141:5:1455 (2018)
28. Fallon SJ, Mattiesing RM, Dolfen N, **Manohar S**, Husain M, "Ignoring versus updating in working memory reveal differential roles of attention and feature binding", *Cortex* (2018)
29. Moradi ZZ, **Manohar SG**, Duta M, Enock F and Humphreys GW, "In-group biases and oculomotor responses: beyond simple approach motivation", *Exp Brain Res* doi:10.1007/s00221-018-5221-7 (2018)

2017

30. **Manohar SG**, Finzi RD, Drew D, Husain M, "Distinct motivational effects of contingent and non-contingent rewards", *Psychological Science* (2017)
 - ▶ **I uncovered a novel distinction between two kinds of motivation.** Rewards that depend on performance have distinct effects from guaranteed rewards. Cited in 3 current opinions reviews. IF 6.1
31. Fallon SJ, Mattiesing RM, Muhammed K, **Manohar S**, Husain M, "Fractionating the Neurocognitive Mechanisms Underlying Working Memory: Independent Effects of Dopamine and Parkinson's Disease", *Cerebral Cortex* 27:12 (2017)
32. Nachev P, Rose GE, Verity DH, **Manohar SG**, MacKenzie K, Adams G, Theodorou M, Pankhurst Q, Kennard C, Magnetic oculomotor prosthetics for acquired nystagmus, *Ophthalmology* 124:10:1556 (2017)
33. **Manohar SG**, Pertzov Y, Husain M, "Short-term memory for spatial, sequential and duration information", *Curr Op Beh Neurosci* 17:20 (2017)
34. **Manohar SG**, Akam T, "Cortical areas needed for choosing actions based on desires (Commentary)", *Brain* 140:6:1539-42 (2017)

35. Sadnicka A, Daum C, Cordivari C, Bhatia KP, Rothwell JC, **Manohar SG**, Edwards MJ, “Mind the gap: temporal discrimination and dystonia” *Eur J Neurol* (2017)
▶ **Joint senior author**
36. Koyluoglu OO, Pertzov Y, **Manohar S**, Husain M, Fiete I, “Fundamental bound on the persistence and capacity of short term memory as stored as graded persistent activity”, *eLife* 6:e22225 (2017)
37. Pertzov Y, **Manohar SG**, Husain M, “Rapid forgetting results from competition over time between items in visual working memory”, *J Exp Psychol: Learn Mem Cogn* 43:4:528 (2017)

2016

38. Muhammed K, **Manohar SG**, Yehuda MB, Chong TTJ, Tofaris G, Lennox G, Bogdanovic M, Hu M, Husain M, “Reward sensitivity deficits modulated by dopamine are associated with apathy in Parkinson’s disease”, *Brain* (2016)
39. Fallon SJ., Zokaei N., Norbury A., **Manohar SG.**, Husain M., “Dopamine alters the fidelity of working memory representations according to attentional demands”, *J Cogn Neurosci* (2016)
40. **Manohar SG**, Husain M, “Lesions to human medial prefrontal cortex alter incentivisation by reward” *Cortex* 76:104 (2016) doi:10.1016/j.cortex.2016.01.005
41. **Manohar SG**, Husain M, “Reduced pupillary reward sensitivity in Parkinson's disease” *Nature Partner Journals Parkinson’s Disease* 1:15026 (2016) doi:10.1038/npjparkd.2015.26
42. **Manohar SG.**, Husain M., “Working memory for sequences of temporal durations reveals a volatile single-item store”, *Frontiers in Psychology* 7 (2016) doi:10.3389/fpsyg.2016.01655

2015 and earlier

43. **Manohar SG**, Chong TJ, Apps MA, Batla A, Stamelou M, Jarman P, Bhatia KP, Husain M, “Reward pays the cost of noise reduction in motor and cognitive control”, *Current Biology* 25(13):1707-16 (2015)
▶ **I developed a new computational framework for understanding motivation.** This was the primary output of my PhD thesis, and united the two disparate fields of neuroeconomics and motor control theory. It allows us to predict in which situations reward can drive improved performance, across cognitive and motor tasks. It is well-cited in literature on motivation, including in a range of high-profile reviews (Berke 2018; Yee and Braver 2018; Kool and Botvinick 2018), and several labs around the world have adopted the framework to model motivation quantitatively.
44. Chong T, Bonnelle V, **Manohar S**, Veromann K, Muhammed K, Tofaris G, Hu M, Husain M, “Dopamine enhances willingness to exert effort for reward in Parkinson's disease”, *Cortex* 69:40 (2015)
▶ **A quantitative way to distinguish between effort sensitivity and reward sensitivity.** My quantitative task is now being employed by many groups internationally in psychiatric disease (Jim Gold, Maryland; Paul Krack, Switzerland; Patrick Bach, Mannheim).
45. Bonnelle V, **Manohar S**, Behrens T, Husain M, “Individual differences in premotor brain systems underlie behavioral apathy”, *Cerebral Cortex* (2015) doi:10.1093/cercor/bhv247
46. Apps MA, Grima LL, **Manohar S**, Husain M, “The role of cognitive effort in subjective reward devaluation and risky decision-making”, *Scientific Reports* 5:16550 (2015)
47. Joseph S, Iverson P, **Manohar S**, Fox Z, Scott SK, Husain M, “Precision of working memory for speech sounds”, *Quart. J. Exp. Psychol.* 68:10 (2015)
48. Hayward C, Patel HC, **Manohar SG**, Lyon AR, “Gene therapy for GM1 gangliosidosis: challenges of translational medicine”, *Annals of translational medicine* 3:S1 (2015)
49. Zokaei N, Ning S, **Manohar S**, Feredoes E, Husain M, Flexibility of representational states in working memory, *Frontiers in Human Neuroscience* 8 (2014) 10.3389/fnhum.2014.00853

50. Bonnelle V, Veromann K, Burnett S, Lo Sterzo E, **Manohar S**, Husain M, "Characterisation of reward and effort mechanisms of apathy", *J Physiol. Paris* (2014)
doi:10.1016/j.jphysparis.2014.04.002
51. **Manohar S**, Husain M, "Attention as foraging for information and reward" *Frontiers in Human Neuroscience* 7:711 (2013), doi:10.3389/fnhum.2013.00711
52. Zokaei N, **Manohar S**, Husain M, Feredoes E, "Causal evidence for a privileged working memory state in early visual cortex" *J Neurosci* 34(1):158-162 (2013),
doi:10.1523/jneurosci.2899-13.2013
53. Norbury A, **Manohar S**, Rogers RD, Husain M, "Dopamine modulates risk-taking as a function of baseline sensation-seeking trait" *J Neurosci* 33(32):12982-12986 (2013),
doi:10.1523/jneurosci.5587-12.2013
54. Camara E, **Manohar S**, Husain M, "Past rewards capture spatial attention and action choices" *Experimental Brain Research* 230(3):291-300, (2013), doi:10.1007/s00221-013-3654-6
55. **Manohar S**, Bonnelle V, Husain M, "Neurological disorders of attention" in *The Oxford Handbook of Attention*, 1028-1061, Eds. Nobre & Kastner, OUP (2013)
56. Sinha N, **Manohar S**, Husain M, "Impulsivity and apathy in Parkinson's disease" *Journal of Neuropsychology* 7(2):255-283 (2013), doi:10.1111/jnp.12013
57. Adam R, **Manohar S**, "Does reward modulate actions or bias attention?" *J Neurosci* 27(41):10919-10921 (2007), doi:10.1523/jneurosci.2957-07.2007
58. Hubbard EM, **Manohar SG**, & Ramachandran VS, "Contrast affects the strength of synesthetic colors" *Cortex* 42(2):184-94 (2006), doi:10.1016/S0010-9452(08)70343-5
59. Walsh SR, Thomas C, **Manohar S**, Coveney EC, "Early management of atrial fibrillation in general surgical in-patients" *Int J Surg.* 4:115-117 (2006).

INVITED TALKS

| | | |
|------|------------------|---|
| 2021 | Guest speaker | Max Planck UCL Centre |
| 2020 | Guest speaker | Department of Psychology, University of Leuven |
| 2020 | Guest speaker | Department of Psychology, University of Zurich |
| 2019 | Invited speaker | Centre for Interdisciplinary Research (Bielefeld, Germany) |
| 2019 | Invited speaker | British Psychological Society national meeting |
| 2019 | Invited panelist | Control Processes international meeting (Brown, USA) |
| 2019 | Invited speaker | Mathematical Neuroethology of Optimal Control meeting (Banff) |
| 2019 | Guest speaker | Kolloquium des Allgemeine Psychologie, Giessen (Germany) |
| 2018 | Guest speaker | Department of Psychology, University of Bielefeld (Germany) |
| 2018 | Guest speaker | British Neuroscience Association Neuroinformatics group |
| 2018 | Guest speaker | Imperial College Neurology Grand Round |
| 2017 | Invited speaker | Gordon Conference on Eye Movements (Canada) |
| 2017 | Invited speaker | British Neuropsychiatry Association meeting (London) |
| 2016 | Guest speaker | Institute of Cognitive Neuroscience, UCL (London) |
| 2015 | Guest speaker | Imperial College Brain Meeting |
| 2015 | Selected Talk | Dutch Neuropsychology Society, Joint Meeting |
| 2013 | Selected Talk | Oxford Parkinson's Disease Research Day UK |

STUDENTS AND THEIR ACCOMPLISHMENTS

| | | |
|-------------------------|-------------------------------------|--|
| Youssuf Saleh | DPhil 2018- | Academic Clinical Fellow 2020 European Academy of Neurology Trainee Prize 2020 Royal Society of Medicine Gordon Holmes Prize |
| Xin You Tai | DPhil 2019- | Academic Clinical Fellow 2019 Wellcome Clinical Research Training Fellowship 2020 Trinity College Graduate Prize |
| Kinan Muhammed | DPhil 2016 & Clinical Lecturer 2019 | 2019 4-year NIHR-funded Clinical Lecturership 2018 Mansell Prize in Neurosciences 2016 Association of British Neurologists Symonds Prize 2016 European Academy of Neurology First Prize |
| Rebecca Finzi | MSc 2016 | Thesis achieved highest mark in the University, won the departmental poster prize. Now PhD student at Stanford. |
| Bahaa Atallah | DPhil 2019- | Co-supervisor / Masud Husain |
| Frida Printzlau | DPhil 2017- | Co-supervisor / Mark Stokes |
| Younes Tabi | DPhil 2018- | Co-supervisor / Masud Husain |
| Moritz Moeller | DPhil 2018- | Co-supervisor / Rafal Bogacz |
| Maaïke van Swieten | DPhil 2017- | Co-supervisor / Rafal Bogacz |
| Stephanie Hirschbichler | PhD 2016- | Co-supervisor / John Rothwell UCL |
| Thijs van der Plas | DPhil 2020 | Supervisor |
| Tim Sandhu | RA 2019 | Funded PhD studentship at Cambridge |

OTHER QUALIFICATIONS AND PROFESSIONAL MEMBERSHIP

| | |
|-------|---|
| 2018– | Member of the Academy of Medical Educators (MAcadMED) |
| 2017– | Fellow of the Software Sustainability Institute |
| 2017– | Associate Fellow of the Higher Education Academy (AFHEA) |
| 2016 | British Psychological Society accreditation (MBPsS) |
| 2016 | USMLE Medical licensing exams for USA. |
| 2014 | Certificate of Completion of Specialist Training in Neurology |
| 2012– | Member of the Association of British Neurologists |
| 2006– | Royal College of Physicians (MRCP) |
| 2005 | Sun Certified Java Programmer |

TEACHING EXPERIENCE

| | |
|----------------|--|
| 2018 | Developed new lecture course in cognitive neurology. Annual course of 8 lectures, 6 tutorials, setting and marking of 2 exam papers, to both Psychology and Biomedical Sciences undergrads |
| 2017 | Developing Learning and Teaching portfolio of teaching work leading to HEA-approved qualification. |
| 2010 – present | Examiner for medical school finals Royal Free / UCL (2010 – 2012), Oxford (2015 – present) |
| 2015 – 18 | Undergraduate tutor for medicine and psychology at Lady Margaret Hall. |
| 2013 – | Good Coding Practice for Scientists: I developed a new course at UCL & Oxford for scientists who write computer code, introducing professional programming concepts and techniques to researchers. I have also given two national seminars. |

- 2017 – 2019 **Code Clinic:** I run weekly consults for students who write code. I advise on anything from debugging to data visualization and statistical modelling.
- 2011 – 2012 **Question setter for MRCP part I exam:** designed 20 MCQ questions per year.
- 2002–2005 **Cambridge University Distributed Opportunities System (CUDOS)** project, University of Cambridge:
Lead programmer for team of 10, funded by a National Teaching Fellowship, developing web-based educational software for medical students.

COMMITTEES AND PANELS

- 2020- Wellcome Trust Neuroscience & Mental Health board
- 2016–2019 Zurich-McGill Grants Review Panel
- 2017– University IT Innovation Grants Review Panel
- 2018– Central University Research Ethics Committee member
- 2018– Neurology Specialist Registrar Training Committee
- 2017– Deputy Training Programme Director for SHOs in Neurology
- 2016, 2019 Trust Peer Reviewer (local care quality assurance)
- 2016–2018 CQC Specialist Advisor (national panel)
- 2015– Director, Cloisters Management Company Ltd

MEDICAL SOFTWARE DEVELOPMENT

- 2002 to present **Human Physiology Teaching simulator:** Department of Physiology, Cambridge University. I coded this realistic computerized numerical model of the whole of human physiology, for teaching purposes. It unifies the simulation of cardiovascular, respiratory, renal and metabolic physiology. The software has been integrated into undergraduate Physiology and Medicine curriculum at Cambridge for over 19 years, with Prof Roger Carpenter and Matt Mason.
<http://www.homphysiology.org>
- 2012 **Neuroslice:** I created an award-winning phone app for teaching neuroanatomy through histological slices and MRI scans, with > 40,000 downloads (paid commission from Taylor and Francis publishers)
<https://play.google.com/store/apps/details?id=org.homphysiology.neuroslice>
- Summer 2000 **NeuroLab** software is sold with the undergraduate textbook: Carpenter, RHS, *Neurophysiology*, Hodder Arnold 2012, ISBN 1444135171
I wrote this undergraduate teaching software as a set of 30 interactive models demonstrating principles of neurophysiology.
- 2018 (in production) **Medical Lists:** I am currently developing a mobile phone app for revising lists for medical finals and MRCP, and can be used as a pocket reference.
- 2017 to present **NeuroSim:** I led development of this neurology simulator for teaching functional neuroanatomy to medical students and neuroscientists. Currently integrated into the Clinical Medicine course at University of Oxford.

Languages: C, C++, Java, Javascript, Forth, Python, MATLAB, Pascal, 80x86 asm, 6502 asm

Methods: Statistics (mixed models, maximum likelihood, MCMC, variational Bayes, permutation testing), Neural networks (rate models, bump attractors, echo-state RNN / BPTT, deep convolutional NN, VAE), Dimensionality reduction (PCA, CCA, LASSO, MDS, kernel methods), Linear classifiers.