

Dr. Carmel Howe

Experience

Work

- June. 2018 – Present **Research Associate**, *Imperial College London*, London, UK.
Research associate position in the Department of Bioengineering. Developing a new high-speed, high-throughput, three-dimensional imaging modality to track network-level neuronal activity in the mammalian brain using two-photon, holographic optogenetic neuron stimulation and simultaneous imaging with synthetic or genetically-encoded fluorescent calcium or voltage indicators.
- Mar. 2016 – Mar. 2017 **Freelance Copy Editor / Proofreader**, *Cactus Global*, Freelance.
Proofread and edited documents due to be submitted to academic journals for grammar, spelling, and usage.
- Sept. 2006 – April 2014 **Apprentice / Undergraduate Engineer**, *GE Energy Power Conversion UK Limited (formerly Converteam)*, Rugby, UK.
During my employment with GE I undertook a 4-year apprenticeship, which included rotation of various departments within the Rotating Machines manufacturing facility. Following completion of my apprenticeship, I was sponsored by the company to attend University of Nottingham. During my sponsorship, I worked within the Rotating Machines facility during summer and Christmas holidays within the Sales & Marketing, Planning and Engineering departments.

Teaching

- Oct. 2017 – June 2018 **Teaching Assistant**, *University of Nottingham*, Nottingham, UK.
Delivered and supported the laboratory, project-based learning for students studying Electrical and Electronic Engineering. Marking and feedback for the modules. Assisted the module conveners with curriculum development including the preparation of teaching materials. Helped out at open days.
- June 2017 & 2018 **Student Assistant - Optics Team**, *Optical Imaging and Electrophysiological Recording in Neuroscience*, ENP-Université Paris Descartes, France.
Student Assistant on the optics team. Assisted PhD & postdoctoral students with the theory and experimental side of the optical bench during the two week course. The optical bench consisted of two sets of experiments designed to introduce the students to different imaging and illumination techniques. By the end the students are able to build and align their own light and scanning mirror confocal microscopes.
- Sept. 2016 & 2017 **Student Assistant - Electronics & Optics Team**, *MBA Microelectrode Techniques for Cell Physiology*, Plymouth, UK.
Student Assistant on the electronics team at the electrophysiology course. Helped PhD & postdoctoral students with the theory and experimental side of basic amplifiers and filters during the two week course. I built and aligned the optical bench before demonstrating light & confocal microscopy, similar to the Paris course.
- Mar. 2016 – Sept. 2017 **Private Tutor**, *Freelance*, Nottingham, UK.
Tutoring a range of students from High School (pre-GCSE) to Undergraduate level in general science and electronics. I developed lesson plans and experiments that were accessible to demonstrate difficult topics.
- Oct. 2014 – Sept. 2017 **Postgraduate Demonstrator**, *University of Nottingham*, Nottingham, UK.
Supervise practicals for undergraduate and postgraduate students in the "HDL for Programmable Logic" module, 2014 – 2017 and "Electronic Engineering" module, 2015 and 2016.

Education

- Oct. 2014 – present **PhD in Electrical and Electronic Engineering**
University of Nottingham
- Title *Developing a Novel Sensor Technology for Detecting Neural Activity*
- Supervisors Dr. Noah Russell (School of Electrical and Electronic Engineering) & Prof. Mark Fromhold (School of Physics and Astronomy)
- Description This PhD project involved the development of a novel sensor technology to allow neural activity from a large network to be imaged non-invasively. The sensors were based on plasmonic sensors, which respond to small perturbations in electric fields. Plasmons are collective oscillations of electrons in a metal that are highly sensitive to nearby changes in refractive index and electrochemical perturbations - both of which occur during neural spiking. The sensor developed could be used to monitor cultured neuronal networks, during network regeneration and development. The experiments were validated using whole-cell patch clamp on *in vitro* neuronal cultures. Post-processing and analysis was completed in custom code written by myself in MATLAB.
- The project was joint supervised with Engineering and Physics, and was part of a larger interdisciplinary project involving neuroscientists, chemists and engineering to build a simple living artificial brain with the goal of understanding fundamental aspects of information processing in the brain. The project involved myself becoming an expert in a diverse range of techniques including optics, electrophysiology, and cell culture.
- Sept. 2010 – July 2014 **MEng Electrical and Electronic Engineering**, *University of Nottingham*, Nottingham, UK, with a year abroad at the University of Melbourne, Australia.
First Class Honours
- Sept. 2008 – July 2010 **FdEng Electrical Engineering**, *Coventry University*, Coventry, UK.
Distinction
- Sept. 2006 – July 2008 **ONC Electrical Engineering**, *Warwickshire College*, Rugby, UK.
Merit Merit
- Sept. 1999 – July 2004 **10 GCSE Grades A-C**, *Bilton High School*, Rugby, UK.
Including English Grade A and Mathematics Grade B

Publications

- Soor, S.S., Quicke, P., **Howe, C.L.**, Pang, K., Neil, M.A.A., Schultz, S.R., Foust, A.J., "All Optical Crosstalk-Free Manipulation and Readout of Chronos Expressing Neurons" In press
- **Howe, C.L.**, Webb, K.F., Abayzeed, S.A., Anderson, D.J., Denning, C. and Russell, N.A., "Surface Plasmon Resonance Imaging of Excitable Cells." In press
- **Howe, C.L.**, Fromhold, T.M., Russell, N.A., "Surface plasmon resonance on gold microstructures", Proc. SPIE 10509, Plasmonics in Biology and Medicine XV, 105090R (23 February 2018); doi: 10.1117/12.2300953.

In Review

- Quicke, P., Song, C., McKimm, E.J., Milosevic, M.M., **Howe, C.L.**, Neil, M.A.A., Schultz, S.R., Antic, S.D., Foust, A.J., Knopfel, T., "Single-neuron level one-photon voltage imaging with sparsely targeted genetically encoded voltage indicators."

Conferences, Presentations and Courses Attended

Conferences & Presentations

- "Avoiding Spectral Crosstalk (and when not to FRET it)"; 45+1 Anniversary Celebration of Merocyanine 540; Wood's Hole, Massachusetts, USA; August 2018.
- "Surface plasmon resonance on gold microstructures" Poster; SPIE Photonics West; San Francisco, California, USA; January 2018
- Poster Presentation; EMBO Practical Course in Advanced Optical Microscopy; Plymouth, UK; April 2015

- Poster Presentation; Neuroscience at Nottingham; Nottingham, UK, January 2015

Courses

- MBA Microelectrode Techniques for Cell Physiology Workshop; Marine Biological Association; Plymouth, UK; September 2015
- EMBO Practical Course in Advanced Optical Microscopy; Marine Biological Association; Plymouth, UK; April 2015

Organisation, Outreach and Leadership

- 2018 – present Department of Bioengineering Postdoc Representative, Imperial College London
- 2018 – present Equality and Departmental Culture Committee Member, Imperial College London
- 2018 – present Assistant Supervisor, Imperial College London
- Nov. 2018 Organiser of the Department of Bioengineering's Annual Post-doctoral and Fellows Research Symposium, Imperial College London
- 2017 – 2018 Lead Organiser of 500 Women Scientists; Nottingham Branch
- 2017 – 2018 Pint of Science Nottingham - Atoms to Galaxies Team Leader
- 2017 'I'm an Engineer, Get me out of here' runner up
- 2016 Mansfield Science Fair
- 2015 May Fest, Nottingham

Prizes & Awards

- 2014 – 2017 EPSRC Healthcare Technologies Research Bursary
- 2014 – 2017 Whitworth Senior Scholarship (£22,500)
- 2017 Institute of Engineering and Technology Travel Award (£500)
- 2017 International Society for Optics and Photonics Student Travel Grant (\$300)
- 2015 Physiological Society Travel Grant (£500)
- 2013 University of Nottingham High Flier
- 2010 – 2014 E3 Academy Scholarship at Convertteam Ltd (£10,000)
- 2010 University of Nottingham Achievement Bursary (£1000)

Professional Memberships

- 2010 Member (MIET) of the Institute of Engineering and Technology
- 2014 Fellow of the Royal Microscopical Society
- 2014 Member of the Institute of Physics
- 2014 Member of the International Society for Optics and Photonics (SPIE)

Skills

- Laboratory Various microscopy techniques (including light microscopy, surface plasmon microscopy and two-photon), CCD/CMOS camera image acquisition, cell culture including hippocampal dissection from rat embryos, whole-cell patch clamp electrophysiology, optogenetics (stimulation, voltage and calcium imaging, immunocytochemistry, and immunofluorescence), NIR-VIS spectroscopy, and electronic laboratory related skills.
- Computing Applications include Microsoft Office, Simulink, Minitab, Labview, Image-J, Autodesk, Solidworks, and MS Project.
Programming Languages include MATLAB, Python, C, C++, VHDL, and SQL.