Jacob Clark

Linkedin: https://www.linkedin.com/in/jacob---clark/
Email: Jacob.clark.19@ucl.ac.uk **Mobile: +447710248395**

I have experience working on interdisciplinary projects with a particular focus on channel proteins. This has provided me with skills in both experimental work, cell biology and biochemistry, and computational work, with atomistic modelling and enhanced sampling methods. I am interested in how the techniques I learned in computational biophysics can be utilised for practical applications, overcoming the limits of conventional approaches, as well as how the methods I have used can be improved to better represent the biological systems being studied.

Education

King's College London

Oct-2019/2023 **LIDo DTP - PhD**
Project supervised by Prof Carla Molteni and Prof Lucia Sivilotti on atomistic simulations of the Glycine receptor and probing binding mechanics.

University of Leeds

Sep-2015/July-2019 **Neuroscience BSc (Ind)**
Graduated with 2:1 Dissertation supervised by Dr Lars Jeuken – Using SMPs to model mitochondrial function.

Placement Year
Supervised by Professor Jeremy Henley – SUMOylation in Parkinson's disease at the University of Bristol.

Research Experience

Sep-2020/2023 – King's College London – LIDo DTP PhD

My PhD project investigated the ligand binding mechanisms of Glycine receptors using atomistic simulations and enhanced sampling. The work involved development of appropriate models to identify key mechanisms involved in partial agonism, hyperekplexia mutants and endogenous glycine binding. Funnel metadynamics was employed to effectively sample binding/unbinding rare events. The key findings derived from the trajectories will be published alongside the insights gained into the pentameric ligand gated ion channel binding mechanics.

Oct-2019/Jan-2020 – University College London – Rotation Project

As part of my PhD, my first rotation was a four-month period profiling the effects of calcium uniporter knockout on the mitochondrial calcium signalling of astrocytes supervised by Prof Josef Kittler. It involved extensive cell culture, molecular cloning, and microscopy.

2019 – University of Leeds – Dissertation Project

My undergraduate laboratory-based project was under the supervision of Prof Lars Jeuken and focused on NADH-ubiquinone oxidoreductase to study how Na^+-H^+ antiporter and the de-active states of complex I contribute to its function and/or ROS formation.

2017 – University of Bristol – Department of Biochemistry - Research Assistant

I worked with Prof Jeremy Henley and Dr Ruth Carmichael, examining links between SUMOylation and Parkinson's disease (PD). Through tissue homogenisation, protein quantification, western blotting and statistical analysis using PD patient brain tissue samples, I identified numerous proteins which had increased expression in PD patients. This data was presented at 2018 FENS in berlin.

2017 – University of Leeds Awarded Jennifer Rowles Research Studentship

Here I worked under the supervision of Dr Jonathon Lippiat, during which I carried out overlap extension PCR to produce a gene fusion encoding a concatemer of Kv1.1 and Kv1.2 potassium channel subunits to assess the sensitivity of this heteromeric Kv1 channel to 4-Aminopyridine.

Research Skills

- **Programming:** Experienced in python, tcl and bash for data analysis and management. Also experienced in HPC systems including primarily ARCHER2.
- **Biomolecular Simulations:** Experienced with forcefield parameterisation, molecular dynamics, and enhanced sampling methods (Gaussian, NAMD and PLUMED), as well as familiarity with ligand binding kinetics and free energy calculations.
- **Tissue Culture:** Familiar with experimental laboratory techniques including primary culture, working with cell lines, western blotting, and microscopy.
- **Molecular Cloning:** Familiar with molecular cloning techniques such as PCR, generating recombinant DNA and transfection methods.

Professional Development

2023 – ORACLE – Cloud Computing
A day-long course that introduced cloud computing resources as an alternative to typical HPC facilities.

2022 – 4TU.ResearchData – Internship
I spent 3 months working with the data steward coordinator at TU Delft on a case study and review of the impact of data stewardship at the academic partner institutions. This experience gave me a detailed insight into data management practices as well as the challenges and flaws of working with large data sets.

2022 – CCPBiosim – MDAnalysis and Machine Learning
This two-day course came at the end of the CCPBiosim Annual biomolecular simulations conference in 2022, it covered the basics of MDAnalysis tools for use with MD trajectories as well as several machine learning tools it can be used with such as KMeans.

2022 – KCL - Publishing a Scientific Research Paper
A two-day course that covered the basics of publishing, the metrics used to compare journals, how to identify appropriate journals and how the process itself works.

2021 – Bioexcel – Summer School
A weeklong course involving lectures and hands on sessions covering: Molecular dynamics, Biomolecular Docking, Free energy calculations, Advanced sampling methods.

2021 – CCPBiosim – PUMED Masterclass
A weekly course that covered a basic plumed syntax and analysis, statistical errors in MD, replica exchange methods, umbrella sampling and performance optimization.

2021 – ARCHER – Understanding Package Performance
Training covering HPC benchmarking, performance metrics and parallel application performance.

2020 – ARCHER - HPC Carpentry Course
A short course in the basic effective use of HPC systems, primarily based on the ARCHER HPC system but also included a lot of general theory and practical training.

2020 – SysMIC module 2
A 120-hour course focused on advanced quantitative skills with MATLAB and python, involving principal component analysis and further utilisation of python for analysis.

2019 – SysMIC module 1
A 120-hour course aimed at providing the basic foundations for python and matlab as well as computational modelling of biological systems and data analysis.

2018 – University of Leeds - Integrative Biomedical Sciences
I was selected for this specialist course to learn the basics of in vivo techniques and the use of animals in research involving detailed theory on drug development and the use of animal models, ethics and hands on practical experience.

Conferences + Presentations

2023 – “Investigate binding mode and path of glycine receptors using molecular dynamics and funnel metadynamics” TYC Student Day, London, UK - **Poster**
2023 – “Investigating the binding of glycine receptors using molecular dynamics and enhanced sampling” NMES Research competition, London, UK – **Short Video**
2022 – “Exploring ligand binding and kinetics in a glycine gated ion channel with molecular dynamics and enhanced sampling” 8th Annual CCPbiosim Conference: Frontiers in biomolecular simulations, Edinburgh, UK - **Poster**
2022 – “Investigate binding mode and path of glycine receptors using molecular dynamics and funnel metadynamics” TYC Student Day, London, UK - **Poster**
2021 – “Investigate the binding pocket of the glycine receptor through atomistic simulations” Bioexcel Summer School, Remote, UK- **Poster + Flash Talk**

References

For references: Prof Carla Molteni (carla.molteni@kcl.ac.uk)
Prof Jeremy Henley (j.m.henley@bristol.ac.uk)