Nicholas J. Fowler

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Education

PhD Biophysics, University of Manchester 2014–2018
MSc Physics, University of Manchester 2012–2014
PGCE Physics Secondary, University of Manchester 2011–2012
BSc Physics, University of Manchester 2007–2010

Experience

Research Associate, The University of Leicester 2021–2022
- Led a team to design a computational method that uses easily acquired nuclear magnetic resonance (NMR) data to find elusive drug-binding protein conformations.
- Coordinated the Collaborative Computational project for NMR (CCPN) team to integrate one of my computational methods (ANSURR - see below) into the widely used CCPN-analysis software.

Research Associate, The University of Sheffield 2018–2021
- Developed the first reliable method for validating the accuracy of NMR protein structures (ANSURR - Accuracy of NMR Structures Using RCI and Rigidity). Currently in discussions with leaders at the Protein Data Bank about implementing ANSURR as the standard way to validate all NMR structures.
- Applied ANSURR to identify a common issue with many existing NMR protein structures (a lack of hydrogen bonds) and devised an innovative combined experimental/computational approach to address it.
- Trained a deep neural network (TensorFlow) to improve ANSURR scoring by accounting for features such as protein size, secondary structure content and flexibility.
- Built a webserver (ansurr.com) to share ANSURR output for all NMR protein structures with the wider scientific community.

PhD student, The University of Manchester 2014–2018
- Designed a computational method to predict the reduction potential of copper protein mutants with biotechnological applications in enzyme catalysed fuel cells. Combined the accuracy of high level calculations (quantum mechanics/density functional theory) with the speed of cheaper methods (continuum electrostatics).
- Optimised molecular biology and electrochemistry experiments to test/refine computational predictions and synthesised two mutants with significantly altered reduction potentials.
- Programmed bioinformatics pipelines to process large sequence and structural datasets to investigate the biophysical properties of post-translational modification sites at the proteomic scale.

Teacher of Science (Part time), Loreto High School, Manchester 2012–2014
- Taught physics, chemistry and biology, graded “Outstanding” by Ofsted criteria.
- Devised and delivered weekend workshops for non-physics specialists on how to teach physics.

Skills

Computational and programming skills

- 8 years of experience working in a Linux environment, command line and shell scripting.
- Proficient programming in Python and Bash and have experience using C++, R, HTML, VBA, SQL.
- Develop code using Jupyter lab, manage code using Git (github.com/nickjf) and release code as PyPi packages (pypi.org/project/ansurr, pypi.org/project/pdb2af, pypi.org/project/nerrds).
- Confident using high performance computing (SGE, Slurm, HTCondor).
- Maintained a network of 12 Linux machines which involved administering user accounts, automating back-ups and software/hardware installation.

Problem solving

- My computational method ANSURR solves the long-standing problem of how to validate an NMR protein structure when there isn't enough data to fully solve it in the first place. Required a creative solution combining approaches from chemistry, mathematics and bioinformatics.
- Identified that the code written by PhD student I supervised was not able to achieve the simulation time required. Recommended a training course on code parallelisation and supported them to rewrite the code so it ran 1000x faster and could then be used to test our hypothesis.

Communication

- Awarded 8 prizes for oral and poster presentations at scientific conferences. Some examples of my talks can be found here: youtu.be/ZDPdHstdiac?t=752, youtu.be/B0adnBxkl98?t=767.
- As a Widening Participation Fellow (2014-2018), I created and delivered workshops, talks and tutorials for diverse audiences including at University events, schools and science festivals. In 2015, I received a "Making a Difference" award for outstanding contribution to public engagement.
- Worked freelance as a motivational speaker (2016-2018) to encourage students from all backgrounds to consider higher education.

Leadership

- Organised and chaired fortnightly International Council on Magnetic Resonance in Biological Systems webinars. Hosted over 70 speakers from 5 different continents and provided networking opportunities for early career researchers during coronavirus lockdowns.
- Secured funding from the Physics of Life Network for an undergraduate physics student to undertake a research project I designed and supervised. She presented her results at the Royal Society and has gone on to pursue a PhD in computational biology.
- Mentored a student during his GCSEs, A levels and physics degree at the University of Oxford. They are soon to finish their PhD.
- Trained and managed teams of science buskers to promote curiosity about science with attendees of science events and festivals.

Hobbies and interests

- Programming science-based games.
- Playing tabletop games and applying machine learning approaches to analyse data relating to them.
- Walking and bird watching.