Christopher Brasnett

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I am a final year PhD student at the University of Bristol researching the physical chemistry of self-assembled lipid systems. I have a strong interest and advanced skills in measuring the structural characteristics of these systems using both experimental and computational techniques. I am looking for a postdoctoral research associate position where I can bring my existing research skills to new problems and continue to develop my biomolecular simulation knowledge and experience.

Education

2016 – present **PhD, Physics.**
University of Bristol

2012 – 2016 **MSci Physics, First Class (Hons).**
University of Bristol

Research Experience

Oct 2016–Present ***PhD project***
Supervisor: Dr. Annela Seddon (University of Bristol)

Experimental and computational approaches to the lipid sponge (L_3) mesophase

Studies of the lipid sponge mesophase, a bicontinuous mesophase important for lipid cubic phase membrane protein crystallisation. The project has focused on several aspects related to mesophase stability and transition. I have investigated its ability to contain additive lipids in comparison to other mesophases, and its topological relation to other mesophases using both X-Ray Scattering (SAXS) and coarse-grained molecular dynamics. I have successfully proposed and subsequently led teams in synchrotron SAXS experiments, working across disciplinary boundaries. I have additionally designed kit for our in-house SAXS instrument, and developed open-source code for the wider community to analyse SAXS data.

Oct 2015-June 2016 ***Masters Project***
Supervisor: Dr. Annela Seddon (University of Bristol)

Anomalous self-assembly in model lipid systems.

This shorter project in the final year of my undergraduate degree investigated the electrostatic doping of lipid cubic mesophases in the context of membrane protein crystallography, showing that the presence of salts must be accounted for in the process. Through the project, learned experimental design, sample preparation, and X-Ray scattering techniques. The project was published as reference (1)

Key Skills

Computational

- Extensive knowledge of **Python** for analysis of both experimental and computational data. I have designed and written my own analysis code and optimised it through parallelisation. I am particularly familiar with the Ovito package for visualisation and analysis of simulations.
- I use **Gromacs** with the Martini force field for molecular dynamics simulations to investigate lipid mesophase transitions not previously studied.
- **High performance computing**: I am a regular user of the Bristol HPC cluster, Blue Crystal 4, to run md simulations and analysis
- I have a working knowledge of **Git**, and maintain repositories on GitHub for my analysis code.

Experimental

- **X-Ray Scattering** techniques: synchrotron and lab based. I have been a senior user of our lab-based source with responsibilities for maintenance and collaboration with external users. As part of my PhD, I have successfully and independently written multiple synchrotron beamtime proposals for two highly competitive instruments, I22 and I07 at Diamond Light Source.
- **Experimental data analysis**: I have combined my computational and experimental skills to develop software to help the wider user community automate x-ray scattering data analysis (references 6, 9).
- **Experimental techniques**: Extensive experience of optimisation of a variety of challenging samples for SAXS measurement, including designing my own sample holders. Experience of working in biochemical laboratories for expression and purification of membrane proteins.

Teaching

- Supervision of undergraduate project students working in our lab for both experimental and computational projects. I carried out project design, development, and training in sample preparation and lab-based scattering techniques. For computational projects, I have written software training guides.
- 1st year undergraduate Physics laboratory: demonstration on experiments and marking of lab scripts and reports.
- Teaching Assistant: I was a teaching assistant on the 3rd year undergraduate biophysics unit, aiding the unit leader with problems classes.

Other professional skills and experience

Committee experience

Between June 2019 and June 2020, I took a sabbatical year from my PhD after I was elected to represent the postgraduate community of the university, as the postgraduate education officer at the students' union. While in the role, I represented the community on many senior university committees related to both education and research. Alongside formal committee responsibilities, I worked in partnership with the university on student-motivated policy issues such as research student supervision, teaching responsibilities, and social opportunities. As part of the role, I was additionally a trustee of the students' union, responsible with the rest of the board for the charity.

Communication

- Oral presentation: APS March meeting 2017
- First author publications: One publication from my final year MSci project (reference 1). Two from my PhD are currently under review and available as preprints (references 8,9)
- Worked with external collaborators in my PhD from several disciplines, leading to publications (references 2-7)
- Written for high-profile blogs and commentary websites about postgraduate research culture in the UK. These were intended for general audiences based on my time working at the students' union.

Courses attended

- Small Angle Scattering Training School, Diamond Light Source, 2017
- Geometry and topology in contemporary material science, Niels Bohr Institute, 2017
- University of Bristol courses in Advanced Python, Introductory C++, and Git

Publications

1. **Brasnett C.**, Longstaff G., Compton L., Seddon A., Effects of Cations on the Behaviour of Lipid Cubic Phases *Scientific Reports* **7**, 8229 (2017)

2. Draper E. R, Su H., **Brasnett C.**, Poole R. J., Rogers S., Cui H., Seddon A., Adams D. J., Opening a Can of Worm(-like Micelle)s: The Effect of Temperature of Solutions of Functionalized Dipeptides *Angewandte Chemie* **129** (35), 10603-10606, (2017)

3. Castilla A. M., Draper E. R., Nolan M. C., **Brasnett C.**, Seddon A., Mears L. L. E., Cowieson N, Adams D. J., Self-sorted Oligophenylvinylene and Perylene Bisimide Hydrogels *Scientific Reports* **7**, 8380 (2017)

4. Ana M. Fuentes-Caparrós A. M., Gómez-Franco F. P., Dietrich B., Wilson C., **Brasnett C.**, Seddon A., Adams D. J., Annealing multicomponent supramolecular gels *Nanoscale*, **11**, 3275-3280 (2019)

5. Draper E. R., Dietrich B., McAulay K., **Brasnett C.**, Abdizadeh H., Patmanidis I., Marrink S. J., Su H., Cui H., Schweins R., Seddon A., Adams D. J. Using Small-Angle Scattering and Contrast Matching to Understand Molecular Packing in Low Molecular Weight Gels *Matter* **2**(3), 764-778 (2020)

6. Dully M., **Brasnett C.**, Djeghader A., Seddon A., Neilan J., Murray D., Butler J., Soulimane T., Hudson S. P. Modulating the release of pharmaceuticals from lipid cubic phases using a lipase inhibitor *Journal of Colloid and Interface Science* **573**, 176-192 (2020)

7. Galini M. G. F., Markus R., Paraskevopoulou V., Foralosso R., Clarke P., Alvarez C. V., Chenlo M., Johnson L., Rutland C., Allen S., **Brasnett C.**, Seddon A., Zelzer M., Marlow M., Mechanistic investigations into the encapsulation and release of small molecules and proteins from a supramolecular nucleoside gel in vitro and in vivo *Journal of Controlled Release* **317**, 118-129 (2020)

8. **Brasnett C.**, Seddon A., Mean and Gaussian Curvature of Lipid Mesophases measured using molecular dynamics, arXiv:2010.10308 *Under Review*

9. **Brasnett C.,** Squires A., Smith A., Seddon A., The effects of lipid type doping on the sponge mesophase, bioRxiv 2021.02.22.432284 *Under Review*