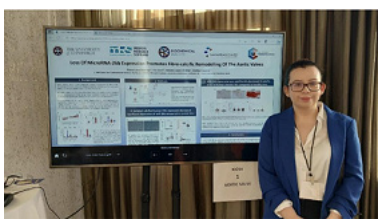
Biochemical Society support in action: experiences from our community

Lucy Ollett (Biochemical Society, UK)

Throughout the year, the Biochemical Society offers a programme of grants for all career stages supporting research, attendance at scientific conferences and the sponsorship of events. So far in 2023, we have awarded over £163,000 towards lab visits, seminar series, and the advancement of research. In this article, we are delighted to share a few insights from our community that highlight the variety of projects and opportunities made possible by our funding. For more information about our funding opportunities and the application process, please visit our website.

General Travel Grants

Diana Luna Buitrago (University of Edinburgh) attended the Heart Valve Society Meeting 2023



I was very fortunate to have attended the ninth Annual 2023 Heart Valve Society (HVS) Meeting between 29 March and 1 April in Fuengirola, Malaga. The HVS aims to bring a community which promotes research on heart valves across various disciplines such as basic research, translational research and clinical research. The annual meeting consists of scientists, cardiologists and cardiac surgeons from around the world to come together to share and exchange ideas in the field. Across the 4 days, over 25 sessions were dedicated to the latest novel research across various aspects of the heart such as aortic valve disease, endocarditis and heart disease sex differences using the latest techniques available.

It was very exciting to have been given the opportunity to not only attend such an interesting international meeting, but also present our research investigating the role of microRNAs in aortic valve stenosis in the form of a poster. The experience of having attended the HVS meeting as a student allowed for attending a range of sessions provided by not only other scientific groups but also clinicians working with patients to tackle the diseases we are continuously investigating in the lab.

During my presentation day, I was able to interact with various researchers with similar interests and additionally allowed invaluable feedback and comments during my presentation, including world leaders in the field who were also in the audience. Overall, this experience has better equipped me for my continued studies towards my PhD and has furthered my interest in attending and presenting at future meetings!

I would like to thank the Biochemical Society for assisting in allowing me to attend the meeting in person through the General Travel Grant.

Jack Stenning (University of York) attended the International Association for Breast Cancer Research Conference

My trip to Tulum, Mexico, for the International Association for Breast Cancer Research (IABCR) Conference for 2023 hosted at the Hilton Tulum was a truly phenomenal experience. After check in, you are guided to the buggy service that takes you from your rooms to the nearby convention centre; it's a great ride as you can see the jungle behind the resort and can try to spot some wildlife as you go.

The meeting organizers, Fusion Conferences Ltd, had everything in hand and we were quickly pointed in

the direction of the early career networking event. The networking event and the meeting as a whole was a fantastic opportunity to mix with other early career researchers as well as established academics whose work I had been reading for a long time! With new friends acquired, we wasted no time jumping into the conference itself.

The talks were masterfully presented; the first day was framed by Robert Clarke and set the tone of the conference, taking a wide-scope view of the field and the most pressing topics faced in the field. Then, one by one, each speaker presented work on their slice of the field – from the design of new breast cancer drugs, assessing the effects of current therapies and identifying new avenues of therapy. In particular, I enjoyed Theresa Hickey's work investigating the effects of the androgen receptor in the breast and how those insights can be used in the treatment of breast cancer.

Finally, this meeting was my first opportunity to take my work to the wider community as a poster for feedback and advice. I was so humbled to have the opportunity to attend and gain this valuable insight. Thank you Biochemical Society grant committee for this funding, as without it I wouldn't have had this life-changing opportunity.

The Korner Fund supported Louis Dwomoh's (University of Glasgow) visit to Johannes Gutenberg University of Mainz

With the support of the Biochemical Society's Korner Fund, I was able to visit the laboratory of Professor Kristina Endres at the Johannes Gutenberg University of Mainz between February and April 2023. The purpose of the visit was to learn the techniques of organotypic brain slice cultures and to explore the potential of this system to our neurodegenerative disease drug discovery work at the University of Glasgow. I was pleased with the set-up and facilities in Professor Endres' lab, as well as the immense support that I received from members of the group.

I was able to learn the skills involved in preparation and culturing of brain slices from a rodent model of Alzheimer's disease (AD), as well as the treatment of these slices with some of our ligands. These treated slices have been transferred to Glasgow for analysis to understand the effect of the treatment on the proteome of these slices, particularly, on the molecular markers of disease in this model.

In addition to developing these essential skills and techniques, I had the opportunity to interact with members of Professor Endres' group and other researchers within the department to understand their research. Also, it was a good experience to sit through oral presentations and examinations for undergraduate students in the department because it showcased the level of dedication that these students had put in their research.

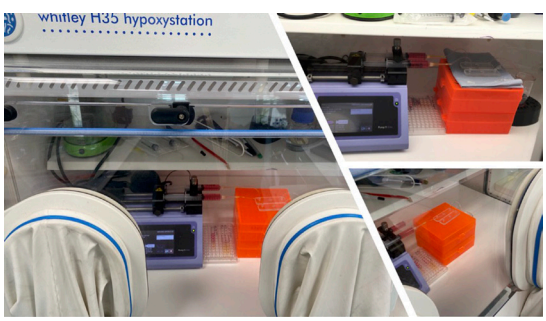
On my return to the UK, I shared my experience with my group, and we are considering setting up a brain slice culture system in our lab to enable us address different research questions in our group. I would like to thank the Biochemical Society for supporting my visit to Mainz.

Eric Reid Fund for Methodology

Dr Isabel Pires' (University of Manchester) project on using a custom-designed spheroid-on-chip model to study the impact of sheer stress under low oxygen conditions was supported

The spread of cancer around the body, or metastasis, causes most cancer-related deaths. One factor known to regulate metastasis is the flow of liquid between cells, and the cellular stresses linked with this. Another factor is the occurrence of regions of low oxygen or hypoxia. The Pires group focuses on studying the biology of low oxygen in tumours, as well as evaluating new ways to target hypoxia-linked therapy resistance, and more recently became interested in the role of flow in cancer biology in this context.

To study the link between fluid flow, hypoxia and key aspects of cancer biology, we developed a 'spheroid-on-chip' model which uses 3D cancer cultures (spheroids) under flow. We observed that spheroids grow better in flow conditions and, interestingly, flow is associated with dramatic gene expression changes, some linked with better oxygenation, but also to other key cancer biology signalling pathways.



The Eric Reid Fund for Methodology award by the Biochemical Society supported a project where we evaluated the use of our 'spheroid-on-chip' system in low oxygen conditions to determine whether the gene expression changes

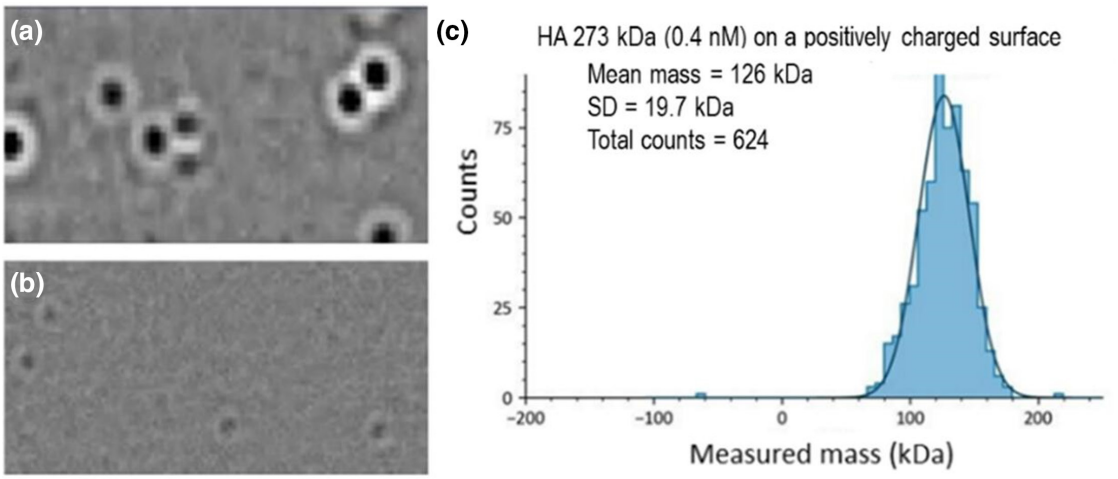


Figure 1. Single frames from videos recorded for the protein thyroglobulin (660 kDa; A) and the polysaccharide hyaluronan (273 kDa; B). Clear dark rings with bright halos are observed in A, typical results when testing globular proteins of relatively high molecular mass. Similar yet less intense features are observed in (B) mass photometry data. (C) Representative histogram derived from the analysis of a mass photometry video for HA (273 kDa) at 0.4 nM in ultrapure water on a positive surface.

we observed before are solely dependent on flow or linked with oxygen levels. This study was developed in the autumn–winter of 2022, at the Pires laboratory at the University of Hull by Emily Pyne, who was close to completing her PhD at the time, and me. During the project, we successfully set up the 'spheroid-on-chip' system inside a hypoxia chamber (see image) and collected RNA samples which were sent to large-scale sequencing of gene expression changes. The Pires group recently relocated to the University of Manchester, where we are investigating the biological changes observed in these samples and exploring their relevance to cancer biology and response to therapy. We would like to thank the Biochemical Society for this funding and support.

Dr Jessica Kwok's (University of Leeds) project on quantifying the mass distribution of heterogeneous proteoglycans and glycosaminoglycans using mass photometry was supported

Mass photometry is a recently developed label-free analytical method that accurately measures the mass of macromolecules by utilizing the principles of interferometric scattering and reflection microscopy. It is already well established for the measurement of globular proteins but has not been applied to biological polymers due to their intrinsic disordered structure. We have explored the application of mass photometry for the determination of carbohydrate polymer mass. Carbohydrate polymers of the glycosaminoglycan family are ubiquitous in the extracellular matrix, and accurately measuring the mass of these molecules would allow for a better understanding of how cells communicate with each other and how they assemble into functional tissues.

We used our grant from the Eric Reid Fund to test the possibility of using mass photometry in assessing the mass of biopolymers, focusing on the glycosaminoglycan (GAG) hyaluronan (HA). Using size-defined samples of HA, ranging from 58 to 2500 kDa, and protein standards which were calibrated for the mass photometry machine, we observed that the mean measured mass determined by mass photometry is consistently smaller than the actual mass of HA. This indicates that the optical contrast for HA per mass unit is smaller than for proteins (Figure 1), and that bespoke mass standards (such as the mass-defined HA samples used here) are required for mass analysis of HA and other GAGs. This could be due to the fact that a flexible polymer like HA does not adopt a folded and compact structure and that the loose structure of HA causes its binding to the glass coverslip to be a dynamic event, rather than the single-point event seen when (globular) proteins land on the coverslip. We thus functionalized the glass surface with positive charge strengthening the binding event of HA. We then used our size-defined HA to establish a 'standard curve' for the flexible HA and evidenced a monotonically increasing relationship between the mean measured mass and the actual mass up to 500 kDa actual mass.

This Eric Reid Fund for Methodology grant allowed us to conclude that with positively charged surfaces in ultrapure water and a proper standard curve established with flexible polymer, the masses of HA from 50 to 500 kDa can be reliably detected using mass photometry. Further improvements in HA binding to surfaces and/or image analysis procedures will be required for the analysis of HA chains larger than 500 kDa. Going forwards, we will focus on validating the here-established method for GAGs other than HA with some final-year undergraduate project students.

This report was compiled by O'Malley, T., Perazhi, A., Richter, R.P. and Kwok, J.C.F.

Our Sponsored Seminar Series Grant supported the University of Portsmouth's molecular bioscience seminar series (Dr Garry Scarlett, University of Portsmouth)

The Biophysics and Molecular Genetics (BMG) group at Portsmouth has been in existence for over 60 years, evolving over time from a tight focus on biophysical and biochemical studies of chromatin to include a diverse range of topics in the molecular biosciences. For many years, the group was serviced by a seminar series organized by a larger university structure. However, re-organization within the university led to this program ending, depriving our biochemistry researchers access to an important aspect of research culture. In response, the group started a new 'grass-roots' seminar program, although initially without a budget for speaker travel or catering!

The funding from the Biochemical Society allowed us to invite speakers from further afield and supply coffee and biscuits for the networking afterwards. Through the support of the Biochemical Society, we have been able to run a successful, well-attended seminar series with a mix of internal and external speakers. The success of the seminar series led the university to recognize the importance of a program focused on the molecular biosciences and we have now secured internal funding to support the program going forward.

Sadly, the founder of BMG group (Colyn Crane-Robinson) passed away recently, remaining active within the lab up until the end. In fact, he was one of the first speakers in our Biochemical Society-funded seminar series (see image). In honour of him, we have named the seminar series the *Colyn Crane-Robinson seminar series in molecular biosciences*, which we hope will continue for another 60 years. ■