Training Day: biophysical techniques for probing biological systems

1–2 July 2014, University of East Anglia, UK

Earlier this year one of the first Biochemical Society-supported Training Days took place at the University of East Anglia (UEA). The opportunity to host a practical hands-on event based upon 'Biophysical Techniques for Probing Biological Systems' was provided by the well-established Centre for Molecular and Structural Biochemistry (CMSB). This centre which straddles the Schools of Chemistry and Biological Sciences at UEA offers world-leading research across a unique range of biophysical techniques including NMR, EPR, CD, MCD, protein electrochemistry and rapid reaction kinetics. Well over 30 students from around the UK attended and received hand-on experience and dedicated instruction from world-leading experts in all these techniques. One of the organisers, Fraser MacMillan, said "the event was an overwhelming success and plans are already afoot to repeat this training event, which also receives key CPD credits, on a regular basis".

Mona AlOnazi (University College Dublin, Ireland)

The Training Day at UEA was a great opportunity to learn about biophysical techniques *in vitro* and their applications to macromolecules. The technical programme covered fundamental, as well as cutting-edge, techniques, and described the techniques in the context of important biological topics. It provided hands-on experience of a range of biophysical techniques: nuclear magnetic and electron paramagnetic resonance, circular and magnetic circular dichroism, protein electrochemistry, and rapid reaction kinetics.

Biological systems, especially macromolecules, are extremely complicated and the need for quantitative approaches to describe and predict biological behaviour combined with data is crucial. The workshop helped in bridging the gap between biophysical techniques for the study of biological systems and their practical benefits. We had the chance to try out new methods and techniques.

During the feedback discussion on the last day, we examined the areas where it might be useful to make changes in the future and the strengths of the teaching techniques in science. For all of the participants the main strong point of the Training Day was having a hands-on element rather than sitting in a lecture all day. Overall, it was a welcome opportunity in a relatively informal atmosphere to discuss shared issues and problems with other researchers, both instructors and participants on the course.

Circular dichroism has been a valuable method for me to analyse the structure of my protein (glucose-6-phosphate dehydrogenase). However, I have now learned about Origin, which is software for analysing the data and plotting in a very convenient way. Moreover, I am also planning to use the rapid reaction kinetics technique and this was a great opportunity to learn more about it. After the Training Day at the University of East Anglia, I went back home to my lab with a better understanding of four important techniques and I will certainly use two of them in my own research project.

Hope Adamson (York University, UK)

This Biochemical Society training event was an excellent opportunity to learn about biophysical techniques that could be applied to my own work on enzymes. A combination of theory and hands-on practical use of the equipment made it particularly useful.

I began the training with a workshop on magnetic circular dichroism (MCD). We were led through the

theory, then ran and analysed our own experiment. This practical approach really helped cement the utility and applicability of the instrument. We were shown an add-on that allowed electrochemistry to be coupled to MCD and this really sparked my interest, as my own project involves electrochemistry. The technique will help me study iron–sulfur clusters in hydrogenase enzymes.

After a buffet lunch, I moved on to a workshop on circular dichroism (CD). This was very hands-on and involved loading and running our own samples before analysing the data we had collected. This comprehensive training made me confident that I could perform and analyse CD experiments in the future. A rep from the company who made the instrument was also present and this was extremely useful for finding out what more could be done with the instrument.

The final workshop of the day was on electron paramagnetic resonance (EPR) spectroscopy. We ran through the theory and then did practical work running samples and simulating the spectra in MATLAB. This practical experience and thorough discussion about how EPR could be used to study the metalloproteins I am interested in gave me great confidence in using the technique in the future.

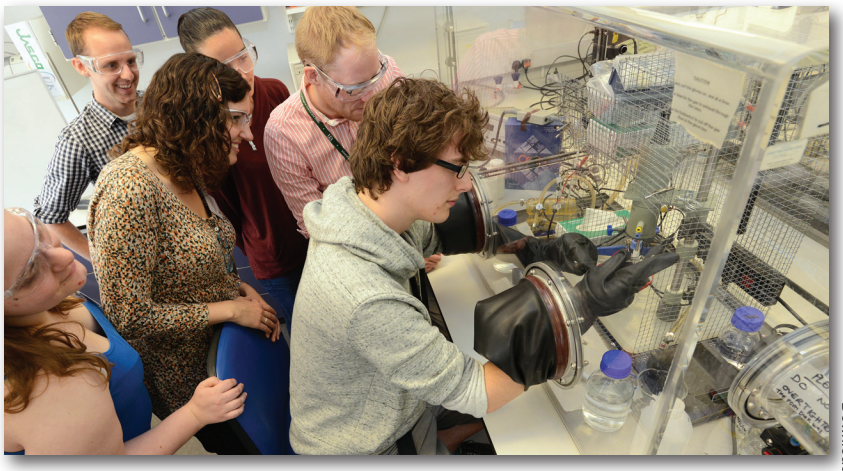
The day ended with a wine reception and dinner and this was a great opportunity to talk to other delegates and the workshop trainers.

The following day I had a session on protein film electrochemistry. My own PhD project uses this technique and it was interesting to see how different approaches are used by different groups. There was a thorough explanation of the theory and then hands-on practical experience of setting up electrochemical cells and running experiments. I had a very interesting conversation with the workshop trainer about our work, which resulted in him giving me some protein to study in my electrochemistry experiments. The ample time for discussion gave the potential for setting up future collaborations.

This training day was both enjoyable and extremely useful. The hands-on nature of the training enabled me to learn exactly how I could use the technique. The opportunity for discussion enabled me to come away with an idea of how two new techniques could be applied to my own work and get some lovely blue copper protein to try out when I got home.

Emma Jardine (University of Sheffield, UK)

The two-day workshop at UEA demonstrated a new way to run conferences. Rather than just learning about theory, and how the machines are put together in the abstract, we were offered a chance to get up close and personal with some actual lab equipment! With a choice of six biophysical techniques to choose from and a range



of abilities catered for, the versatility of the day was excellent. This structure afforded the opportunity to delve further into techniques that were relevant to individual projects with enthusiastic experts and to sample previously unknown or barely-known techniques.

Each session was 2.5 hours long, which was an ample amount of time to become versed in theory and application, but this knowledge was cemented immediately by getting to grips with the relevant lab equipment and/or data analysis. This was a massive advantage over typical lecture-based demonstrations, where concepts taught in the abstract often remain in the abstract, never to be put to work for a project where they could provide data that would be challenging to extract by other means.

Of the six potential techniques, four were available for the conference for each person, which allowed a degree of flexibility to the proceedings. This flexibility coupled with the ever-changing groups throughout the workshop enabled networking and problem-solving teamwork that would have been difficult to achieve under more traditional meeting styles.

For the first meeting of its type from the Biochemical Society, there was a lack of teething problems. The day had been timetabled appropriately so that people flowed through the groups in a way that was well organized and at the same time personally relevant to each individual at the time. Registration was easy and we were given a handy pack that we could make notes on and take away at the end of the day for further study. Feedback during the session was acted on almost immediately.

I personally came away with a deeper understanding of the theory and applications of the techniques that I was already familiar with and an appreciation of the breadth of techniques available to answer research questions. The pitching was ideal and some initial feedback from the second day was acted on straight away. I would do this or a similar workshop again, even if I had to pay for it out of my own paltry money. ■