

AUSTRALIAN COURSE IN MACROMOLECULAR CRYSTALLISATION

The 2011 Australian Course in Macromolecular Crystallisation course was held in Melbourne from 12 to 16 December 2011. The course had 20 students, chosen from 40 applicants and from all around Australia and New Zealand. Of the 20, eleven were PhD or Masters students, five were postdocs, four were staff scientists/technicians and one was a lab head. Six ASBMB members were sponsored to attend the course: Andrew Perry (Monash University), Bhumika Shah (Macquarie University), Fung Lay (La Trobe University), Sophie Broughton (St Vincent's Institute), Natalie Burr (Massey University) and Khatira Anwari (WEHI). The course consisted of 16 lectures, delivered by four international and eight Australian experts, and almost 20 hours of lab practicals. The last day was spent at the Australian Synchrotron, where we had the use of both macromolecular crystallography beamlines, and the students worked on crystal retrieval, cryoprotection, X-ray data collection and were introduced to data processing.

The laboratory sessions were focused on introducing the students to alternative techniques that are less widely known than 'regular' vapour diffusion, and included exercises in microbatch, counterdiffusion, dialysis microfluidics and mesophase techniques. We also had an exercise that probed protein stability in different buffer formulations using the technique of differential scanning fluorimetry. We were extraordinarily fortunate to have Professor Martin Caffrey, of Trinity College, Dublin – without doubt the world's leading expert on cubic lipidic phase crystallisation – as a lecturer at the course.

Some interesting factoids about the course: we used over 10,000 pipette tips, and more than 20 ml of protein solutions in the practicals. One of the most useful sessions in the course was the group discussion of the practicals – what the students saw, and what the results mean – which was held at an informal pizza night on Thursday evening. The best student presentation received a copy of Bernhard Rupp's *Biomolecular Crystallography* – with a personal inscription from the author, who was also a lecturer at the course.

Janet Newman, Course Organiser



*Students at the course listen to
Dr Tom Peat of CSIRO Parkville.*

Student Feedback

With absolutely no experience in structural biology, I decided to dive into the Australian Course in Macromolecular Crystallisation to gain some insight. The practical training that was complemented by lectures was intense. We learnt many different ways of setting up crystallisation trials and viewed beautiful protein crystals in different shapes and sizes under the microscope. We often dealt with lysozyme, so much so that I was also seeing it in my dreams as a contaminant in my precious protein sample. Having gurus in the field such as Bernhard Rupp and Jim Pflugrath gave us the opportunity to learn through their experience and wisdom. I learnt many interesting facts and narratives, including how hair is important for nucleation of a protein crystal and why crystallographers are generally bearded men. For me, the highlight of the course was learning the lipid cubic phase technique that was introduced by Martin Caffrey to crystallise membrane proteins; it was amazing in theory and in its practical simplicity. I had an enjoyable time at the course and I thank the organisers for making it all happen.

Khatira Anwari, Walter and Eliza Hall Institute

My experience at ACMC2011 was inspirational. From lipid cubic mesophase to movies of growing crystals to phase diagrams, the lecture portion of the course was highly interesting, educational, and as with anything involving protein structure and crystallography, the presentations were beautiful and the techniques were elegant. Both those who were new to crystallography and seasoned crystallographers learned something new, and the diverse backgrounds of both the 'students' and speakers resulted in some interesting discussions that were intense and enjoyable.

The practical sessions introduced me to many new techniques and we were able to follow up on the results of those methods. It was very rewarding to work with a kind protein like lysozyme that reassured me that indeed proteins can actually crystallise!

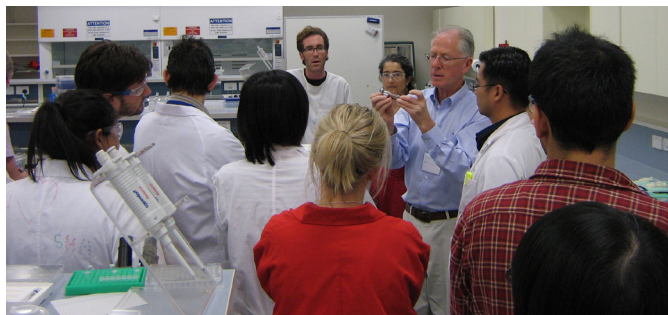
The beer and pizza evening was especially fun and gave us the opportunity to critically assess the experiments we had done during the practical sessions. I was both shocked and honoured to be chosen to receive a copy of Bernhard Rupp's book.

As a first time visitor to the Australian Synchrotron, I was very impressed by the facilities and took the opportunity to fish, mount and collect data on one of the model proteins we had crystallised. The speed at which data were able to be collected was shockingly good when compared to a home source.

The thing that struck me the most about the speakers wasn't just their knowledge in their respective facets of proteins and crystallography, but their passion for the science they do. Not only was this a course that taught me additional theory, techniques and skills, but it has also inspired me to go on to further study within the protein crystallography field. I would highly recommend this course to anyone with an interest in protein structure.

Natalie Burr, Massey University, New Zealand

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*Students at the course listen to Professor
Martin Caffrey of Trinity College Dublin.*

The opportunity to participate in ACMC2011 was one that couldn't be passed up, and fortunately, I made the cut. With the understanding that the course would be steered by Janet Newman, I knew we would be in for an excellent course, both in terms of content and calibre of speakers. It certainly did not disappoint.

We explored areas of protein production and purification, quality control measures prior to crystallisation trials, and

optimisation of diffraction quality crystals. As a relative novice to protein crystallography, even though I have used the robotic crystallisation facility at the CSIRO Collaborative Crystallisation Centre with reasonable success, I felt that I needed a more fundamental understanding of the what, why, which, when and how of protein crystallography.

Theory was met with an instructive practical component that allowed us to explore the various techniques available to the crystallographer, some that are commonly used and others that are less so. Having the experts on hand was fantastic and in particular, one who wrote 'the Book'! The week was rounded off with a session at the Australian Synchrotron to examine our efforts. Why can't we all grow crystals as nice as lysozyme?

Three major things came away with me from the course: 1) Understand the 'phase diagram' as this may help sway your crystallisation success. 2) Crystallography is an art as much as it is a science (and it can be beautiful). 3) You need to ask yourself, 'Am I a lucky scientist?'

Fung Lay, La Trobe University