Protein Evolution – Sequence, Structure and Systems

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A Biochemical Society/Wellcome Trust Focused Meeting held at The Wellcome Trust Conference Centre, Hinxton, Cambridge, 26–27 January 2009

To commemorate the 200th anniversary of Charles Darwin’s birth, the Biochemical Society and the Wellcome Trust held the meeting on the Wellcome Trust Genome Campus at Hinxton, a highly appropriate venue, as the campus houses the Wellcome Trust Sanger Institute and the EMBL European Bioinformatics Institute – two world-leading centres providing major new insights into evolution.

A range of topics were presented, including comparative analyses of genomes, classification of protein structures into evolutionary families, protein interaction networks and protein systems. Tom Blundell (Cambridge) opened the meeting with a talk which reported both his early work on the evolution of the insulin family and recent studies classifying protein conformation in superfamilies. Bengt Mannervik (Uppsala University, Sweden) presented results on the evolution of multi-substrate activity in enzymes. Dan Tawfik (Weizmann Institute, Israel) described experimental work aimed at reproducing the evolution of new proteins in the laboratory.

The meeting also provided the occasion for the award of two Biochemical Society Medals. Dame Louise Johnson was awarded the prestigious Novartis Medal and described the structural insights into protein phosphorylation. Central to Professor Johnson’s talk was the evolution of protein families. Araxi Urrutia received the Early Career Research Award and presented her work on transcriptome evolution. Both presentations were ideal within the context of the meeting, highlighting the central role of protein evolution in contemporary molecular biology.

The organizers, Michael Sternberg, Roman Laskowski and Janet Thornton, were ably assisted in arranging the conference by the Biochemical Society Meetings Office and the Wellcome Trust. Generous additional sponsorship was provided by Syngenta, Portland Press and the BioSapiens Network of Excellence, funded by the European Commission FP6 programme.

One aim of the meeting was that attendees would leave with further insights into evolution which will stimulate new research and could form the topics for presentations at future Darwin anniversary meetings. Overall, this aim was more than achieved.

Papers from this meeting will be published in Biochemical Society Transactions (volume 37, part 4).

British Yeast Group Meeting

Nick Kent (Cardiff School of Biosciences)

A Biochemical Society Independent Meeting held at the Barcelo Cardiff Angel Hotel, 17–19 March 2009

The British Yeast Group 2009 (BYG2009) meeting was organized by Dr Nicholas Kent and hosted by the Cardiff University School of Biosciences. BYG has run annually for 32 years, drawing researchers from the UK, Ireland and the wider EU who use yeast species to study biochemistry, molecular biology and cell biology. This year, 105 delegates from 38 different institutes attended. Full programme details are available at www.byg2009.cf.ac.uk.

The last few years have seen a surge of discoveries in basic molecular biology, genome dynamics and evolution which have utilized both yeast genetics and high-throughput analysis. This year’s choice of invited speakers and the distribution of offered presentations reflected this trend. The meeting began with a session exploring recent work co-ordinated by Ray Waters and Simon Reed (Cardiff University) utilizing microarray technologies to probe mechanisms of genome-wide DNA repair. New insights into the generation and processing of DNA breaks during DNA replication and recombination were explored in a session.
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BYG has a long tradition of encouraging junior lab members to present work orally. Of 26 offered talks, six were given by graduate students and nine by postdoctoral researchers. One postgrad and two postdoc poster abstracts were selected for oral presentations. Josefin Fernuis (postdoc, University of Edinburgh) won a £100 Formedium prize for her talk on pericentric chromosome cohesion, and Alicja Sochaj (postgraduate, University of Edinburgh) won a £100 Formedium prize for her poster on spindle checkpoint signalling.

Kai commenced with the latest views on the organization of lipids within membranes and lipid rafts. He described methods that make it possible to quantitatively determine lipid composition of isolated patches of membrane and organelles, thus paving the way for new insights in this controversial area. He ended by emphasizing the importance of employing both biochemical and cell biological approaches to address existing and emerging questions in cell biology. This was followed by an invitation for any ‘raft bashers’ in the audience to ask questions and a lively round of discussion ensued.

The truly dynamic nature of cells was highlighted in work described by Michel Bornens. By using micro-patterning of adhesive substrates into simple geometric configurations, Michel provided a striking visual demonstration of how adhesion can determine cellular organization. After the plenaries, wine, beer and soft drinks flowed along with animated discussions surrounding all the posters.

Interactive poster sessions are essential to a successful meeting and students, postdocs, group leaders and invited speakers all helped to make them extremely enjoyable. The next two days consisted of parallel sessions ranging from microtubule dynamics, motors and organelle movement and emerging mechanisms of cell movement to the cell biology of the immunological synapse, signalling in mitosis and the endocytic pathway. Two speakers in each session were chosen from abstracts giving junior researchers an opportunity to present their work.

From these, one excellent presentation given by Thomas Nightingale (UCL) was awarded the very generous Abcam Oral Communication prize. More than 150 posters were presented, hence the task of deciding on poster prizes, donated by the Biochemical Journal and the BSCB, proved to be a very difficult but satisfying one. Networking between established members of the cell biology community, postgrads and postdocs
was encouraged with workshops and careers speed-dating events held during the lunch-time break as well as an evening pub crawl. Attendees also benefited from plenary talks given by BS and BSCB medal winners: David Komander, the BS Early Career Research Award, Erik Sahai, the BSCB Hooke Medal, and Joan Steitz, the BS Jubilee Medal. The conference dinner took place at the appropriately named Dynamic Earth.

A lively ceilidh band managed to entice even those less inclined up on the dance floor. Fortunately, there was minimal injury to toes and shins during this dynamic movement of delegates.

The last session on Imaging and New Frontiers and the grand finale Cancer Research UK Lecture given by Jennifer Lippincott-Schwartz truly demonstrated that not only can we now capture these dynamic processes in real time, but also this is now being done down to the level of a single molecule. Finally, one goal of the meeting was to acknowledge the contribution of women scientists to cell biology which was very easy given the tremendous input from Joan Steitz, Jennifer Lippincott-Schwartz and Sandra Schmidt to name but a few. Truly awesome!

A participant adds:
An interesting possibility arose when the Biochemical Society and the British Society for Cell Biology decided to co-host a meeting for the first time: would the two camps be subdivided due to differences in subject matter, experimental techniques or scientific perspectives? In fact, I am happy to report that the sunny weather outside Appleton Tower was matched by a genuine warmth inside.

A great deal was packed into fewer than 4 days. There were awards to give out, posters to view, exhibitions to visit, plenary sessions, invited speakers and oral communications selected from abstract submissions. And that was just the science!

There was also a ‘Collaborathon’ workshop, a ‘Career speed-dating’ event, and a fabulous Conference Dinner and Ceilidh at Our Dynamic Earth – a striking and fascinating interactive venue.

However, most impressive was the level of scientific discourse on display. The general tone was one of boundary-breaking research. Whether cell biologists presenting whole animal work, or microscopists pushing the limits of resolution, one common theme seemed to be the desire to embrace, describe and explain heterogeneity and complexity, rather than remain satisfied with oversimplified generalizations.

This perspective was evident from the start as Kai Simmons (Max-Planck) set the tone for the meeting with meticulous work in the area of lipid rafts that ranged from precise biophysical measurements to isolation and analysis of yeast secretory vesicles.

The number of fascinating talks focusing on cutting-edge research in nearly all areas of biochemistry, molecular and cellular biology was absolutely astounding. Sandy Schmid (Scripps), rather than give a pedestrian watered-down general endocytosis talk to the mixed audience, presented a tour-de-force covering, in vivid detail, data from no fewer than three ground-breaking papers from her lab in the last year, as well as one in collaboration with Josh Zimmerberg (NIH).

Other presentations highlighted cutting-edge methodologies: Michael Hausser (UCL) described with perfect alacrity how, armed with a multiphoton confocal microscope, a patch-clamp electrode and a great deal of ingenuity, one could develop and apply numerous innovative experimental paradigms ready to revolutionize the field of cellular neuroscience.

Also describing multiphoton work conducted in London, Erik Sahai (CRUK) gave a tremendous BSCB Hooke Medal Lecture linking together signal transduction, cellular morphology and cancer metastasis. However, Vic Small (IMBA) demonstrated that careful application of well-characterized methodologies can also permit an entire re-envisioning of what otherwise seems to be an accepted understanding. Through electron microscopic tomography of actin in the lamellapodium of migrating cells, Small has called into question a model proposed by Pollard and Borisy in a landmark review published in Cell in 2003. Small’s work challenges whether Arp2/3-mediated branched actin networks exist in the leading edge. Only time will tell the extent to which sample preparation is responsible for the apparently vastly different results, but one thing is sure, this type of fabulous data was exactly what Dynamic Cell was all about, and I for one am already looking forward to next year’s instalment!

Josh Rappoport (University of Birmingham)

Papers from this meeting will be published in Biochemical Society Transactions (volume 37, part 5).