

ARC Centre of Excellence in Structural and Functional Microbial Genomics

From the Director



The latter part of 2006 has seen a flurry of activity in various vaccine projects and other activity in the Centre. The paper reporting the sequencing and analysis of the *Leptospira* genome was published in September in the *Proceedings of the National Academy of Sciences of the USA*. The project involved four Centre CIs in collaboration with the Australian Genome Research Facility, the Victorian Bioinformatics Consortium and the United States Department of Agriculture. An ARC Linkage project on vaccine

development in leptospirosis in collaboration with Pfizer Animal Health is utilising the genome sequence data. The data have also been instrumental in the establishment of a microarray consortium which includes Prof David Haake at UCLA/VA in California and Dr Richard Zuerner of the USDA in Iowa, and which is investigating global gene regulation and pathogenesis in *Leptospira*. November/December also sees the continuation of vaccine trials for fowl cholera in collaboration with Centre Associates Dr Rob Moore (CSIRO) and Dr Ian Wilkie (University of Queensland) and swine dysentery in collaboration with Dr Darren Trott (University of Queensland) and Intervet International.

State of the art mass spectrometry equipment purchased with funds from the Victorian Department of Innovation, Industry and Regional Development has been installed and commissioned and will enhance enormously the proteomics services and facilities, directed by Centre CI Professor Ian Smith, available to Centre researchers and to the wider scientific community. It forms a valuable complementary facility to the world class protein production facility managed by Centre Associate Dr Steve Bottomley.

In support of the activities of National Science Week in August, the Centre sponsored a visit by Professor George Weinstock, Director of the Sequencing Centre, Baylor College of Medicine, Texas, USA. Professor Weinstock delivered an enthralling public lecture titled *Demystifying Genomics* in which he highlighted the most recent advances in sequencing technology and its many applications. During his week long visit, all Centre staff and students had the opportunity to discuss their own research with Professor Weinstock. Our thanks to him for such a generous donation of his time and expertise.

Once again, a Centre CI has been honoured nationally for their scientific achievements. At a ceremony and dinner in Canberra in October, Dr James Whisstock was awarded the Prime Minister's prize for Life Scientist of the Year. Sincerest congratulations to James from all Centre members on a magnificent achievement!

I would like to take this opportunity to thank all Centre staff and students for their dedication and hard work in 2006 which has seen such a successful beginning to the Centre's basic and applied research activities. I look forward to your support in making 2007 an even better year. Please enjoy a happy and safe festive season.

Ben Adler
Director

HIGHLIGHTS

Centre CI James Whisstock receives Life Scientist of the Year Award

As a child, Centre Chief Investigator Associate Professor James Whisstock was fascinated by machines. At school, he had two inspiring biology teachers and transferred this fascination to protein structures. When, at Cambridge, he first saw a protein crystal structure (which he likes to compare to tiny machines) he just knew that was the area of science that he wanted to focus on. This focus has most recently led James to be awarded one of Australia's most prestigious scientific awards for a scientist in the early stage of their career – the 2006 Science Minister's Prize for Life Scientist of the Year.

In particular, it is James' discovery of how a protein called MENT helps condense DNA so that it fits inside a cell nucleus which has led him to be recognized for world-class scientific endeavour. James' MENT discovery has arisen out of ten years work on a family of proteins called serpins. Serpins are significant in human disease because if mutated their normal protein folding processes can be disrupted or they can abnormally aggregate or cluster, which in turn can lead to the development of diseases such as emphysema, liver cirrhosis, certain dementias and thrombosis. However, whilst James has found that some serpin aggregations contribute to disease, aggregations of serpin MENT also plays an important role in DNA condensing or 'packaging'. Indeed James



and his lab team have been able to demonstrate how MENT is fundamentally involved in condensing DNA.

James was presented with his award by the Minister for Education, Science and Training, the Honourable Julie Bishop at a special ceremony in Canberra on October 16.

James, who moved to Australia in 1997 from Ipswich in the U.K, has worked in the Department of Biochemistry and Molecular Biology at Monash University for the past ten years. He has been extremely happy with his move to Australia and describes it as a dream come true.

Aside from his scientific pursuits James likes to spend time bushwalking, swimming, cycling, reading, rowing, keeping up to date with current affairs, dining out and having the odd beer with mates.

James is also in line for another reward. He and his partner, Michelle, are expecting their first child in January next year.

The Centre is particularly privileged to now have two recipients of the Life Scientist of the Year Award leading Centre research projects. Chief Investigator, Professor Jamie Rossjohn, also from the Department of Biochemistry and Molecular Biology, was awarded the prize in 2004.

Associate Professor Whisstock's lab: <http://research.med.monash.edu.au/whisstock/>



ARC Centre Scientific Conference 11-12 October 2006

An exciting showcase of the Centre's scientific excellence was on display at the Scientific Conference of the Centre which took place at the Merrimu Reception Centre in Murrumbidgee. The delightful ambience of Merrimu, in a grand Edwardian mansion just 10 minutes drive from Monash University's Clayton campus where the Centre is based, provided the context for a two-day conference at which both laboratory heads and research fellows spoke on their research. The excellent talks were complemented by a display of posters generated from the research of research fellows and postgraduate students in the Centre.



Left to right: Richard Ferrero, Ross Coppel, Brian Cooke, John Davies, Jim Pittard

The conference was opened by Deputy Director Phillip Nagley, in the unavoidable absence of the Director Ben Adler. Phillip welcomed the more than 50 participants and stressed the importance of communication between the various laboratories of the Centre for the fulfillment of the Centre's ambitious goals. Such communication and active collaboration was evident in the talks on the first day, in the series of talks given by each of the Centre's nine Chief Investigators. The recent advances in the research of the various laboratories clearly reflected such collaborations, particularly in the area of host-pathogen interactions. New insights in this area will lead to better ways of detecting and controlling infection of animals and birds by bacterial pathogens. For example, the search for novel proteins in bacteria that lead to disruption of the cellular process which lead to containment and destruction of the invading bacteria will provide new insights into how bacteria manipulate the host cells to ensure their survival at the expense of the host animal. Another exciting interactive development in the Centre entails the setting up of an internationally competitive screening procedure for molecular recognition receptors (called TLRs) which will lead to new approaches to uncovering the ways in which host cells identify the infectious bacteria and take decisions to activate the innate immune system to contain the infection and to set the stage for specific immune responses to eliminate the infection. This work also involves the Monash Institute of Medical Research in collaboration with staff from the Centre. Work was also reported on the progress towards development of new vaccines that can confer protection on chickens against fowl cholera or lead-up work eventually generating vaccines for sheep against footrot. Exquisitely detailed molecular structures of proteins that are found on the outer surface of bacteria provide the basis for another route to gain new vaccines and also to develop novel antimicrobial agents that can control infection.

The presentations made by the Research Fellows on the second day of the Conference showed the depth of talent in the Centre and illustrated the advanced technologies being applied within the

Centre. These talks included detailed studies of the fine hair-like structures called fimbriae, which extend from certain bacteria (such as *Dichelobacter nodosus* responsible for footrot in sheep) and are responsible for bacterial motility that is important in their ability to infect a mammalian host tissue. Another talk presented a comprehensive analysis of the genus *Mycobacteria* which showed their evolutionary relationships and how the chemical composition of the outer coating of the bacteria is related to their virulence in infection. These examples are but two of many interesting and challenging presentations made during the conference.

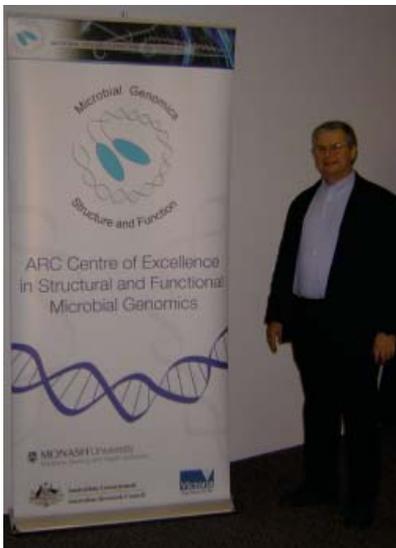
Members of the Scientific Advisory Board, under the chairmanship of Professor Jim Pittard, attended the Scientific Conference and their participation not only brought these members up to date with research advances in the Centre but also provided an excellent opportunity for Board members to meet the researchers within the Centre, including the lab heads as well as the Research Fellows and postgraduate students working within the Centre.



Left to Right: Annabelle Duncan (Board member), Marianne Johnston (Research Programs Manager), Phillip Nagley (Deputy Director), Jim Pittard (Chair of Scientific Advisory Board), John Egerton (Board member)

Thanks are due to Sheree Michael and Marianne Johnston for their excellent work in organising the conference.

Centre Visitors



Mid-way through August the Centre was privileged to have the company of Professor George Weinstock from the Baylor College of Medicine, Houston, Texas, USA. In between various meetings with Centre Chief Investigators, George spent time with Centre Research Fellows, PhD students and also delivered a public lecture on Genomics as a Centre initiative, in collaboration with the Monash Science Centre, for National Science Week.

Whilst visiting the Centre Professor Weinstock also completed an informal evaluation – as part of one of the Centre's Australian Research Council (ARC) reporting requirements - and summed up his tour by saying, "I enjoyed my visit very much and feel quite positive about the future of the Centre and the quality of the research team that it comprises. My congratulations to everyone for making such a good start."

The full version of his report has been posted on the Centre updatelog (refer <http://microbialgenomics.updatelog.com/login>).

RESEARCH NEWS



New Associate Dean Biotechnology

Centre Chief Investigator Professor Ian Smith has been appointed as the new Associate Dean (Biotechnology Development), replacing Professor David de Kretser, who has recently taken up the position of Governor of Victoria. The position of Associate Dean (Biotechnology Development) is to provide leadership in all aspects of the marketing, commercialisation and development of Biotechnology within the Faculty of Medicine, Nursing and Health Sciences. Ian will work closely with the Faculty Business Development Managers (BDMs) to assist in the identification, protection and ultimately commercialisation of intellectual property (IP) arising from faculty research. In addition, Ian will work closely with both the BDMs and academic staff to identify commercial funding sources to help support research within the faculty. Although Ian's scientific role within the Centre as one of the principal investigators, will remain unchanged, his new role will allow him to work more closely with the Director, research staff and the Centre commercialisation personnel to both help commercialise appropriate research and also to help raise additional research funding for the Centre. He will also be involved in looking at collaborative research opportunities for the Centre both within and outside Monash University.



Ian's appointment will be for a two-year term, renewable, in accordance with University policy.

Centre PhD student receives Young Scientist Travel Fellowship

Zara Marland, a PhD student from Centre Chief Investigator Professor Jamie Rossjohn's laboratory, was recently the recipient of an International Structural Genomics Organisation (ISGO) and National Institute of Health (NIH) Young Scientist Travel Fellowship. The fellowships supported 33 young graduate students and young post-doctoral researchers to attend the 4th International Conference on Structural Genomics (ICSG2006), in Beijing, in October this year. Zara was the only Australian recipient. ICSG2006 brought together many of the most prominent and influential scientists in Structural Genomics to present recent advances and future challenges in this technology driven and exciting field.

STAFF PROFILE



Emma Byres



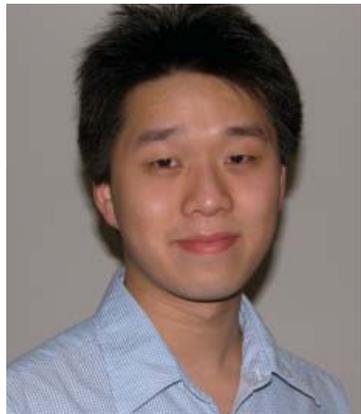
Research Fellow, Dr. Emma Byres is one of the Centre's most recent postdoctoral recruits, joining Prof. Jamie Rossojohn's laboratory in the Protein Crystallography Unit in February of this year. Originally from Scotland, Emma obtained her PhD in X-ray crystallography from the University of Dundee, Scotland, after completing a BSc Hons in Biochemistry at the University of Edinburgh. Her PhD work involved constructing gene knockouts in the parasite, *Trypanosoma*

brucei, and determining the three-dimensional structures and mechanism of an enzyme thereby found to be essential in this organism. Her current research within the Centre entails solving the X-ray crystal structures of potential enzyme drug targets from mycobacteria and other disease-causing microorganisms, in order to understand how such enzymes work and how drugs may potentially be designed to inhibit these enzymes.

STUDENT PROFILE



Wilson Wong



Wilson Wong is a Centre PhD student investigating the structural biology of extracellular proteases produced by the causative agent of ovine footrot, *Dichelobacter nodosus*. Wilson, who moved to Melbourne from the Gold Coast, Queensland for his honours degree (an investigation of the nuclear-cytoplasmic trafficking of a HIV protein), is originally from Hong Kong, China and came to Australia in

1997. Wilson completed his high school education on the Gold Coast as well as his bachelor degree in Biomedical Science. Wilson is part of Associate Professor James Whisstock's laboratory in the Protein Crystallography Unit of the Biochemistry and Molecular biology department. He worked in this unit as a Centre research assistant before commencing his PhD mid-way through this year. Wilson would like to take this opportunity to express his gratitude to the ARC Centre for providing him with the means to pursue post graduate study.

OTHER NEWS



New Centre Associate

The most recent addition to the Centre Associates is Dr Brian Cooke from the Microbiology department. Dr Cooke is the Microbiology department NHMRC Research Fellow and is also a member of the Centre Protein Analysis Facility sub-committee. One of his areas of research is the bovine parasite *Babesia bovis*. The Centre looks forward to the benefit of Brian's expertise.

The Centre is grateful to all Associates for their contribution to the Centre research program.

UPCOMING EVENTS



Christmas 'Coffee'

Centre members and associates who would like the opportunity to participate in a Centre 2006 'break up' are welcome to join the Research Fellow group for a coffee on Wednesday, December 13 at 3.00 pm at the Café Cinque Lire.

No RSVP required.



The ARC Centre of Excellence in Structural & Functional Microbial Genomics newsletter is compiled and edited by Marianne Johnston. This edition includes contributions from Professor Phillip Nagley, Professor Ian Smith, Zara Marland, Wilson Wong, and Emma Byres with photographs of the Centre Scientific meeting supplied by Arek Rainczuk and the photograph of Assoc. Prof James Whisstock courtesy of Amanda Hamilton. Contributions are welcome and can be forwarded to Marianne via email marianne.johnston@med.monash.edu.au or fax 9905 8241. Marianne is now located on the ground floor of the STRIP, Rm G93, (North end), phone number 9905 8610.