NEWS AND EVENTS

Prof Phil Bird steps down as Acting Head of School

“In stepping down from my role as acting Head, I’d like to express my gratitude to all those who have helped me over the last year, in particular Doug McGregor. It has been my privilege to work with such a great group of people.”

Kind regards
Prof Phil Bird

Our new Head of School, Professor John Carroll, took up his position on Monday, 3rd September.

Finalist in 2012 GSK Award for Medical Research

Professor James Whisstock is one of 11 leading medical researchers named as finalists in the 32nd year of the GlaxoSmithKline Award for Research Excellence.

This annual Award comes with a Grant of $80,000 and is one of the most prestigious awards available to the Australian research community.

Prof Whisstock has been nominated for his research on perforin-like proteins, which are being “fine tuned” to fight cancer, malaria and diabetes.

The winner will be announced at the 2012 Award for Research Excellence new oration event to be held on September 11th in Melbourne.

One of the Ten Best Research Projects of 2012

Assoc Prof Tim Cole (3rd from left) was one of five Chief Investigators led by Monash Dept of Anatomy’s Prof Richard Harding (1st on left) of a 2010 NHMRC program study. This study was named by the NHMRC as one of the 2012 Ten Best Research Projects.

Their project focused on improving the health outcomes of preterm babies. In particular, how best to support the function of preterm babies’ lungs.

The Atomic Structure of PlyC

Scientists have discovered the structure and operating procedures of a powerful anti-bacterial killing machine that could become an alternative to antibiotics

In research published in the Proceedings of the National Academy of Science USA, scientists from Monash University, The Rockefeller University and the University of Maryland detail how the bacteriophage lysin, PlyC, kills bacteria that cause infections from sore throats to pneumonia and streptococcal toxic shock syndrome.

In collaboration with Professor Vince Fischetti at Rockefeller and Dr Dan Nelson at Maryland, Monash researchers Professor James Whisstock, Associate Professor Ashley Buckle and Dr Sheena McGowan from the School of Biomedical Sciences, have spent the last six years deciphering the atomic structure of PlyC, to better understand its remarkable anti-bacterial properties.

First identified in 1925, PlyC was purified in the 1960s by Professor Fischetti, but its atomic structure proved elusive until now.

“Scientists have been trying to decipher the structure of PlyC for more than 40 years. Finally knowing what it looks like, and how it attacks bacteria, is a huge step forward,” Dr McGowan said.

NHMRC Grant Success

Professors Mibel Aguilar (Department of Biochemistry and Molecular Biology) and Patrick Perlmutter (School of Chemistry) were successful recipients ofARC Linkage Project funding. They will receive $240,000 to develop drug compounds containing stable and bioactive small proteins. They will initially target cardiovascular disease but the technology will be applicable to other health areas.


2012 Australian Museum Eureka Prize

As reported in our last newsletter, Monash “Team TAM”, consisting of ProfTrevor Lithgow, Joel Selkirk, and Drs Matthew Belousoff, Chaille Webb, Hsin-Hui Shen and Andrew Perry, was selected as a finalist for the 2012 Australian Museum Eureka Prize for Infectious Diseases Research.

Team TAM has discovered a machine of molecular scale in bacteria, the Translocation and Assembly Module (TAM), which enables bacteria to cause disease. The discovery of TAM will allow new strategies to be developed for preventing a range of bacterial infections and the emergence of antibiotic resistance.

At the Award Dinner held in Sydney on 28 August, the prize was awarded to a team from the Walter and Eliza Hall Institute for their identifications of mechanisms to boost the ability of the immune system to kill and eliminate overwhelming infections in mice, which could transform the treatment of HIV and hepatitis.

Although Team TAM was not awarded the prize, a good night was had by all and they are congratulated on being nominated for such a prestigious award.

ARC Future Fellowship Recipients

Drs Fasseli Coulibaly, Stephanie Gras (Rossjohn Lab) and Onisha Patel (Rossjohn Lab) have been awarded 2012 ARC Future Fellowships. The Future Fellowships scheme aims to promote research in areas of critical national importance by giving outstanding researchers incentives to conduct their research in Australia. The aim of Future Fellowships is to attract and retain the best and brightest mid-career researchers. Stephanie Gras said of her Fellowship: “The award of the ARC Future Fellowship is a great honour and a tremendous recognition of my work to date, and I’m very happy and flattered to receive it. This opportunity will help me setup my independent research at Monash in the area of viral immunity, especially on viral escape in the context of influenza. I would like to thank all the people who contributed to this success and supported my career, particularly Jamie Rossjohn for his ongoing guidance. Also the Rossjohn lab members, past and present, with whom it has been (and still is) a pleasure to work. Thanks to the people in the Department for their help, the research office and my collaborators.”

ARC Linkage Project Funding

Professors Mibel Aguilar (Department of Biochemistry and Molecular Biology) and Patrick Perlmutter (School of Chemistry) were successful recipients of ARC Linkage Project funding. They will receive $240,000 to develop drug compounds containing stable and bioactive small proteins. They will initially target cardiovascular disease but the technology will be applicable to other health areas.

Their group will also receive industry funding.

Lab Head: Dr John Price

Being born in Wales to a Welsh father and Irish mother, raised in the windswept North-East of Scotland, and married to a Scottish ‘lass’ with 3 children (one born in the United States and two born in Australia), it could be said that my heritage and accent are as mixed up as the genetics of the cancer cells which I study. So it is fitting that I have found myself living in multicultural Australia where there are even some who are more mixed up than me!

After completing my undergraduate studies in Biochemistry/Genetics, I remained at the University of Aberdeen and joined the lab of Neva Haites, embarking upon a PhD project which investigated the influence of growth factors upon the metastatic propensity of renal and ovarian cancer cells. The project fuelled my interest in the study of cancer cell biology and in particular, the metastatic process, which has continued to be my main area of research focus to this day.

To gain further experience in the field of metastasis, after the completion of my PhD in 1996, I obtained an NIH Fogarty International Fellowship and joined the Lab of Pathology at the National Cancer Institute in Washington DC. This division comprised of a number of world leaders in metastatic biology and I had the privilege of working under the mentorship of Lance Liotta and Elise Kohn while at NCI. My time in the US was quite an experience, from both the scientific and personal perspectives. Working at the NCI, although it was a major culture shock coming from a small institute at the University of Aberdeen, was a fantastic experience as a scientist, and I gained valuable experience in cancer cell biology, metastatic biology, science in general, lab politics and what not to do to be a decent lab head! I also learned from a personal standpoint that life always has its surprises, which was the case when I was told by my wife after two days of arriving in the US that I was to become a father for the first time!! So when in the US, I not only learned a lot about metastatic biology but also the indispensible ‘Lamaze’ breathing technique and how to relax to Kenny G music during labour! I still can’t hear a Kenny G song without breaking into a cold sweat!

While at the NCI, an exciting opportunity presented itself for me to move to Melbourne to join Rik Thompson's group at St Vincent's Institute. His lab was part of the newly established Victorian Breast Cancer Research Consortium and was focused upon breast cancer metastasis, especially the identification of novel molecular mediators of bone metastasis. It was during my time in Rik’s lab that I gained valuable experience in mouse models of cancer and with his support, I was able to obtain my own grant funding and establish an independent group. It was also during my time at St Vincent’s Institute that I co-chaired the seminar program with Jamie Rossjohn, which resulted in our subsequent collaboration and co-supervision of a PhD student examining the biology and structure of the integrin αvβ3. In 2006, I secured an NHMRC RD Wright Fellowship and with Jamie playing an instrumental role, I joined the Monash Department of Biochemistry & Molecular Biology that same year.

Working within the department has been a fantastic opportunity, not only for the great collaborations that have been established, but also for the support given to develop core technologies such as whole animal biophotonic imaging, the overall availability of diverse facilities and equipment, as well as the opportunities for student interactions that being on campus affords. It has also allowed me to build a great team of people who make up my research group, and with whom it is a great fun to do science with.

My group’s current major research goals centre around the role of the stress transcription factor, heat shock factor 1 (HSF1), in mediating cancer cell migration, survival, metastasis, and chemoresistance, especially in regard to triple-negative breast cancers. Such is the impact of this transcription factor on many important pathways in cancer progression that we are now embarking on ways in which we can specifically inhibit this factor. We have also been investigating the role that HSF1 plays during therapeutic induced damage of the bone and identified that it plays a major role in mediating enhanced osteoclastogenesis during proteotoxic stress within the bone microenvironment.

The diverse range of protein, molecular, cellular and in vivo approaches that we utilize make the work both stimulating and challenging, and our incorporation of biophotonic approaches (IVIS200 imaging) in our xenograft and syngeneic mouse tumour and experimental metastasis models have allowed us to visualize tumour growth and metastasis in real-time, adding another dimension to the research. With these approaches, it is hoped that our research will lead to significant findings in the near future that will impact upon our knowledge and treatment of metastatic cancers.

Cancer Biology and Metastasis Laboratory:

Images of MDA-MB-435Luc2mCherry in nude mice after intra-cardiac inoculation (5 wks) imaged by bioluminescence and digital X-ray (bottom LH panel).
POSTGRADUATE MATTERS

PhD Graduates

Tanya Mary D’Cruze
Thesis: “Characterising putative effector proteins of Burkholderia pseudomallei”
Supervisor: Rod Devenish

Newly Enrolled PhD Students

Tze Man (Fiona) Chang
Supervisor Lee Wong

Christopher Stubenrauch
Supervisors: Trevor Lithgow and Matthew Belousoff

2012 Postgraduate Research Conference

Pre-submission seminars are being planned for the Dept of Biochemistry Postgraduate Research Conference, which will be held on the 22nd and 23rd November.

The conference provides an opportunity for 3rd year PhD students to present a talk and all students to present a poster to the Department.

STUDENT SOCIETY

NOT DRS
August Beer Club

New Staff Member

Dr Ralf Schittenhelm, RF
Lab Head: Prof Anthony Purcell

Seminars in August

4 pm on Wednesdays
in Lecture Theatre H1 (Building 11)
Food and drink will follow the seminar in the foyer of building 76/77

September 5th
Moira O’Bryan (Monash Uni)
Infertile, fat and wheezy
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September 12th
Scott O’Neill (Monash Uni)
Wolbachia infections on insects and their potential use to control dengue virus transmission: a journey from the lab bench to the field
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September 19th
Paul Gooley (Melb Uni)
Role of dynamics in the optimization of carbohydrate binding by the beta-subunit of AMPactivated protein kinase
**************

September 26th
Kate Loveland (Monash Uni)
Signalling in Spermatogenesis

Please send suggestions for future speakers to committee members:
Martin Stone, Travis Beddoe, Catherine Itman, Ana Traven or Peter Boag

More Biochemistry news: please visit our website
www.med.monash.edu.au/biochem

Three Minute Thesis Competition

The winners of the Biochemistry 3-minute thesis competition held on 1st August were Michael Kraakman (Prof Mark Febbraio, Baker Institute) and Adam Shahine (Rossjohn Lab). Other contestants were Sarah Conduit (Mitchell Lab), Justin Chen (Dr Craig Harrison, Prince Henry’s) and Shuchin Lai (Devenish Lab). The winners were chosen by the scores of the audience, and Prof Martin Stone reported that the competition was of a very high standard.

Adam and Michael went on to represent the Department in the MBio Graduate School competition, where Michael was second-placed and received a $600 travel grant, while Adam was third-placed and received a $300 travel grant.

Michael then proceeded to the Faculty Three Minute Thesis Competition, which he won, receiving $300. At the University final held on 4th September, Michael placed second out of 11 students, just missing out on the big prize and a trip to Queensland. Prof Stone said that “overall the standard was extremely high and the topics wide-ranging, including: photographic arts and television; professional ethics in education; pedestrian safety; the effect of stress on cancer and development of nano-scale detection devices”.

Link to MBio e-bulletin:

All queries on Postgraduate matters: Please contact Prof Mibel Aguilar
mibel.aguilar@monash.edu

More Biochemistry news: please visit our website
www.med.monash.edu.au/biochem

Please send suggestions for future speakers to committee members:
Martin Stone, Travis Beddoe, Catherine Itman, Ana Traven or Peter Boag
My upbringing in the Northern Territory and remote South Australia provided me with a constant exposure to Australian native fauna which captured my imagination and paved the way for a future scientific career in biology (with my eyes set on Zoology). I studied at the University of Adelaide and through various avenues, I discovered the amazing world of the cell, the protein, the gene, and how they orchestrate development.

I undertook a PhD at Adelaide Uni in the Department of Genetics with Tim Cox, where I studied the genetic cause of a disease where babies are born with craniofacial and epithelial fusion defects. We knew the mutated gene (MID1) but had no idea what the protein did, and it was my task to find this out. By the time I had completed my PhD in 2007, I had found MID1 to be a microtubule associated E3 Ubiquitin Ligase that oligomerises. MID1 interacts and controls the levels of Protein Phosphatase 2A via ubiquitylation, through the binding of a C2H2 Zinc Finger “B-Box” (the structure of which, we solved collaboratively using NMR). I also subclassified all the “TRIM” proteins in the process and identified a novel domain unique to a subclass of these proteins that functions as a microtubule-associating domain. The approaches I used over the course of my PhD varied from molecular biology to cell biology, protein chemistry and bioinformatics.

I enjoyed working on genes and proteins involved in embryonic development and patterning during my PhD. I wanted to continue down this path further into developmental biology for my postdoc. Unfortunately, a reliance on medications to keep me healthy also keeps me in Australia for all but relatively short trips overseas, so any hopes I once had of heading overseas for a postdoc vanished. During the final stages of my PhD, I was very fortunate to cross paths with Dr Ian Smyth who was heading back to Australia to set up a lab after time in the U.S.A., Edinburgh and London. Ian’s work on the Fras & Frem genes in Fraser Syndrome model mice was extremely exciting, and fortunately for me Ian needed someone with my skills, so I joined the Department of Biochemistry & Molecular Biology and Ian’s lab in 2007. Shortly after beginning my postdoc, an Optical Projection Tomography (OPT) machine had arrived at Monash (the only one in Australia). The particular advantage of this technology is that it enables the 3D imaging of small tissues (about 0.5mm to 1cm), which is great for studying embryonic mouse development. One of first things I scanned were some embryonic mouse kidneys which are known to be affected in the Fraser syndrome model mice. The beautiful 3D dataset of the ‘ureteric tree’ (which forms the drainage system of the kidney after it is fully formed) captured our imaginations. Wanting to computationally ‘map’ the kidney, I began a collaboration with a friend from high school who is a programmer and works on Top Secret classified projects at the DSTO in Adelaide. We wrote a simple piece of software that analyses the OPT data and generates measurements of the ‘tree’. This was published, but learning from its deficiencies, we had already started a new piece of software with a goal of being more precise, being more biologically accurate/representative, and squeezing as much measurement data out of the 3D scan as possible. Recently completed, our software can now analyse practically any branching structure including kidneys, lungs, salivary glands, mammary glands and prostate glands. It accurately maps and generates nearly 6000 data measurements for a 14.5 embryonic-day mouse lung. This undeniably provides a level of quantification power previously unimagined for developmental biologists, which for morphological analysis, has always been a very qualitative endeavor. While the images and animations generated from the OPT data invoke much thought, and have won several international awards (including a Wellcome Trust imaging award), the power of the data is in the measurements that we can now glean from the data. We are now using our software and technology to answer important biological questions on how the development of the kidney is orchestrated by genetic and environmental influences during embryogenesis. Using our technology and imaging analysis tools, we have gained some collaborations with groups at the IMB at the University of Queensland, University of Michigan, Harvard, and some of those have spawned publication and grant funding success.

Images from Dr Ian Smyth, using Optical Projection Tomography (OPT)

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Mouse embryo

The image captures the foetal lung of a mouse beginning its complex process of branching to form the airways necessary for life outside the womb. By understanding how this occurs, we hope to better understand childhood lung disease.
INTRODUCING: Dr Takuya Shiota (Lithgow Lab)

Background
I undertook a Bachelor of Science in Biology in the Department of Biology at Konan University, under the supervision of Dr. Youhei Watanabe. My study was on the mechanism of protein disaggregation molecular chaperone ClpB. At that time I was interested in the organization and maintenance of protein functions through the study of the molecular chaperone. I enrolled in Masters and a PhD course in the Laboratory of Biochemistry at the Nagoya University under the supervision of Prof. Toshiya Endo, who was the leader of the Scientific Research in the Priority Area ‘Protein Community’, studying the organization and maintenance of mitochondrial protein. My Masters and PhD study focused on the in vivo protein-interaction analysis of a mitochondrial translocator TOM complex’s subunit protein Tom22 at work. Previously, lack of high-resolution structural information on the dynamics of the interactions among mitochondrial translocator components has hampered understanding of the precise mechanism of mitochondrial precursor movement along the import pathways. To understand the mechanism of mitochondrial protein transport systems, I applied the in vivo site-specific photocrosslinking method to analyze interactions between subunits of the TOM complex in yeast, Saccharomyces cerevisiae. The in vivo site-specific photocrosslinking method is a powerful tool to provide snapshots of the protein-protein interactions at spatial resolution of amino-acid residues in living cells.

The identification of numerous new transport components in recent proteome studies has led to novel mechanistic insight into mitochondrial protein transport in the mitochondria, but transport of mitochondrial precursor protein and mRNA in the cytosol is still unclear. I am interested in not only the mechanism of mitochondrial translocator proteins but also transport of mRNAs encoding mitochondrial proteins. Since Prof. Trevor Lithgow and Dr. Kip Gabriel are specialists in protein transport, and Dr. Ana Traven is a specialist of RNA binding protein in the Host-Pathogen Molecular Biology Unit here at Monash University, I thought that this area of Monash University would provide the best environment for me to study mitochondrial protein transport in the mitochondria and transport of mitochondrial precursor proteins and mRNAs in the cytosol. Luckily, I obtained a research fellowship from TOYOBO BIOFOUNDATION and Prof. Lithgow accepted me willingly.

Projects
My research objects are the determination of the partner proteins of Puf3 and analysis of TOM complex using the in vivo site-specific photocrosslinking method. Since in vivo site-specific photocrosslinking method is necessary for both projects, I would like to explain about this method. In vivo site-specific photocrosslinking method is performed combining the in vivo suppressor tRNA method and the site-specific phorocrosslinking method. Briefly, the gene for the target protein containing amber codon which is one of the stop codons, for a desired position is introduced into yeast cell that contains an orthogonal pair of amber suppressor tRNA and its cognate aminoacyl-tRNA synthetase specific for BPA. BPA (p-benzoyl-L-phenylalanine) has a photoreactive benzophenone side chain, which reacts with nearby carbon-hydrogen bonds, yielding a covalent crosslink by 350-365 nm UV light. Addition of BPA into the culture medium allows incorporation of BPA into the target protein at the position specified by the amber codon. Subsequent UV irradiation of yeast cells results in photocrosslinking of BPA in the target protein with nearby proteins.

Determination of the partner proteins of Puf3
Puf3 is one of the PUF proteins, which represent a conserved family of RNA-binding proteins characterized by the presence of a Pumilio homology domain. Puf3 is targeted to the mitochondrial outer membrane and binds to COX17 mRNA to regulate decay. Recently it was reported that Puf3 interacts with three mitochondrial proteins: Mmm1, Mdm10 and Mdm12 by pull-down and two-hybrid assays. To define Puf3 partner mitochondrial protein I will perform in vivo site-specific photocrosslinking method for Puf3. Since this method can fix the transitory interaction via crosslink, unlike the co-immunoprecipitation method, it is not necessary to worry about degradation of RNA. The knowledge gained should explain high efficiency protein transport to the mitochondria in the cell.

Analysis of TOM complex using in vivo site-specific photocrosslinking method
I continue the analysis of interaction of TOM complex especially, about Tom40. Tom40 is channel forming protein and central subunit of TOM complex, that is one of the beta-barrel membrane proteins. The structural information of TOM complex was obtained by cryo-EM analysis. Therefore we do not have high resolution of structural information of not only TOM40 complex but Tom40. Recently, structure of VDAC1 which is also mitochondrial beta-barrel protein, is revealed by NMR and X-ray approach. I have corroborated with Prof. Paul Horton et al. in CBRC, Japan to obtain the modeling structure of Tom40 from the VDAC1 structure. We will determine the specific binding region of Tom40 with other subunits of TOM complex. The knowledge gained should demonstrate the TOM complex and protein translocation system of the mitochondrial outer membrane.
OHS MATTERS

FIRST AIDERS

BUILDING 13A-G
1. Lina D’Agruma
2. Oanh Ho

BUILDING 13B-G
1. Minh Pho

BUILDING 13D-L1
1. John Price
2. Jessica Vlesseux (in training)

BUILDING 13D-L2
1. Xuelei Li
2. Gavin Higgins
3. Lan Gong

BUILDING 16
1. Noeline
2. Danuta Maksel (in training)
3. Anita Barry (in training)

BUILDING 76-G
1. Irene Hatzinisiriou
2. Maria Sandoval
3. Maghda Bhati
4. Natasha Ng
5. Alexander Theodosiss

BUILDING 77-L1
1. Linda Wiltzer
2. Rae Farnsworth
3. David Sheffield (Medic)
4. Christina Mitchell (Medic)
5. Sandra Hakim (in training)

BUILDING 77-L2
1. Elaine Pearson
2. Monica Prakash
3. Iresha Hanchapola
4. Ray Koh
5. Steven Heaton

QUICK OVERVIEW OF WHAT TO DO WHEN AN EMERGENCY ARISES:

1. Remain CALM...
2. Yell out for a First Aider (don’t go looking for one yourself, get someone else to go looking)
3. First Aiders: Read MSDS before treating any chemical injury
4. First Aiders: Call Med Centre if necessary ext. 53175
5. First Aiders: Call the Safety Officer and/or Safety Representative as soon as possible


Environmental Sustainability At Monash
Anyone concerned with any environmental issues should contact
Leigh Yang (li.yang@monash.edu) or visit The Office of Environmental Sustainability (TOES)