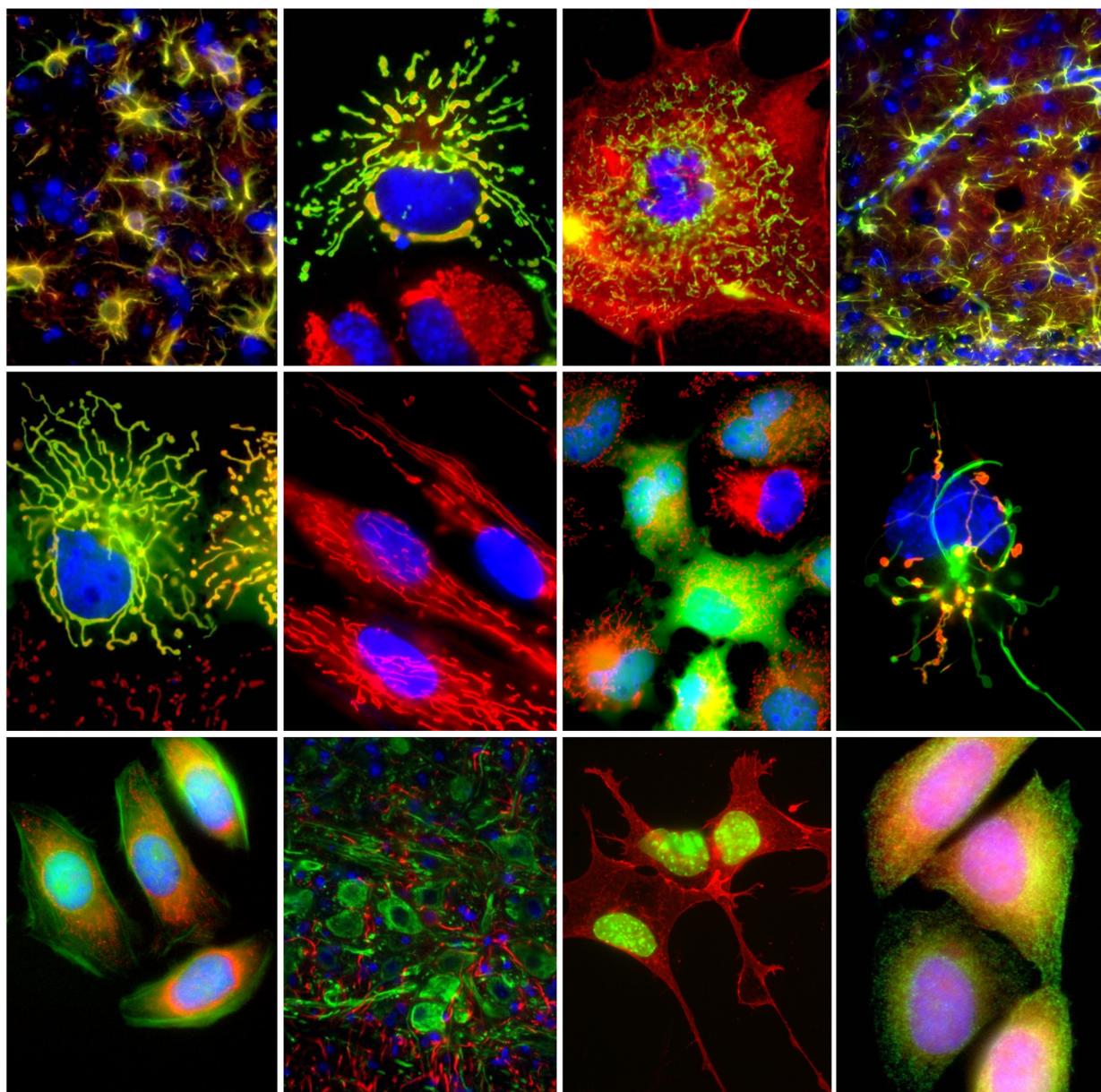


# ANNUAL REPORT 2010



**LA TROBE  
INSTITUTE FOR  
MOLECULAR SCIENCE**

# CONTENTS



Year in Review	3
LIMS Mission	5
Income and Expenditure	7
Research	8
Outreach	16
Seminar Program	19
Publications	22
External Funding	31
Staff	34

## YEAR IN REVIEW

The past year has been a year of consolidation for LIMS. The refurbishment of the first and second floors of Physical Sciences 4 building was completed, allowing us to consolidate groups previously located in other buildings. Alongside this, the planning for the construction of a new, six storey iconic building moved to the next phase with the appointment of WATPAC as builders. At this time, the building site is a hive of activity and it will be interesting, in the fullness of time, to review the construction process from the film footage being collected around the clock from the roof of an adjacent building. We also launched the LIMS logo which you will find on each page cover of this Annual Report.

The development of the heart and soul of LIMS, its staff, has also moved apace in 2010. New academic appointees in chemistry and genetics have now settled into their jobs and have revitalized these disciplines. Dr Anne Richards (inorganic and structural chemistry) was successful in obtaining an ARC Future Fellowship and takes the total number of Future Fellowships in LIMS to six. Professor Leann Tilley was successful in her application for an ARC Professorial Fellowship and Dr David Dougan obtained an ARC Australian Research Fellowship. Dr Ivan Poon received an NHMRC Training Fellowship. Dr Marc Kvansakul joined LIMS as a lab head funded by an NHMRC Training Fellowship.



It was also time to celebrate individual achievements by staff of LIMS. Professor David Vaux was awarded the 2010 Macfarlane Burnet Medal by the Australian Academy of Science for his work on apoptosis, Professor Leann Tilley the Bancroft-Mackerras Medal of the Parasitology Society for her work on malaria, and Dr Alexander Maier was one of three finalists in the Eureka Prize for Scientific Research held in Sydney in August. Professor Michael Ryan has taken over as Head of the Department of Biochemistry from Professor Nick Hoogenraad who has served in this position for 20 years. Dr Ian Potter became Head of the Department of Chemistry.

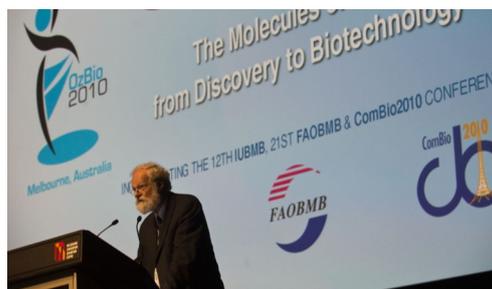
A new LIMS special seminar program was launched with the first seminar being presented by Professor Frances Shannon, Chair of the LIMS Advisory Board and DVC (Research) at Canberra University. Professor Tom Gonda (University of Queensland), Professor Trevor Lithgow (Monash University), Dr Elizabeth Hartland (University of Melbourne) and Professor Justin Gooding (UNSW) also contributed to this program.

## YEAR IN REVIEW (cont)

A major activity for members of the Biochemistry Department was organising OzBio2010, an international conference in the Melbourne Convention Centre, from 26 September – 1 October 2010. The conference, representing the International Union of Biochemistry and Molecular Biology (IUBMB), the Federation for Asian and Oceanic Biochemists and Molecular Biologists (FAOBMB), the Australian Society for Biochemistry and Molecular Biology (ASBMB), the Australia New Zealand Society for Cell and Developmental Biology (ANZCDB) and the Australian Plant Scientists (APS) was attended by 2000 registrants and the conference was universally acclaimed as an outstanding meeting.

Another major activity was the detailed planning for the Excellence in Research in Australia (ERA) discipline ranking exercise carried out by the ARC in late 2010. Representatives from each of the disciplines in LIMS were involved in putting together detailed profiles of publication and other research outputs which formed the basis of the assessment.

In January, 2011 the ERA results produced a wonderful result for LIMS. In the field of research of 'Biochemistry and Cell Biology', La Trobe received the top score of 5 (an outstanding performance, well-above world standard). No other university in Australia received this score placing this discipline at number one in Australia. In 'Analytical Chemistry', 'Physical Chemistry' and in 'Genetics', the score was a very credible 3 (equal to world standing). This gives us a very strong base to build the future of LIMS.



OzBio2010, September 2010

One of the measures of success for LIMS is the extent to which the close association and organisation of its research activities creates an environment for cooperation and collaboration. LIMS organised a grant writing workshop in February which resulted in every grant submitted by early career staff being reviewed by experienced members of staff. There were also workshops on 'New Gen Sequencing' organised by the Genetics Department in Healesville in November and a workshop by the Chemistry Department in Woodend on Molecular Processes and Analysis and Molecular Design and Synthesis. The Outreach Program run by Francesca Calati also saw a substantial expansion in the range of activities and in the number of participating schools as detailed elsewhere in this report. Part of this program was the production of a video on the discovery of X-rays produced by students from St Helena Secondary College, sponsored by the ARC Centre of Excellence for Coherent X-rays and LIMS which won a Eureka Prize. The video was launched at the National Gallery of Victoria with appropriate fanfare in December.



Professor Nick Hoogenraad  
Executive Director



Professor David Vaux  
Director

## LIMS MISSION

LIMS is an amalgamation of scientific disciplines whose collective function is to carry out world class research and to educate students to be productive members of a modern, technologically driven society.

**Research** must be world class which means it must be of high quality and it must be of such importance as to make the research carried out by members of LIMS have international impact. This is best measured by the citations the published output attracts, but also its ability to attract competitive grant income. Indeed, if it fails to attract funding, it will fail as inevitably the research in the disciplines of LIMS (biochemistry, genetics, chemistry and pharmacy) are laboratory based, expensive to perform and in need of substantial funding for equipment, staff and consumables.

**Education.** Our educational role in LIMS should be to use the best contemporary approaches to train tertiary level students to equip them to be able to have satisfying and productive careers. These careers are likely to be in the respective disciplines we teach, but since the education we offer should have a breadth to it, those careers could equally be of a more general nature such as in the commercial sector, public service and teaching. Certainly, our own future depends on training at least a portion of our students to become researchers of the future.

The educational mission of LIMS also includes an **Outreach** component. It is incumbent upon us to stimulate an interest in science in youth at the pre-university levels of education, as a good supply of motivated, high quality students is essential for our own viability as a research institute and indeed, for a society dominated by technology. This program may prove to be a valuable place to advertise our own exceptional standing in molecular science education. If outreach is to be one of our missions, it needs to be broadly contributed to by LIMS staff.

**LIMS Environment.** In so far as LIMS is a collection of people rather than disciplines, the mission of LIMS should be expressed at the level of individuals. Arguably the most important consideration from an individual perspective is that LIMS should provide an environment which enables each individual to perform their role optimally. The environment should be optimal from a physical perspective and we can at least be confident that LIMS will achieve that with respect to buildings and space with the refurbishment and construction programs in progress. In order to provide optimal research facilities, we also need to find ways of raising funds to buy state of the art equipment. Although we have well proven approaches to this such as leveraging funds from infrastructure schemes such as ARC-LIEF, we also need to think collectively about gaining access to the successor of NCRIS, NRIC and to find access to state government funding for infrastructure.

We need to find the best way to get our brand into the market place and we need to think carefully about procedures to achieve that aim. These could include brochures, public events and a strong alumnus support group. We have made a start to this as we have established a LIMS Fund Management Committee to create a fund to support the mission of LIMS.

**Management.** The management structure of LIMS should ensure that all people who work in LIMS can share ownership of its mission. This can be achieved at various levels and our current structures of departments as semi-autonomous organisational units (consisting of a HOD, departmental meetings and committees) is a well proven approach to academic organisation. We need to achieve input from the broadest participation base at the level of the School/ LIMS. We have a LIMS Executive and we have an Advisory Board. There are Research and Academic Committees which still need to refine the

## LIMS MISSION (cont)

way they operate *vis a vis* the other management structures (e.g. 'who has responsibility for what?'). We need to find the best way to get things done with the maximum participation in decision making without being overburdened by too many formal procedures and structures, a problem which is all too familiar at universities.

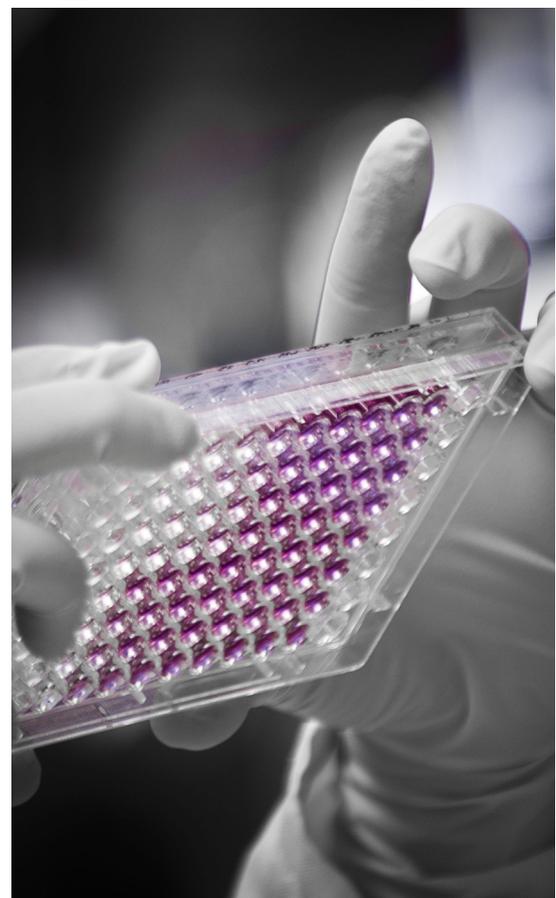
**Quality outcomes.** Although we all strive as individuals to achieve the best outcomes in research and education, ultimately we will be judged collectively:

- How good is LIMS as an institute?
- How well do we stack up against our goals?
- How do the component disciplines measure up in the ERA?
- How good is our reputation for being a very good place to work?

Although it is probably trite to say that we are only as good as our weakest link, positive answers to these questions to a large extent lie in understanding how our collective contributions are assessed and then responding appropriately. We have the answer from an ERA perspective: quality of the published output is paramount. But what is equally true is that it is the output of the *whole* discipline cohort that will be judged. Thus, a discipline with a few stars, but a long tail with many publications with low citations will perform poorly in this form of assessment. Thus, 'publish or perish' will not serve LIMS well. What we should be emphasising is to publish in quality journals and publish compelling research which will stimulate citations. Our mission should not be to do work on esoteric topics of no particular interest to the broader scientific community, but we have to have the courage to work at the cutting edge and to compete with the best in the world.

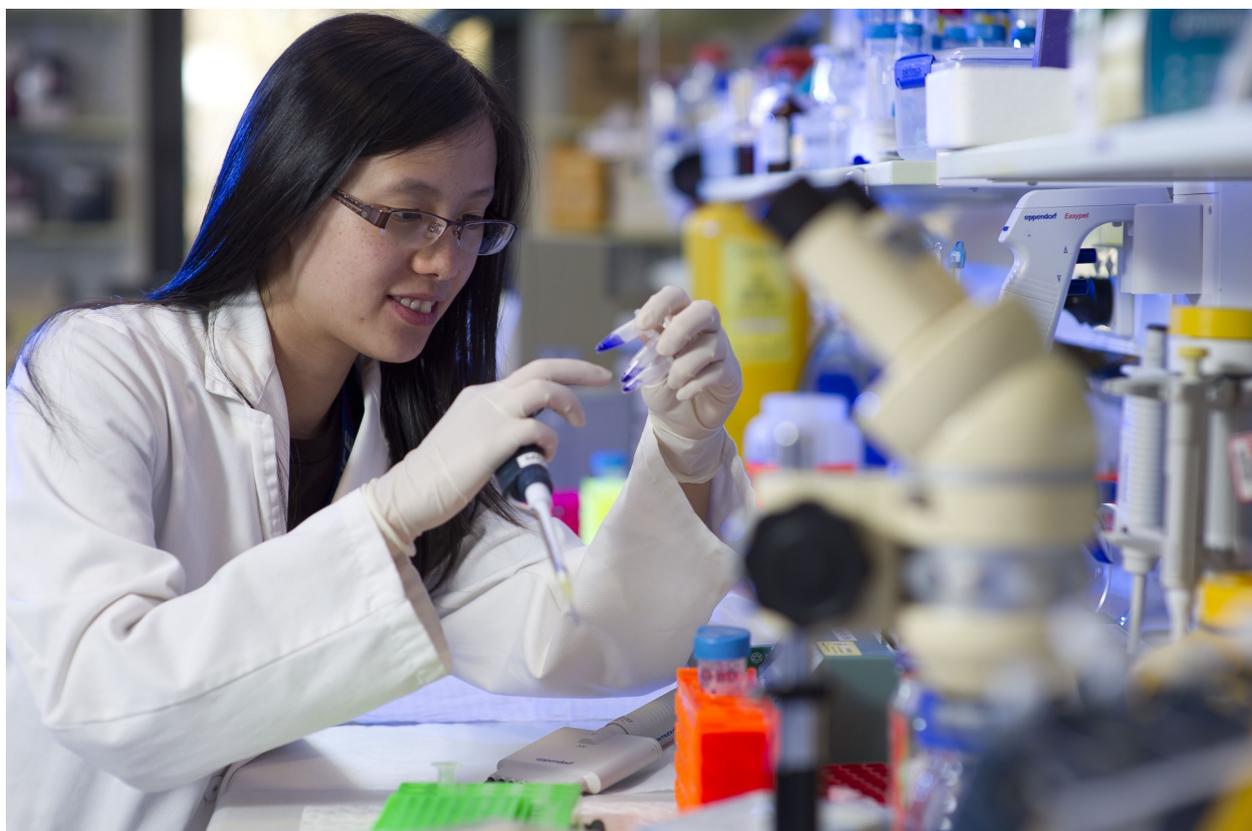
If we achieve our aims and succeed in our mission, it is almost inevitable that we will also create an environment in which it is a pleasure to work.

Nick Hoogenraad  
(Extracted from the 'LIMS Manifesto')



# INCOME AND EXPENDITURE

	Government income	Grants and consultancies
Brought forward from 2010	312,512	2,938,613
Income		10,489,390
Government DEEWR, RTS, IGS, RIBG (net of overheads and central costs)	7,563,714	
Research grants		9,273,693
Research consultancies and contracts		3,487,122
Other revenue		1,288,737
Expenditure	7,495,222	11,005,519
Salaries	4,991,171	7,966,697
Materials and equipment	497,767	2,249,603
Repairs and maintenance	54,699	28,423
Travel, books and stationery, postage, staff development	1,171,982	649,440
Other expenditure including contributions and transfers	779,604	111,357
Carried forward to 2011	381,004	5,982,647



# RESEARCH

## Research Strengths

A major effort in 2010 was to prepare the portfolio for the disciplines which fall under LIMS, biochemistry and cell biology, physical chemistry and analytical chemistry and genetics, for the Excellence in Research in Australia (ERA) process. This process ranks all academic disciplines in Australian Universities by 4 digit codes (e.g. 0601: Biochemistry and Cell Biology) and by 2 digit codes (e.g. 06: Biology). As mentioned earlier the results were outstanding with LIMS achieving a maximum score of 5 for Biochemistry and Cell Biology. The assessments were made on the basis of publications in a defined portfolio of journals ranked A\*, A, B and C, with quality being assessed on the basis of the percentage A\*/A out of the total of all publications and on the basis of citation analysis of the published output for the whole cohort in the discipline.

The prestige of LIMS is acknowledged through its significant funding from research bodies and its publications. In the period 2005-2010 LIMS laboratory heads published 460 journal publications of which 281 (61%) were A or A\* level. These include 2 Nature and 6 Nature stable publications, 2 Science, 5 Cell, 4 PNAS, 3 EMBO J, 3 J Cell Biology, 5 Blood, and many other high profile publications. Revenue from research grants and contracts increased by 100% in the period 2005 to 2010, significantly exceeding the target set by the university of a 20% increase in this period. For the 2007-2010 period LIMS members attracted over \$25 million in competitive research funds with substantial funding received from the ARC and NHMRC as well as industry and international sources. In 2010, the income from grants, consultancies and contracts was close to \$10 million (see table on page 7).

In recognition of the role of LIMS members as world-class research leaders in the areas of molecular science, biotechnology and nanotechnology, the Federal Government awarded La Trobe University \$64.1 million of funds through the Education Investment Fund to establish the La Trobe Institute for Molecular Science (LIMS). Together with other sources of funds, bringing the total to \$94 million, the LIMS project will result in the refurbishment of all four floors of Physical Sciences 4, the construction of a new six storey building and the addition of a SPF mouse facility to the Central Animal House. LIMS staff contributed comprehensively to developing the design brief for laboratories and support facilities of LIMS during 2010.

In 2010, the departments of LIMS recruited a number on new staff which will help to strengthen the research effort of LIMS. Marc Kvansakul joined biochemistry as a Senior Fellow funded on an NHMRC Career Development Award Fellowship, with a brief to establish a protein crystallography capability in LIMS. In chemistry, four new members of staff were appointed each with excellent research credentials. Anne Richards, has established an inorganic structural laboratory, Adam Mechler a physical chemistry lab, Evan Robertson an analytical laser facility and Peter Barnard an inorganic synthesis lab. In genetics, Adam Hart has established a mammalian stem cell lab, Greg Somers (NHMRC Peter Doherty Fellow) a Drosophila stem cell lab, Nick Murphy (ARC Postdoctoral Fellow) an ecology lab and Jan Strugnell a lab to study aquatic populations. LIMS has 57 research fellows, 14 of whom were self-funded in 2010. The number of research-only staff in Molecular Science has increased by 50% from 2007-2010. A LIMS Research Fellow scheme was implemented in 2010 and 5 new internationally competitive researchers have been invited to join LIMS in 2011. LIMS supports and trains more than 100 postgraduate students, many of who have been awarded prestigious scholarships and awards.

# RESEARCH (cont)

## Research Themes

In 2010 LIMS proposed a number of research themes to attempt to get around the traditional discipline boundaries and encourage cross disciplinary collaborations.

The proposed themes are:

- Biotechnology
- Cancer and cell death
- Evolution and development
- Molecular basis of disease
- Molecular design and synthesis
- Molecular processes and analysis
- Protein structure and function
- Teaching and learning and applications in society.

## Research Collaboration

The core strategy of the group is to be 'joint owners' of the Institute. As such, self-funded research-only staff members have equal access to resources and attend staff meetings. Members of the group attend retreats and planning forums where strategic directions are set. This provides a strong training environment and lays the foundations for academic success.

LIMS staff are involved in major collaborative research efforts including:

- ARC Centre of Excellence for Coherent X-ray Science (CXS)
- Co-operative Research Centre for Biomarker Translation (CRC-BT)
- NHMRC Program Grant on Apoptosis
- AgriBio Research Centre (AgriBio)
- Australian Synchrotron



## RESEARCH (cont)

### LIMS Equipment and Facilities

In 2010 LIMS purchased equipment valued at \$1,286,244 from funds provided for capital expenditure (\$832,000), RIBG (\$111,000) and LIMS (\$324,000). Major items of equipment were an AKTA Express FPLC system, micro plate reader, centrifuges and rotors, cell culture Incubators and biosafety cabinets, a BioRad ProteOn XPR36 surface plasmon resonance machine, flow cytometer, chemidoc system, HPLC, Argon and 633nm lasers, NMR auto sampler and a range of smaller items of equipment. ARC LIEF funds made a substantial contribution to the purchase of major items of equipment.

A LIMS equipment grant scheme managed by the LIMS Research Committee was also implemented in 2010.

The refurbishment of levels 1 and 2 of PS4 was completed. This refurbishment is part of the \$94million LIMS project and was funded by money from BURF. This leaves only minor refurbishment to level 3 to be completed in 2011 in order to have completed the total refurbishment of the PS4 building. Upon completion of the new LIMS building in November 2012, the refurbished building will be connected at all 4 levels into the new building to make up the LIMS complex.

### LIMS Research Committee

Composition of the LIMS Research Committee:

Professor Leann Tilley (Chair; Director of Research, LIMS)

Dr Conor Hogan (chemistry representative, LIMS)

Dr Christine Hawkins (biochemistry representative, LIMS)

Dr Warwick Grant (genetics representative, LIMS)

Dr Michelle Gibson (pharmacy representative, LIMS)

Professor Mike Ryan (research experience representative, LIMS)

The Research Committee has undertaken a number of projects including:

- Grant writing workshop
- Mentoring program for fellowship and grant applications
- Forums and workshops for discussion of LIMS themes and research strategy
- Postgraduate student careers forum
- Start-up grant scheme and a salary gap funding scheme to attract new self-funded researchers
- National and international postgraduate student travel schemes
- A series of one day technical workshops
- Establishment of a postgraduate student travel fellowship scheme for the presentation of work at international meetings. This scheme has been supported by a gift from a supporter of LIMS
- LIMS equipment grant scheme



Leann Tilley  
Director, Research

## RESEARCH (cont)

### Biochemistry Research and Professional Highlights

#### Appointments

**Marc Kvansakul** (NHMRC CDA Fellow)

#### Departures

**Don Phillips** - appointed Emeritus Professor

#### Awards/ Esteem

**Lahiru Gangoda** (Silke/Vaux lab) was awarded the Biochemical Journal Poster Prize at the 5th Garvan Signalling Symposium, held in Sydney on 18-19 October 2010. The title of her poster was 'Analysis of Sharpin mutant mice and the role of Sharpin in the TNF superfamily pathways'.

**Catherine Palmer** (Ryan lab) and **Jeff Yeoman** (Tilley lab) were awarded ASBMB student poster prizes at the recent OzBio2010 conference.

**Alexander Maier** was one of three finalists to walk down the red carpet at the 'Oscars' of Australian science – the Eureka Prize for Scientific Research held in Sydney in August. As the judges said, Dr Maier has made 'an enormous step forward' in understanding a key adaptive strategy used by the malaria parasite to survive in – and cause damage to – its human host.

**Marc Kvansakul** was one of 9 winners at the Victorian Young Tall Poppy Science Awards 2011. This prestigious award 'uniquely acknowledges the recipients' research achievements alongside their capacity and commitment to communicate science and its significance to the community and social outcomes'.

**Leann Tilley** was awarded the prestigious Bancroft-Mackerras Medal by the Parasitology Society for her work on malaria. This medal is awarded for outstanding contributions to the science of parasitology.

**Nick Hoogenraad** was awarded the Dean's Medal for Outstanding Service to Science and Engineering.

**David Vaux** was awarded the 2010 Macfarlane Burnet Medal by the Australian Academy of Science. The biennial prize recognises scientific research of the highest standing in the biological sciences.

**Michael Baker** was the 2010 recipient of the Nancy Millis PhD Excellence Prize for the most outstanding PhD thesis from the Faculty of Science Technology and Engineering. Micky was a PhD student in the Ryan laboratory and is now working as an Alexander von Humboldt Research Fellow at the Institute for Genetics, University of Cologne, Germany.

**Matthew Dixon** was awarded a Young Investigator Award at the 35th Lorne Protein Conference on Protein Structure and Function.

**James Micevski** and **Stephanie Kralik** of the Dougan/Truscott lab were both awarded student poster prizes for their work at the 35th Lorne Protein Conference on Protein Structure and Function.



## RESEARCH (cont)

**John Silke** was awarded a La Trobe University DVC (R)/VC Excellence in Research Award for Mid-Career Researchers for his work on apoptosis and cancer. A Commendation for Mid-Career Researchers was also given to **Alexander Maier** for his research on malaria.



Mike Ryan  
Head, Biochemistry Department

### Chemistry Research and Professional Highlights

#### New Appointments

Carmel Abrahams was appointed chemistry first year laboratory coordinator

#### Conference Presentations

**Conor Hogan** gave an invited seminar on 'Luminescent electrode interfaces for sensing applications' and a presentation on 'toward tuneable electrochemiluminescence' at Pacificchem 2010.

**Evan Robertson** gave presentations on 'FTIR spectroscopy of collisionally cooled aerosols' and 'Laser spectroscopy of neurotransmitters' at Pacificchem 2010.

#### Symposia

LIMS Research Symposium Retreat at Woodend in November for chemistry and pharmacy members of Molecular Processes and Analysis and Molecular Design and Synthesis research themes.

ACI Inorganic Chemistry Symposium organised by **Anne Richards** and hosted at La Trobe in November.

#### Awards/Esteem

**David Wilson** awarded both a Vice Chancellor's and a Dean's Teaching Award for Teaching Excellence.

The first year chemistry teaching team (**Bob Brownlee, David Wilson, Ian Potter, Helen O'Hara, Jeff Rowe, John Traeger, John Christie and the late Bruce James**) awarded both a University and Faculty Citation for Outstanding Contributions to Student Learning.

**Jacqui Delaney** was awarded best student oral presentation at RACI Research and Development Topics 2010.

**Ellen Reid** was awarded a poster prize at RACI Research and Development Topics 2010.

**Egan Doevan** was awarded a poster prize at RACI Inorganic Chemistry Symposium.

**Reshmi Kiran** was awarded the Don Stranks Award for best student oral presentation at the 39th International Conference on Coordination Chemistry (ICCC39).



Ian Potter  
Head, Chemistry Department

# RESEARCH (cont)

## Pharmacy Research and Professional Highlights

### New Appointments

**Richard Summers**, Lecturer, Pharmacy Practice

**Pene Wood**, Associate Lecturer, Pharmacy Practice

**Christina Dennis**, Associate Lecturer, Pharmacy Practice

### Conference Proceedings

Proceedings of the Australasian Pharmaceutical Science Association Annual Conference, Brisbane.

Therese McMahon and **Joe Tucci**, Pharmacists' Perceptions and Knowledge of Pharmacogenetic testing.

Alisia Neels and **Joe Tucci**, Counselling Patients: What do Pharmacists Find Challenging?

**Erin O'Connor, Joy Spark, and Leslie Fabain**, Medication reconciliation and admission medication charting: Are there any discrepancies?

**Joy Spark**, John Willis, and Graeme Byrne, Why do Australian women use compounded progesterone products?

**Joy Spark**, and Leslie Fabian, Pharmacy intervention outcomes in a private hospital setting.

### Australian Society for Microbiology Conference 2010, Sydney

**Zoe Dyson and Daniel Tillett**, In situ detection of bacteria using fluorescently labelled bacteriophages.

**Steve Petrovski and Daniel Tillett**, Biocontrol of biological foaming with bacteriophages

**Bruce Johnson, Michael Angove and Eben Quill**, A macroscopic and spectroscopic study of the sorption of phytic acid to goethite. Chemical Speciation in Solution and at Solid/Solution Interfaces, Umeå University.

### Seminars

**Joe Tucci**, The clinical relevance of pharmacogenetic screening of Indigenous Australians. Central Victorian Division of General Practitioners meeting, Bendigo.

**Joe Tucci**, Pharmacogenetic screening of Indigenous populations: a proposal. 2nd Annual Australian Pharmacogenomics Summit, Sydney.

**Joe Tucci**, Pharmacogenetic Issues Associated With Type II Diabetes Drug Therapy. International Symposium on the Role of Pharmacy in the Treatment of Diabetes, Jakarta, Indonesia.

**Michael Angove**, Application of acid washing to the remediation of contaminated soils. EPA HazWaste Fund, Special Seminar.



Michael Angove  
Head, School of Pharmacy

# RESEARCH (cont)

## Genetic Research and Professional Highlights

### New Appointments

**Greg Somers** (Lecturer, NHMRC Peter Doherty Fellow).

**Nick Murphy** (Lecturer, ARC Research Fellow)

**Jan Strugnell** (Lecturer)

**Adam Hart** (Lecturer)

### Awards/ Esteem

- **Warwick Grant** was invited to sit on a World Health Organisation Advisory Committee for Helminth Control (Tropical Disease Research (TDR) Disease Reference Group for Helminth Disease).
- **Adam Hart** was appointed to Adjunct Research Fellow of the Department of Anatomy and Developmental Biology at Monash University.
- **Jan Strugnell** was invited to be the leader of the international 'Palaeo-reconstruction and Evolution' subgroup of Scientific Committee for Antarctic Research (SCAR) Life Sciences program.
- **Jan Strugnell** won an early career investigator prize to attend the annual 'Science at the Shine Dome' event in Canberra put on by the Australian Academy of Science.

### Conferences and Workshops

**Adam Hart** participated in organisation of the Australian Health and Medical Research Congress Melbourne, he reviewed abstracts and recommend poster prizes.

**Jan Strugnell** also presented at the SCAR (Scientific Committee on Antarctic Research) Open Science Conference in Buenos Aires.

**Vedia Yazgin** presented a poster titled 'Changes in wing pattern morphometrics of the Common Brown Butterfly (*Heteronympha merope merope*) over a thirty-year period' at the Genetics Society of Austral-Asia conference held in Canberra

**Katherine Lange** presented a poster entitled '*Mixl1* regulation of *MesP2* expression in early mesoderm' at the Lorne Genome conference. **Katherine Lange** was also selected to attend 6<sup>th</sup> Australian Developmental Biology Workshop and present a poster entitled '*Mixl1* regulation of *MesP2* expression in early mesoderm'. Yarra Valley

**Anna Lister** presented a talk entitled 'Genetic responses to climate change in the Common Brown Butterfly (*Heteronympha merope*)' at the 57<sup>th</sup> Annual Genetics Society of AustralAsia conference in Canberra.

**The Grant lab** participated in the third Australasian *Caenorhabditis Elegans* meeting held in Brisbane in June 2010. **Warwick Grant** was selected as a speaker at the Molecular Helminthology conference in Greece September 2010.

## RESEARCH (cont)

### Research Retreat

The research retreat entitled 'New Horizons in Evolution and Development' took place in November at the Sanctuary House Resort Motel, Healesville. The 2 day research retreat for LIMS Evolution and Development Theme included a half day symposium on Next Generation DNA sequencing, a research poster symposium and a day of student and lab leader research seminars.



Warwick Grant  
Head, Genetics Department



Evolution and Development Researchers at the Healesville research retreat

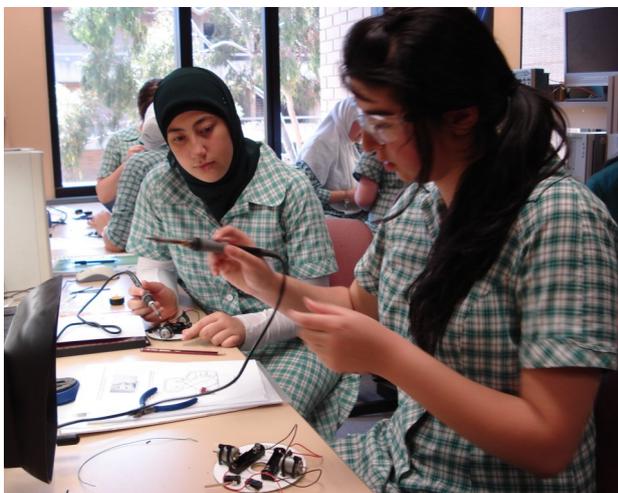
# OUTREACH

Over the past 12 months LIMS commitment to engaging with the school community has seen a sustained increase in the number of outreach programs. Central to the LIMS mission, these programs seek to promote a culture of academic generosity by bringing current and future scientists together to participate in genuine science learning. A total of 1600 students and 500 teachers from 70 schools participated in a range of science outreach programs in 2010.

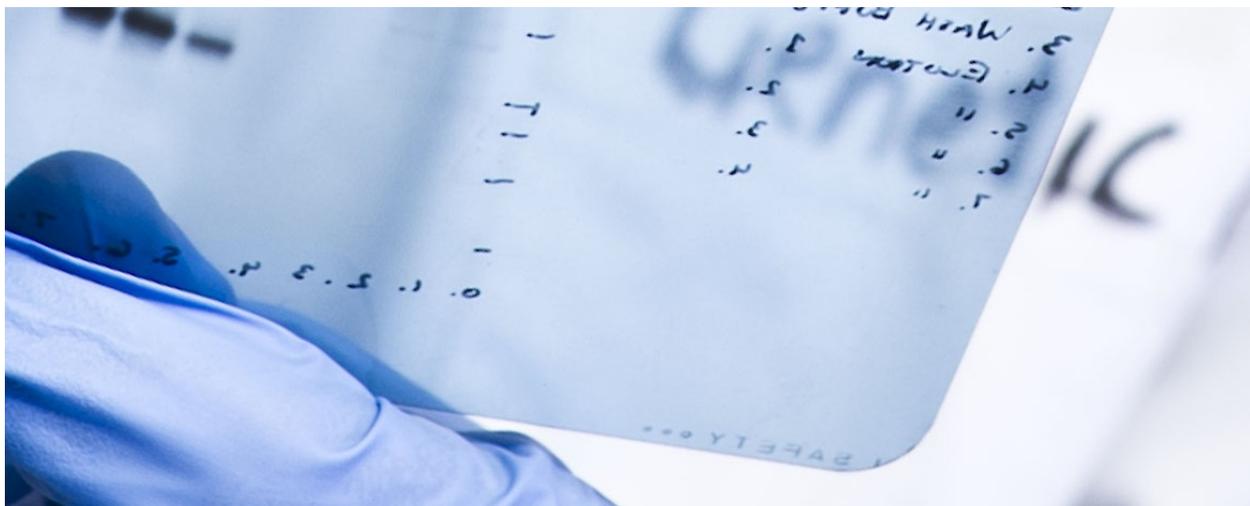
## VCE Program

Practical workshops in instrumental analysis, aspirin synthesis, water chemistry, immunology and disease and nanotechnology provide high school students with the opportunity to work at the laboratory bench under the guidance of experienced staff and young postgraduates. In 2010, the VCE Program attracted over 1000 students and their teachers from local and regional schools.

These workshops are very popular because teachers can see the relevance of exposing their students to specialised equipment such as the MS and NMR, biotechnology procedures and expert knowledge that is unavailable in the school environment. Students have the opportunity to work in small groups with young postgraduates at the laboratory bench. This environment gives the student a glimpse of what it is like to study science at a university. Funding was acquired to further develop outreach resources in nanotechnology and VCE programs at Bendigo and Albury-Wodonga campuses.



## OUTREACH (cont)



### Year 9 Out-of-Class Program

The success of the Year 9 Out-of-Class Program, which is now in its fourth year, relies on the important role scientists, from postgraduates to eminent research scientists, and other professionals, play in redefining the science learning that takes place. They provide experience and guidance with laboratory experiments, lead discussions about ethical and social implications, promote careers in science and provide insights about the life of a scientist.

A special feature was the winning of the University of Sydney's Sleek Geeks Eureka Prize by 6 students from St Helena Secondary College for their short documentary entitled *Roentgen: A Bright Spark*. This was co-supervised by **Peter Kappen, Ron Berkoczy, Fabienne Perani** and **Andrew Peele**.

The program has rapidly gained interest amongst local schools and in 2010 the schools that participated were Ivanhoe Grammar School, Pascoe Vale Secondary College, Eltham College, Epping Secondary College and Parade College. Approximately 300 students spent one to two weeks at the University where they interacted and worked with academics, librarians, pre-service teachers and their teachers to explore science questions and issues not presented in the school curriculum. The lectures provided students with a whole range of topics such as swine flu, pandemics, shark antibodies, malaria parasites, stem cell research, climate change, brain diseases, synchrotron science, nanotechnology, river blindness, food shortage, space science, biofuels, apoptosis, desalination and GMF.

The lab tours give students an opportunity to see firsthand a working research facility and hear explanations from our scientists on the research being undertaken in their laboratories. Whilst on campus, the students acquire skills that equip them for life. They learn to interact with adults, take responsibility for their own learning and get a taste of what it is like to be a university student. Of equal importance is the opportunity the programs provide for postgraduate students to engage in 'an outreach activity' that develops their communication and presentation skills.



Francesca Calati  
Director, Outreach Program

## TEACHING AND LEARNING

During 2010 we saw continued interest from students in the subjects offered by the core disciplines within LIMS. One of the major focuses of the teaching and learning team during 2010 was the redesign of all first year subjects in preparation for the implementation of Design for Learning (DFL). As part of this process, all first year undergraduate subjects were reviewed, revised and restructured to ensure there was appropriate alignment between the defined intended learning outcomes for students, the described assessment tasks and the selected Faculty Graduate Capabilities (FGCs). Within LIMS (and therefore, the School of Molecular Sciences) there were subjects from genetics, chemistry and pharmacy that were put through the DFL process in preparation for delivery in semester 1, 2011. This process was time consuming yet staff were generally supportive of the changes being proposed to help improve the learning students will obtain through the revised curriculum. As biochemistry is not taught at first year level, it was not involved in this process throughout 2010. By the end of 2010, all first year subjects across the Faculty of Science, Technology and Engineering had been revised and approved by the Faculty Academic Committee ready for delivery in 2011. All second year subjects will be the focus of the DFL process during 2011 followed by third year subjects in 2012.

Two new postgraduate coursework masters programs were initiated during 2010 to provide further opportunities for students wishing to obtain a higher level education. An 18-month Master of Biotechnology was introduced to allow the generation of the second new course which is the Master of Biotechnology/Master of Business Administration double degree. As a contribution to this double degree, the CRC-BT provided significant scholarships to the best 5 applicants joining the course mid-year 2010. The uptake of these two courses was slow which was not unexpected given the problems experienced by the higher education sector during 2010 and the significant drop in international student enrolments across all universities in Australia during this period. It is expected that these two new courses will allow biotechnology trained students to also develop skills in management and finance and therefore, contribute to the biotechnology sector in ways other than via direct research.

The successful Master of Biotechnology and Bioinformatics program continued to experience strong interest with over 40 new students joining the program during 2010. In light of the ongoing success of this program, the new laboratories, office space, tissue culture and computer facility were completed and occupied during the June/July mid-year break. This allowed all students in the program who were not allocated to LIMS research laboratories to work in the same space for the first time since the course was expanded at the end of 2007.



Peter Cartwright  
Director, Teaching and Learning

## SEMINAR PROGRAM

- 22 February Dr Rudi Marquez (Glasgow University, UK)  
Adventures in biological chemistry
- 9 March Assoc Prof Stuart Batten (Monash University)  
Nanoballs, crowns and nitrile anions
- 10 March Dr Patrick Humbert (Peter MacCallum Cancer Institute)  
The disorientation of cancer: tumour suppression mediated by a network of cell polarity regulators
- 16 March Assoc Professor Charles Young (The University of Melbourne)  
Adventures in metal-sulfur chemistry: novel reactions and unique materials
- 23 March Professor Frances Shannon (Australian National University - University of Canberra)  
Controlling T cell differentiation through the NF- $\kappa$ B signalling pathway
- 23 March Assoc Professor Kieran Lim (Deakin University)  
Improvements in teaching and learning can be linked to C1 research papers for 'average' science academics
- 29 March Professor Andrew Sinclair (Murdoch Children's Research Institute)  
Sex in humans and birds – what is the difference?
- 30 March Professor Glen Deacon (Monash University)  
Lanthanoid containing bimetallics prepared from the elements
- 31 March Dr Nick Robinson (Norwegian Fisheries and Aquaculture)  
Application of second-generation sequencing technologies for improving health surveillance and disease resistance in fish
- 13 April Dr. Paul Donnelly (RACI Alan Sargeson Lecture—University of Otago)  
Coordination chemistry in biology: metal complexes in diagnosis and therapy
- 14 April Dr Leigh Coultas (WEHI)  
Hegehog and VEGF signaling in development of the blood vascular system
- 20 April Dr Jean-Jacques Youte (WEHI)  
Explorations in natural product synthesis

## SEMINAR PROGRAM (cont)

- 21 April Professor Tom Gonda (University of Queensland)  
*Myb* target genes and transformation in myeloid cells
- 28 April Dr Leonie Quinn (University of Melbourne)  
*Drosophila* models for regulation of the MYC oncogene
- 5 May Dr Doug Fairlie (WEHI)  
Targeting the Bcl-2 apoptosis pathway for therapy
- 11 May Professor Richard Robson (The University of Melbourne)  
Coordination polymers: past, present and future
- 12 May Professor Alister C. Ward (Deakin University)  
Fishing for function: analysis of cytokine receptor signalling using zebrafish
- 19 May Dr Adam Walker (La Trobe University)  
Protein disulphide isomerase and ER stress signaling in motor neuron disease
- 26 May Professor David J. Adams (RMIT)  
Modulation of ion channels by venom peptides
- 27 July Dr. Zhiguang Xiao (The University of Melbourne)  
Determining protein affinities: the challenges and stones behind
- 4 August Dr Coral Warr (Monash University)  
Odorant receptors and olfactory signalling in *Drosophila*
- 11 August Dr Daniel Hatters (University of Melbourne)  
Insight to Huntingtin aggregation in cells using new fluorescent sensors of protein oligomerization
- 18 August Dr Tobias Sargeant (WEHI)  
Studying the evolution of apicomplexa: new methods for species tree inference using protein domains
- 25 August Dr Stuart Ralph (University of Melbourne)  
Bioinformatic prioritisation of drug targets in infectious disease

## SEMINAR PROGRAM (cont)

- 1 September Professor Trevor Lithgow (Monash University)  
The evolution of molecular machines for protein import into mitochondria
- 7 September Dr Peter Tregloan (The University of Melbourne)  
Learning about learning with technology
- 8 September Dr Daniel Gray (WEHI)  
Apoptotic mechanisms imposing immunological tolerance
- 9 September Professor Peter Sadler (Warwick University)  
Organometallic and photoactivated metal anticancer complexes
- 15 September Dr Clare Parish (Howard Florey Institute)  
Cell therapies for the treatment of Parkinson's Disease
- 21 September Dr Ljiljana Pusker (The Australian Synchrotron)  
Infrared microspectroscopy beamline at The Australian Synchrotron
- 22 September Dr Ada Rephaeli (Sackler Medical School, Tel Aviv University, Israel)  
The basis for the selectivity of HDAC inhibitory prodrugs
- 5 October Assoc Professor Brendan Abrahams (The University of Melbourne)  
Physical and chemical changes within crystals
- 6 October Dr Ricky Johnstone (Peter MacCallum Cancer Institute)  
Use of HDAC inhibitors alone and in combination for the treatment of cancer
- 13 October Dr Elizabeth Hartland (University of Melbourne)  
Subversion of innate immune signaling by enteropathogenic *E. coli*
- 20 October Professor Justin Gooding (University of New South Wales)  
Making silicon water friendly for electrochemical, cell biology and molecular electronic applications
- 23 November Max O'Connor Research Seminar. Prof Alan Bond (Monash University)  
Dawson-type - polyoxometalates as photocatalysts for water oxidation in ionic liquid media

# PUBLICATIONS

## Biochemistry

### Book Chapters

**Vaux, D** (2010) Bcl-2 Family Proteins - Key Regulators and Effectors of Apoptosis, *Cell Death*, 69-75.

**Vaux, D** (2010) Inhibitor of Apoptosis (IAP) and BIR-containing proteins, *Cell Death*, 138-147.

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### Journal Articles

**Abu Bakar, N, Klonis, N, Hanssen, E, Chan, C and Tilley, L** (2010) Digestive-vacuole genesis and endocytic processes in the early intraerythrocytic stages of *Plasmodium falciparum*, *Journal of Cell Science*, 123, 441-450.

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**Anders, R, Adda, C, Foley, M** and Norton, R (2010) Recombinant protein vaccines against the asexual blood stages of *Plasmodium falciparum*, *Human Vaccines*, 6, 39-53.

**Augusteyn, R** (2010) On the growth and internal structure of the human lens, *Experimental Eye Research*, 90, 643-654.

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**Crespo-Ortiz, M, Tilley, L and Klonis, N** (2010) Solution behavior of hematin under acidic conditions and implications for its interactions with chloroquine, *Journal of Biological Inorganic Chemistry*, 15, 1009-1022.

**Dougan, D, Truscott, K and Zeth, K** (2010) The bacterial N-end rule pathway: expect the unexpected, *Molecular Microbiology*, 76, 545-558.

**Dunse, K, Stevens, J, Lay, F, Gaspar, Y, Heath, R and Anderson, M** (2010) Coexpression of potato type I and II proteinase inhibitors gives cotton plants protection against insect damage in the field, *Proceedings of the National Academy of Sciences*, 107, 15011-15015.

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**Duquez, J, Nachbur, U, Cook, W, Gentle, I, Moujalled, D, Moulin, M, Wong, W, Khan, N, Chau, D, Callus, B, Vince, J, Silke, J and Vaux, D** (2010) TAK1 is required for survival of mouse fibroblasts treated with TRAIL, and does so by NF- $\kappa$ B dependent induction of cFLIPL, *PLoS One*, 5, e1-e9.

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**Van Der Weerden, N**, Hancock, R and **Anderson, M** (2010) Permeabilization of Fungal Hyphae by the Plant Defensin NaD1 occurs through a cell wall-dependent process, *Journal of Biological Chemistry*, 285, 37513-37520.

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Sousa-Nunes, R and **Somers, W** (2010) Phosphorylation and dephosphorylation events allow for rapid segregation of fate determinants during *Drosophila* neuroblast asymmetric divisions, *Communicative and Interactive Biology*, 31, 46-49.

**Strugnell, J** and Allcock, A (2010) Co-estimation of phylogeny and divergence times of Argonautoidea using relaxed phylogenetics, *Molecular Phylogenetics and Evolution*, 54, 701-708.

**Westerman, M**, Meredith, R and Springer, M (2010) Cytogenetics meets phylogenetics: a review of karyotype evolution in diprotodontian marsupials, *Journal of Heredity*, 101, 690-702.

Zhadanov, S, Dulik, M, Markley, M, Jennings, G, Gaieski, J, Elias, G, Schurr, T and **Mitchell, R** (2010) Genetic heritage and native identity of the Seaconke Wampanoag tribe of Massachusetts, *American Journal of Physical Anthropology*, 142, 579-589.

### Pharmacy and Applied Science

#### Journal Articles

**Gibson, L** (2010) At the heart of snails, *Australasian Science*, 31, 33-35.

Ihmaid, S, **Al-Rawi, J** and **Bradley, C** (2010) Use of Diphenyliodonium bromide in the synthesis of some N-phenyl  $\alpha$ -amino acids Synthesis, structural elucidation and DNA-dependant protein kinase and antiplatelet studies of 2-amino-[5, 6, 7, 8- mono and 7, 8-di-substituted]-1,3-benzoxazines, *European Journal of Medicinal Chemistry*, 45, 4934-4946.

Karolidis, D, **Kustrin, S** and **Morton, D** (2010) Artificial neural network (ANN) based modelling for D1 like and D2 like dopamine receptor affinity and selectivity, *Medicinal Chemistry*, 6, 259-270.

Kemp, S and **Spark, M** (2010) Rurally focused BPharm course: perspectives of graduates, *Journal of Pharmacy Practice and Research*, 40, 275-278.

## PUBLICATIONS (cont)

Mamangkey, **N**, **Kustrin**, S and Southgate, P (2010) Assessing pearl quality using reflectance UV-Vis spectroscopy: does the same donor produce consistent pearl quality? *Marine Drugs*, 8, 2517-2525.

**Mcilroy**, S, Nittami, T, **Seviour**, E and **Seviour**, R (2010) Filamentous members of cluster III Defluviococcus have the in situ phenotype expected of a glycogen-accumulating organism in activated sludge, *FEMS Microbiology Ecology*, 74, 248-256.

Mckerrow, J, **Al-Rawi**, J and Brooks, P (2010) Use of Diphenyliodonium bromide in the synthesis of some N-phenyl  $\alpha$ -amino acids, *Synthetic Communications*, 40, 1161-1179.

Quill, E, **Angove**, M, **Morton**, D and Johnson, B (2010) Characterisation of dissolved organic matter in water extracts of thermally altered plant species found in box-ironbark forests, *Australian Journal of Soil Research*, 48, 693-704.

## EXTERNAL FUNDING

### **AdAlta** (\$900,000)

Development of new diagnostic and therapeutic approaches to infectious diseases (M Foley, 4 years, \$900,000)

### **AICR** (\$219,017)

Characterisation of the YAP oncogene as a regulator of apoptosis and cell growth (M Hulett, 3 years, \$219,017)

### **ANZ** (\$60,000)

Molecular complexes formed by the malaria parasite *Plasmodium falciparum* in response to fever (A Maier, 1 year, \$20,000)

The role of assembly factors in mitochondrial Complex I biogenesis and their defects in disease (M McKenzie, 3 years, \$20,000)

Towards an understanding of the role of Ubr1 in Johanson-Blizzard Syndrome (K Truscott, 2 years, \$20,000)

### **ARC** (\$7, 818,705)

Apoptotic signalling in virally infected and normal cells (C Hawkins, 5 years, \$788,800)

ARC Centre of Excellence in Coherent X-ray Science (M Ryan and L Tilley, 4 years \$2,640,480)

Biogenesis of red blood cell membrane modifications by the malaria parasite *Plasmodium falciparum* (M Anderson, 5 years, \$331,000)

Creation of a non-venomous honey bee (D Vaux, 3 years, \$65,000)

Discovery and application of circular proteins (M Anderson, 5 years, \$305,130)

Evolution of the unique fauna of the Great Artesian Basin mound springs: the impact of aridification and climate change (N Murphy, 2 years, \$150,002)

Functional genomic analysis of exported DNAJ molecules in the malaria parasite *Plasmodium Falciparum* (A Maier, 3 years \$295,925)

Improvement of anthracycline chemotherapy by enhancement of apoptotic responses and tumour targeted activation (S Cutts, 4 years, \$686,400)

Laser Facility for Ultra-sensitive Molecular Characterisation (E Robertson, 1 year, \$67,000)

Lighting up the charged brigade: laser spectroscopy of protonated and metal-containing complexes (E Robertson, 3 years, \$105,000)

Mitochondrial proteases and their contribution to protein homeostasis (K Truscott, 4 years \$686,400)

Molecular Archaeology: Carbon isotope analysis of amino acids as a means to investigate diets, physiology, metabolism and palaeoenvironment (C Smith, 4 years, \$683,420)

Small Molecule X-Ray Molecular Structure Elucidation Facility (A Richards, 1 year, \$182,000)

Studies on the regulation of the pro-apoptotic protein Bim in mammalian development and cancer

Transporting proteins to and within mitochondria (H Puthalakath, D Stojanovski, M Ryan, C Pfanner, 4 years, \$328,800)

Tumour localization and enhancement of anthracycline anticancer activity (S Cutts, 3 years, \$328,348)

Ultra-high Frequency Non-contact Vibrometry Equipment for Biomechanics Metrology (A Mechler, 1 year, \$175,000)

### **Australian and Pacific Science Foundation** (\$10,000)

Gene flow, adaptation and speciation in Antarctic octopus: consequences of climate change' (J Strugnell)

## EXTERNAL FUNDING (cont)

### **Cooperative Research Centre** (\$6,000,000)

Cooperative Research Centre for Biomarker Translation (N Hoogenraad, M Foley, 7 years, \$6,000,000)

### **Hexima** (\$5,439,082)

Insect resistance in plants

To investigate the potential human therapeutic effects of Hexima's molecules (M Anderson and M Hulett, 2 years, \$5,439,082)

### **MVI/PATH Gates Foundation** (\$986,239)

A proposal to develop a more effective malaria vaccine using a modified form of recombinant AMA1 (M Foley, 4 years, \$986,239)

### **NHMRC** (\$13,086,833)

Analysis of the functions of a novel class of ubiquitin Ligases in TFN signalling in vivo (J Silke, 3 years, \$528,500)

Australia Fellow (D Vaux, 5 years \$4,000,000)

Determining the role of ER Stress induced apoptosis in thymic negative selection (H Puthalakath, 4 years, \$535,500)

Dissecting the function of heparanase in inflammatory disease using genetic tissue-specific ablation (M Hulett, 3 years, \$577,750)

Functional Genomics Suite to investigate the malaria parasite Plasmodium falciparum (A Maier, 1 year, \$20,000)

Identifying novel regulators of RNA receptor signalling to modulate viral innate immunity (J Vince, 4 years, \$393,205)

Investigating the role of Kaposi sarcoma herpesvirus Bcl-2 in tumourigenesis (M Kvensakul, 4 years, \$414,615)

Metabolomic analysis of programmed cell death (I Gentle, 4 years, \$279,000)

Novel fluorescent probes of cellular microenvironments to study the mechanism of action of endoperoxide antimalarials (L Tilley, 5 years, \$886,250)

Pluripotent Stem Cells from the Mouse Testis (A Hart, 3 years, \$538,500)

Role of a novel Tks5-Nck signaling pathway in cancer invasion (P Lock, 2 years, \$330,712)

Role of transformation and IAPs in sensitivity of cells to TNFalpha (J Silke, 3 years, \$336,591)

Roles of impaired apoptosis and differentiation in tumourigenesis and therapy ((D Vaux, 4 years, \$1,637,961)

Targeting viral Bcl-2 proteins for therapy (M Kvensakul, 3 years, \$300,750)

The Na<sup>+</sup>/H<sup>+</sup> exchanger and V-type pyrophosphatases of the malaria parasite (A Maier, 3 years, \$213,624)

The role of assembly factors in mitochondrial Complex I biogenesis and their defects in disease (M Ryan, 3 years, \$586,875)

Trafficking of the cytoadherence-mediating protein to the host cell surface in malaria parasite-infected erythrocytes (L Tilley, 3 years, \$565,500)

Trafficking of virulence determinants within the malaria parasite Plasmodium falciparum (M Dixon, 4 years, \$285,000)

Viral caspase inhibitors (C Hawkins, 3 years, \$656,500)

## EXTERNAL FUNDING (cont)

### **Overseas Funding Bodies** (\$838,981)

Blood brain barrier dynamics in early us MS Society EAE (J Orian, 4 years, \$700,480)

Pathological changes in pre-clinical stages of murine multiple sclerosis (Orian, 1 year, \$138,501)

### **Other** (\$420,126)

Access Nano teacher professional development (F Calati, 1 year, \$29,701)

Definition of the mechanism by which capase-2 suppresses lymphomagenesis (C Hawkins, 1 year, \$56,256)

Genographic research on migration of humans: oceania and pacific node of international collaboration RJ Mitchell, 5 years, \$187,584)

Is Protein Disulphide Isomerase (PDI) a novel biomarker for MND (J Atkin, 1 year, \$54,020)

Protein Disulphide Isomerase (PDI) a novel biomarker for Motor Neuron Disease? (J Atkin, 1 year, \$32,885)

Mining of Proteomics Data (G Talbo, 1 year, \$13,900)

New chelating N-Heterocyclic carbene ligands for the development of 99mTc-and 68Ga - based Molecular Imaging Agents (P Barnard, 1 year, \$20,400.00)

Paper fluidics: A novel approach to low cost printable micro sensors (C Hogan, 1 year, \$5,380)

Protein trafficking to Mitochondria (D Stojanovski, 2 years, \$20,000)

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Founding members of LIMS, taken at the site of the new LIMS building