NEWSLETTER – October 2006

From the Convenor

Dear Colleagues,

Our Network enjoys continuing support by its Members and we are pleased to report new Members. Their expertise will undoubtedly enrich the capabilities of our community. We welcome them warmly and I am looking forward to increased scale and scope of professional interactions and participation in Network activities, including our funding program.

We have just closed the second call for project for 2006 and received a range of interesting applications in the areas of anti-cancer drugs, cell biology, fluorescence assays and advanced fluorescence technologies. FABLS has two funding rounds each year and welcomes projects from all Members, including from those who work for companies outside of the University. The only requirement for projects is the match with the required criteria which, among other things, favour cross-disciplinary partnerships. Students and early career researchers should take note that we do not assess track records so they have the same chance as more senior Members. We offer a supportive assessment process: the Committee returns the proposal with comments for rectification and submission in the same round. We should also stress that the success rate is very high and we hope that this could encourage your participation.

FABLS plans to place an increasing emphasis on supporting teaching and training programs. In this context we are proud to support the leading fluorescence training event this year, the International Workshop on Fluorescence Spectroscopy in Biological and Biomedical Research FLUORO 2006 (2 October-6 October 2006, Coffs Harbour) organized by Pierre Moens. It featured lectures by Enrico Gratton, Kenneth Jacobson, David Jameson, Robert Learmonth and Pierre. The event was also supported by Varian Inc, Invitrogen. FABLS sponsored 20 student scholarships.

Your attention is also brought to the Live Cell Imaging 2006 course being presented at Monash University on 3 – 8 December, 2006. (see page 4)

Finally, I would like to draw to your attention to the upcoming 2007 FABLS Workshop which will be organized as a satellite to the 32nd Lorne Conference on Protein Structure and Function, Lorne, Victoria on 4-8th February 2007. FABLS will sponsor Members costs to attend this Workshop. I hope to see you there.

We would also welcome any inquiries about making contact with the membership.

Ewa Goldys
New Members

The FABLS membership has grown to 192. Over the last 3 - 4 months 56 new members have joined. Have a look at the FABLS’ website to see the depth of skills and versatility of our Membership. In the mean time here are the new international members.

- Dr Tobias Kippenberg, Max Planck Institute of Quantum Physics, Laser Spectroscopy
- Dr Edwin Yeow, Nanyang Technological University, Chemistry and Biological Chemistry
- A/Prof Luis Bagatolli, MEMPHYS Centre of Biomembrane Physics, Biochemistry and Molecular Biology
- Dr Sabato D’Auria, National Research Council of Italy, Institute of Protein Biochemistry
- Dr Claus-Dieter Warzecha, University of Cologne, Institute of Organic Chemistry
- Dr Evgenia Matveeva, University of North Texas Health Science Centre, Molecular Biology and Immunology
- Mr. Andy Yen Hsinb, University of Auckland, Physics
- Dr. Muhammad Atif, Pakistan Institute of Engineering and Applied Science, Physics and Applied Mathematics
- Dr. Xi Peng, Purdue University

Business Liaison

FABLS continues to develop its presence to people from business and government and to establish a system to exchange information for the benefit of both organisations. Recent activities include:

Science Industry Australia (SIA)

FABLS accepted an invitation to make a presentation about the network to the NSW chapter of Science Industry Australia Association. David Tayler’s presentation focusing on the need to attract more industrial members into FABLS.

Manildra Group

Ewa Goldys and David Tayler met with Dr Robin White from Manildra to discuss the application of fluorescence techniques in the management of ethanol production. This lead to further discussions with Dr Grant Stanley, Associate Professor in Microbiology and Biotechnology, Victoria University, to informally collaborate in an investigation to identify yeasts that improve the efficiency of the ethanol fermentation process.

Seminar - Application of Enzymes in Manufacture

FABLS 2nd seminar was held on 17th August, at the Australian Technology Park in Sydney. Dr Peter Bergquist, Director, Macquarie University Biotechnology Research Institute, spoke about harnessing the natural power of enzymes to help fix the environment and replace chemicals in industrial processes and eliminate the concept of “waste streams”. Mr Tim Wawm, CEO, Applimex Pty Ltd, complemented Dr Bergquist’s presentation, talking about the technology developments within his company and the changes in direction to take up market opportunities. The third speaker, Dr Graham Vesey, Chief Technical Officer, BTF Pty Ltd spoke the growing need for precision controls for microbiological testing in the food and pharmaceutical industries and how his company was developing new products for markets worldwide.
David Tayler attended as an invited member on consultation workshop established to assist on a national agricultural biotechnology strategy. It was overwhelmingly agreed that a convergence of technologies, which is an objective of FABLS, can make major contribution to agriculture practices and processes. “We need to continue research on genomics, gene networks and phenome-genome technologies including visualization technologies to determine phenotypes accurately. It is important that bioinformatics be developed, database repositories for technologies are generated and that database mining tools are universally interchangeable and accessible. Some of the important areas to be addressed by Ag Biotechnology will be disease resistance, energy production and resilience to abiotic stress and environmental conditions”.

Sources of funding for research in agricultural biotechnology are the agricultural R&D corporations. They are listed later in this newsletter.

FABLS was briefly promoted to the 25 participants from industry, government departments and research organisations.


FABLS will be an exhibitor at Ausbiotech being held at Sydney’s Darling Harbour on 20-22 November. It is part of a program to bring industry’s attention to the FABLS network. Based on the past, the organisers are prediction 1200 delegates. We will focus on 4 themes:

1. Hardware (Laser/cytometer development, microscopes, etc)
2. Reagents (Fluorophores/ fluorescent molecules)
3. Industrial applications (food industry, etc)
4. Health care (such as detection of micro-organisms, etc)

A number of FABLS members have offered their help over the 3 days. (Anya Salih, University of Sydney, Robert Learmonth, USQ, Liz Harry, UTS, Kristie Johnson, Macquarie University A/Prof. Matthew Phillips, University of Technology, Sydney) Ewa and David will also attend

If you would like to help, please contact David ([dtayler@ics.mq.edu.au](mailto:dtayler@ics.mq.edu.au)). It is an opportunity to develop new industry contacts and there is an opening to attend some of the talks.

**Potential for professional training courses**

- **Combio Survey**
  An analysis of the questionnaire undertaken at Combio (2005) has indicated a need for awareness and professional courses. The results indicate that postgraduates (across a range of disciplines) and staff would like to attend courses on fluorescence spectroscopy, laser scanning fluorescence microscopy, and FRET, which will develop a stronger understanding of the theory and applications. Day courses presented during the week, face-to-face, were preferred.

- **Fluorescence Imaging Group (FIG)**
  FIG, represented by Dr Ian Harper (Monash University) and Mr Stephen Cody (Ludwig Institute for Cancer Research), and Ewa Goldys and David Tayler agreed in principle that FABLS would provide administrative support for the educational and training activities of FIG. This would help FIG to present selected seminars and courses to a wider audience interstate. Two examples are a course on Live Cell Imaging at Monash (see next section) and a

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1 Agbiotech Consultation Report, NSW OSMR, 15th August 2006, Australian Technology Park
shortcourse on preparing images for publication which Ludwig/FIG is planning for early 2007 in Melbourne.

- **Varian Instruments**

To explore further opportunities to organise professional training courses, a meeting was held with David Haines and Dean Logan at Varian Australia Pty Ltd. Varian already promotes a number of courses in Australia on its website, and has a strong commitment to course presentation in the US. Opportunities with potential included bring US presenters to Australia to provide courses in several locations around Australia, and multi-faceted workshops on how researchers are developing fluorescence techniques in biological applications.

Collaboration with other companies is equally valid.

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**Up-coming Training Course - Live Cell Imaging 2006**

Dr Ian Harper, Monash University, has organised a 5 day course, Live Cell Imaging, at the Monash Micro Imaging Department, on 3 – 8 December, 2006. Members and their colleagues are welcome to attend. The website is [http://microimaging.monash.org/training.html](http://microimaging.monash.org/training.html) and enquiries to microscopy@med.monash.edu.au. Registration fee is $1100 incl GST.

A limited number of student scholarships will be available to offset registration costs.

**COURSE CONTENT**

- Principles of optics
- Light microscopy and image formation
- Fluorescence & Confocal microscopy
- Fluorescent Proteins
- Fluorescence applications: FRET, FRAP, FLIM
- Multiphoton Microscopy
- 3D and Deconvolution microscopy
- TIRF
- Working with cells
- Optimising for Live cell imaging
- Working with multidimensional datasets

For details and registration forms, contact: microscopy@monash.edu.au

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**Research News**

The review articles which follow are the first in what we hope to be an active section of the newsletter. All the researchers (contact details provided) are interested to discuss applications of their technology with commercial partners.

**Single Nanocrystal Spectroscopy**

Professor Paul Mulvaney (mulvaney@unimelb.edu.au) and his research group at the School of Chemistry in the University of Melbourne are working on the development of photostable semiconductor nanocrystals as tags in biolabelling applications. These unusual materials have a number of names including quantum dots and even artificial atoms. They are 1-10nm in size.

Over the past 4-5 years his research group (www.nanoparticle.com) have improved the photostability of these small semiconductor particles by overcoating them with a second semiconductor layer, which passivates them and provides long-term stability. These materials have tunable luminescence emission across the visible and NIR regions of the spectrum (see photograph below).
The nanoparticle group is exploring the robustness of FRET based assays using QDs and also the blinking behaviour of single nanocrystals (see PCCP September 2006). Blinking refers to the fact that an individual nanocrystal displays fluctuating luminescence, the on-times and off-times of which exhibit a power law dependence on time. The origins of this phenomenon are currently unexplained, and may limit the applications of nanocrystals in areas such as single particle diffusion studies.

The nanoparticle group are currently working with the Ludwig Institute for Cancer Research and CSIRO Molecular Health Technologies on bioconjugation strategies. They are looking for partners with strong experience in bioconjugation chemistry, PEG chemistry and coupling chemistry (e.g. colloidal gold bioconjugation) to optimise and improve the design and structure of the bioconjugates. A key goal of the group will be to provide materials for beta-testing by the Australian biotechnology community during 2007.

Photograph of CdSe particles in chloroform under UV illumination. The smallest particles emit blue light and are ~1.5nm in diameter. The largest particles are around 5nm in diameter. Passivation leads to a final size of around 10nm.

Real-Time Identification of Micro-organisms by Quantum Dots and Flow Cytometry

Determining the microbial diversity in extreme environments is one of the outstanding tasks for microbiology. Techniques that complement the microbial culture approach are necessary for a better understanding of microbial diversity and its role in ecosystem maintenance. Semiconductor quantum dots have the potential to become a new class of fluorescent probe for biological applications. We have overcome many of the methodological problems that limit the exploration of microbial community structure and function in applying recent advances in quantum dot technology to microbial ecology. The technology we have developed will have wider applications, particularly in diagnostic microbiology and for biosecurity surveillance.

This technology has the potential for
- Rapid real-time method for bacterial identification, particularly in water
- Multiplexed detection of microbial pathogens and assessment of biomass diversity

Raquel Ibàñez, Dr Belinda Ferrari and Professor Peter Bergquist (peter.bergquist@vc.mq.edu.au) have devised ways of coupling quantum dots to oligonucleotide probes to identify bacteria in biomass, and demonstrated that quantum dots are at least 70-fold brighter than organic fluorophores.

Preliminary studies have shown that the FACS Aria instrument with its purple laser is ideally suited to the detection of signals from quantum dots hybridised to specific oligonucleotides and antibodies conjugated to DynaBeads. We have achieved a substantial increase in sensitivity compared to previous generation instruments.
New Functional Luminescent Materials Studied Molecule by Molecule.

Dr Toby Bell (tbell@unimelb.edu.au) and Professor Ken Ghiggino are using state-of-the-art single molecule detection techniques to study new functional luminescent materials that have potential applications as molecular probes in bio-imaging and solar light harvesting. Single molecule techniques can yield information about the distribution of a given parameter rather than just the ensemble averaged value and reveal rare phenomena that would otherwise be obscured in a bulk measurement.

The outcomes of the research are

- A new class of ultra-stable high quantum yield fluorescent dye molecules suitable for use as fluorescent labels of biological samples (collaboration with Prof. Steven Langford, Monash University, and
- A new photo-active polymer for use in light harvesting and artificial photosynthetic applications.

Novel dye compounds based on a naphthalene diimide (NDI) have been synthesized and shown to be highly fluorescent and photo-stable. On-going research will develop the NDI based dye molecules into commercial fluorescent probes.

A range of photo-active polymers has been synthesized with well controlled polymer chain length and architecture. Dr Bell would like to collaborate with partners to build working photo-voltaic devices based on the photo-active polymers.

Sideways Light Delivery from Optical Fibre for Surgical Treatment

Dr Judith Dawes (judith@ics.mq.edu.au), Dr Graham Marshall, Dr Mick Withford, from Macquarie University are developing a device to deliver a beam of light sideways from optical fibre to allow keyhole surgery to be performed using lasers. Some tissues need laser treatment from within a tube (e.g. blood vessel or urinary tract), but this is awkward using the end of the optical fibre to deliver the light. Based on specialist fibre gratings, our device can be optimised for any wavelength delivered by optical fibre.

The research will lead to the development of an optical fibre delivery system for sideways light delivery in a single beam which has the benefit of enabling laser treatment by inserting fibre in tissue and creating a line of laser-scarring or ablation. The system will cater for any laser wavelength, be able to handle significant laser power, over a range of temperatures. Clinical trials of this system for treating various tissues have been conducted.

Devices have been fabricated in single mode optical fibre and tested to 600 C, with no apparent problems shown. Light emission has been observed, with modest power output, demonstrating excellent opportunities for scaling emitted power and tailoring spectral characteristics of emitted light.

Funding and collaboration are sought to model, fabricate, optimise devices in multimode optical fibre for higher laser power delivery and further demonstrate the system clinical applicability.
Latest Equipment Update

Extending functionality in Spinning Disk Live Cell Imaging - PerkinElmer

Applications involving living cell imaging, show significant improvement when imaged with confocal optics. Confocal systems employing scanning mechanics based on micro-lens enhanced Nipkow disk pinhole arrays provide real time confocal fluorescence using standard CCD camera systems are being recognised as an imaging tool ideally suited for this application. The main advantages of this type of instrument is the demonstrable reduction in photo-bleaching rates compared with both classical widefield and classical confocal fluorescent approaches. This in turn allows extended observation times for live cell analysis especially for long term multidimensional imaging.

With the release of the new Ultraview ERS system, a number of essential live cell tools have been added. These most significantly include Live Cell FRET imaging, designed to monitor FRET (fluorescent resonance energy transfer) activity over long observation times without the need for destructive cellular photo termination. Recently introduced, is a unique high speed FRAP system to allow controllable photobleaching experiments both in a programmable and interactive mode without significant reduction in the high speed imaging rates capable with the spinning disk system. Coupled with high speed computer controlled XY stages, new high sensitivity EMCCD camera technology and the flexibility of control through many 3rd party microscope control software, the Ultraview brings a very versatile tool to those whose research is involving the need to image live cell dynamics.

For more information please contact Chris Johnson or Antoinette Violo at PerkinElmer on free call 1800-033391

Live Cell Cycle Analysis - Invitrogen

The cell cycle, the progression of a cell’s genes and internal structures through a round of division, results in cell growth and separation into two daughter cells. Flow cytometry testing is useful for quantifying the distribution of a population of cells into the different nuclear phases of the cell cycle. These applications require dyes that bind to DNA stoichiometrically.

**Vybrant® DyeCycle™ stains** for flow cytometry are ideal tools for DNA content analysis in living cells. These DNA-selective stains are cell membrane-permeable and, after binding DNA, emit a fluorescence signal proportional to DNA mass. Fluorescence data generates a frequency histogram that reveals various phases of the cell cycle. These live-cell dyes allow for simultaneous co-staining of cell populations for other parameters, as well as the possibility of DNA content-
based cell sorting. With the option of three unique DyeCycle™ stains, researchers now have the flexibility of live cell cycle analysis using the 405 nm or 488 nm lasers.

The versatility of the Vybrant® DyeCycle™ stains has been demonstrated in a number of novel experimental applications, including:

- cell sorting based on cell cycle phase
- identifying side populations (SP) of stem cells and early progenitors
- analysing late apoptotic changes in chromatin structure

**Cell sorting based on cell cycle position**

Vybrant® DyeCycle™ stains do not have the toxicity observed in DRAQ5, and have been used in some cell types to sort viable populations from G0/G1 and G2/M populations. Resolution of cell cycle information in viable cells allows evaluation against the dynamic background of live cell activity, as well as the ability to sort cells based on position in the cell cycle.

**Identification of late chromatin structure changes in live cells during apoptosis**

Apoptosis, the carefully regulated process of cell death, occurs as a normal part of development. This cascade of events leading to complete cell deconstruction consists of changes that occur through any of several well-characterized pathways, including cell surface signaling, changes in morphology, and caspase activation. These apoptotic pathways result in DNA condensation and fragmentation, and eventual loss of plasma membrane integrity. We have found that the new cell-permeant DNA stains Vybrant® DyeCycle™ violet and Vybrant® DyeCycle™ orange detect changes in DNA structure associated with late-stage apoptosis using 405 nm and 488 nm excitation, respectively.

For more information visit www.invitrogen.com/flowcytometry
Contact: mail.australasia@invitrogen.com  Australia: 1800 331 627  New Zealand: 0800 600 200

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**Diversifying your Funding Sources**

**Part 1  National Institutes of Health, (NIH) –USA**

When this newsletter reaches you, the Australian FABLS Members will likely have received the letter from the Australian Research Council informing them about the success (or lack of thereof) of their research proposals in this year’s round. Even ARC itself admits that some outstanding applicants with leading edge projects will miss out. The post-mortem will lead to even more refined sharpening and refocusing the proposal for next year and even more time spent on proposing than actually doing the research.

Decreasing your reliance on this single funding source is therefore important. Many of us do not try. I believe lack of awareness is a significant factor and in this series of articles I will try to explain some principles and practicalities of alternative funding programs.

I’d like to begin with NIH. This is an agency whose funding scope is close to the type of research of many FABLS Members.

NIH (www.nih.gov) is a mammoth organization funding broadly understood health oriented research. NIH works largely by solicitation of proposals. They continue to announce founding opportunities in specific areas which can be found under Funding Opportunities and Notices.
1. **Find the funding opportunity.** For those whose research focus does not come up in the NIH search engine and who need to think more laterally, I suggest inspecting the Table of Contents (TOC) in the middle of the Funding Opportunities and Notices page.

2. **Apply as an Australian organization or in a team with a US partner.** NIH accepts both types of submissions. You do not have to have a US partner to be successful. If applying with a US partner, you will most likely be a sub-contractor. This does not prevent you from being a Principal Investigator (PI) or co-PI. A sub-contract means that all grant funding will be received by your US partner institution and they will send a proportion of the funding to your institution.

3. **Register with the NIH** that you will be applying. This works like the GAMS ID. You need to register with the eRA Commons as you need a login name and password. Please note that your institution needs to be registered first. At Universities, this is done through their Research Offices. Once the institution is registered your Research Office will issue you your login name and password. NIH suggests that you leave several weeks for that.

4. **Decide on which funding mechanism to use** (see [http://grants1.nih.gov/grants/funding/funding_program.htm](http://grants1.nih.gov/grants/funding/funding_program.htm)). For most of us who have no prior track record of funding by NIH this could be the R21 mechanism, which is used for “exploratory” research with limited amount of preliminary work. In comparison with the successful ARC proposals, well developed NIH proposals are typically better grounded in relevant preliminary work than it is the norm in Australia and thus R21 may be often appropriate. The other alternative is to use R01. The remaining mechanisms may also be applicable but it is less likely.

5. **The format of the proposal** is very well described in the guidelines. The sections of the proposal are: Background and Significance, Preliminary Studies and Research Design and Methods. The guidelines say how many pages to write for each. Altogether NIH proposals are longer than ARC (15 pages for R21 and 25 for R01) and take proportionally more time. My recent R21 with a sub-contract took 4 weeks to write and 8 weeks to prepare, with admin checks and signoffs at both institutions.

6. **The style of the NIH proposals** is a bit different to what we are used in Australia. I had a chance to speak with NIH project assessors who were familiar with ARC proposals and their impression was that ARC proposals are not focused enough on details, compared with good NIH proposals. There are some expressions of this on the NIH website and in the guidelines which say that project must be “discrete, specified, circumscribed”. NIH expects that research is “hypothesis driven”. This has implications for the section “Research design and methods” where applicants need to specifically
   • describe what experiments they will carry out,
   • spell out the hypotheses being tested,
   • foreshadow the experimental difficulties,
   • suggest ways of overcoming them,
   • explain what kind of results they are likely to get,
   • explain how the results will be analysed and interpreted,
   • explain what these results will mean to your hypotheses, and
   • what will be the consequences of your conclusions to the project as a whole.

This is quite challenging to do if you have not yet done your research, but if carried out competently, it does show the depth of preparation and thinking about the subject, and also makes a very good impression. The guidelines say that the level of details should be the same as in a journal research publication on the subject. However, I should stress that
the ARC emphasis on strong conceptualisation, placing issues in context and capturing significance and novelty are still relevant and should be included in the proposal. This is our strength which may be missing in some proposals originating from the US applicants (who have been trained in spelling out the details) and it should give you a competitive advantage.

7. **Other parts of the form** include a range of usual justifications (budget etc) which do not differ in style a great deal, other than being a bit more detailed. The format for the track record is different and there is a description of facilities which is also more detailed than in Australia. For example, some NIH applicants include the descriptions of laboratories with floor plans, all in the spirit of overwhelming the referees with strength of relevant details.

The submission to NIH is electronic and done by the administering organization (very much like to the ARC). If you are doing it through your Australian organisation you should give your Research Office enough time, if this is their first. Staff may have problems handling the electronic complexities, which will require clarifications from the NIH etc. It is good to plan in advance.

Before I leave you to consider all this I would like to bring to your attention that NIH can fund various international activities. Please check the Fogarty International Center website [http://www.fic.nih.gov/](http://www.fic.nih.gov/) to see what is on offer.

If you do apply to NIH, FABLS would be delighted to receive your note that you have done so. We can offer some help with the submission as we have checklists and some expertise. I wish you all the best in these endeavours.

**Part 2  Australian Industry focussed Research and Development Corporations**

There are 15 Research and Development Corporations, which provide research funds. Together, the R&D corporations fund upwards of $100 million annually for new research projects. Obtaining research funds through the R&D Corporations is more likely if the project attracts industry support/endorsement. It is well worth talking to the corporation managers to help identify appropriate industry partners. The Corporations’ website home page address and selected research areas/priorities that could be of interest to FABLS members are noted.

1. **Australian Egg Corporation Limited** ([www.aecl.org/index.asp](http://www.aecl.org/index.asp)) selected research areas include detection and control of avian influenza, factors influencing albumen quality, need for reduced individual bird vaccination

2. **Australian Livestock Export Corporation Limited** ([www.livecorp.com.au](http://www.livecorp.com.au)) research priorities include production/quality specifications, product safety, QA, environmental management, animal health and mortality, and salmonella in sheep

3. **Australian Pork Limited** ([www.apl.au.com](http://www.apl.au.com)) selected programs include disease diagnosis and control, reducing antibiotic use, contributions to genetic improvement and improved eating quality innovations.


5. **Cotton Research and Development Corporation** ([www.crdc.com.au](http://www.crdc.com.au)), research areas include breeding, biotechnology, gene mapping, breeding for disease and pest management


8. *Forest and Wood Products research and Development Corporation* ([www.fwprdc.org.au](http://www.fwprdc.org.au)), research areas include non-destructive techniques for pre harvest resource assessment, timber and fibre, silviculture and tree breeding for the improvement of juvenile wood properties

9. *Grains Research and Development Corporation* ([www.grdc.com.au](http://www.grdc.com.au)), selected research priorities include developing genetic improvements and regional adaptation of new grain varieties, eg fast track breeding approaches, and improved resistance to biotic and abiotic stress, eg developing microbial inoculants to create disease-suppressive soils.


14. *Rural Industries Research and Development Corporation* ([www.rirdc.gov.au](http://www.rirdc.gov.au)), a huge range of research priorities are supported and include for example research improving existing products through chemical / microbiological modification of essential oils, investigating extraction and testing of active constituents from Australian flora, develop new crops and products for medicinal purposes


As only a narrow range of the R&D corporations are presented here, it could be worthwhile looking at the individual sites to see how your research could complement their activities.

### A Snapshot of the Research and Development Industry

According to the latest Bureau of Statistics data, expenditure on R&D in Australia is on the rise. R&D expenditure grew by 7% in the 2003-04 financial year to $7.2 billion. This level of expenditure places Australia as the 15th biggest R&D spender among OPEC countries. Australia spends the equivalent to 0.89% of its gross domestic product on R&D.

R&D and innovation policy has become a key facet of industry policy around the world, with innovation increasingly seen as the main factor in future productivity and economic growth

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The management consulting firm Booz Allen Hamilton recently conducted a global survey among 1,000 companies and found that their executives believe that greater innovation resulting from R&D is vital to sustain earnings growth. R&D spending around the world had grown by an average of 6.5% annually since 1999 to US$384 billion in calendar year 2004.

However, while Australia’s record of commercialisation is improving, it remains low by world standards. The major factors behind Australia’s commercialisation record are the lack of early-stage capital, and to some extent effective links between researchers and industry.

Ernst & Young have identified 671 public listed companies in the Asia Pacific region. As of December 2005, Australia hosts 420 core biotechnology companies and 615 medical devices companies, of which 92 and 80 companies respectively, are listed on the Australian Stock Exchange. The total capital raised in 2004-05 for newly listed companies was $134.4 million. Venture capitalists invested $450 million in 2003-04 in the healthcare and bioscience area.

Human health care accounts for the largest share of the biotech industry. Of the 92 biotechs, 44 are involved in human therapeutics, 15 in agricultural biotechnology and 13 in diagnostics.

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**Your Contributions to the Newsletter**

We hope to instigate lots of interest in the newsletter content, and would like the readers to also be the editorial providers. Some of the sorts of things we would like to include are

- interesting contacts, (we need to build our national database)
- equipment available for collaborative (and consultative) projects
- latest equipment updates from industry
- ‘good news stories’

Compiled by David Tayler
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3Ch. Srinivas Rao, Australia’s Biotech Burgeons, Biospectrum, Vol 1, issue 4, p46