



# PHYTOGEN

A  
NEWSLETTER  
FOR  
AUSTRALIAN  
PLANT SCIENTISTS

Volume 9 Number 3  
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# PHYTOGEN

Volume 9: Number 3

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### *ASPS Newsletter Editor*

[helen.irving@vcp.monash.edu.au](mailto:helen.irving@vcp.monash.edu.au) Helen Irving

Monash University



A big thanks to all the scientists who contributed to this issue of Phytogen.



## Editor's corner

Dear Fellow Society Members,

Thank you for all of your contributions, as we again have another excellent issue of Phytogen. The "state of affairs" collated by the Victorian representative Michael Tausz highlights some of the research and other important activities occurring in plant sciences in Victoria (see page 9).

An important event happens next year as ASPS turns 50. For a foretaste of some details of planned events to celebrate this momentous occasion see page 8.

Please keep the articles coming as it is your contributions that make Phytogen a success. A two year roster is in place for the "State of Affairs" and **Western Australia** will feature in the next issue. Reports from local, national and international meetings relevant to plant science are welcomed; so please send reports to Andy Netting ([anetting@unsw.edu.au](mailto:anetting@unsw.edu.au)) who is co-ordinating "From our Seed Banks". Since we have several items this issue, the report on ComBio07 and student prizes has been held over until next year.

I wish everybody a safe and happy festive season and a very productive and successful 2007.

*Helen Irving*



## URGENT CALL for Reports on Meetings

We are always on the look out for reports on the conferences that our members attend. This is an opportunity to write about research that excites you and share your interests with our members.

Please send meeting reports to: reports to Andy Netting ([anetting@unsw.edu.au](mailto:anetting@unsw.edu.au))



## President's Report 2007

This year has been another of mixed fortune for plant science. On the one hand, plant science as an industry remains very strong, as indicated by the report from Kate Grenot late last year (see Phytogen 8.3 December 2006), and plant science research continues to perform strongly. It is particularly pleasing to see another plant scientist awarded a Federation fellow and to also win the Prime Minister's Science Prize. The Society congratulates Peter Waterhouse and Ming-Bo Wang on this achievement. On the other hand, the Society's membership continues to decline with both regular and student membership down slightly from last year (see the treasurer's report). If you wish the Society to survive, it is important that you keep your membership up to date and encourage colleagues, students and postdocs to join. University enrolments in plant science are also in decline across the nation and replacing the current cohort of researchers will be a challenge over the coming years. Reversing this trend is a major marketing challenge for all of us involved in plant science education. I had hoped to contribute to this by organising a Eureka Prize in the plant arena, but the large cost of the prize meant we had to find multiple sponsors and this proved too difficult in the end. However, there will be a undergraduate student prize in these awards next year and I will keep you informed on how we can foster plant science entries.

Much of the time of the Executive this year has focused on mounting an attractive program in plant biology at ComBio2007 and I think the array of plant science presentations on offer this year is excellent. I would like to thank my colleagues in the Sydney area for assisting with the program. Next year's meeting is in Canberra and it will again feature plant science strongly and also a major plant-based satellite meeting. Other activities this year included attendance by myself, Robyn Overall and Charlie Warren at Science Meets Parliament in Canberra, where we represented the society and promoted plant biology and its role in global climate change. This is a really worthwhile event and I urge you to consider attending next year. A significant amount of time of the council and executive of the ASPS during the year goes into soliciting nominations for and assessment of candidates for the various awards on offer by the Society. This year, in addition to the Robertson Fellowships, we have also chosen very worthy recipients of the JG Wood memorial lecture, Dr Rana Munns from CSIRO Plant Industry in Canberra, and the Goldacre award, Ullie Matthias, from ANU. I would like to thank all those who were involved in assessing the awards, including some of our Corresponding Members.

As detailed in the treasurer's report, this year has also seen the securing of the RN Robertson travel award by movement funds from the Society's reserves and a donation from the International Society of Plant Molecular Biology that has allowed us to offer more student travel fellowships. Largely because of the efforts of Peter Ryan, the Society now has more sustaining members also and overall the Society remains

financially strong. But we need to increase our membership base in order to maintain this.

Finally, I would like to thank the executive for their support and enthusiasm throughout the year and to the council members for their support of various initiatives. I wish to particularly thank Peter Ryan for keeping the Society in such an excellent financial position so that new initiatives can be undertaken in the future and the secretary, Robyn Overall for organising the executive. I thank the outgoing council members for their work for the Society and members of the supporting subcommittees Marilyn Ball (Public Officer), Graham Farquhar (FASTS representative), Brian Atwell (Plants in Action), Jennifer Henry (FBP); and last but not least the Phytogen Editors Helen Irving and Andy Netting.

*David Day*  
President ASPS

## ASPS Office Bearers - 2008

|                              |                  |                                 |
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| Genetics & Molecular Biology | Patrick Finnegan | University of Western Australia |
| Plant Development            | Dennis Green     | Charles Sturt University        |
| Plant Microbe Interactions   | Peer Schenk      | University of Queensland        |
| Plant Science Education      | Chris Ford       | University of Adelaide          |
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| FBP representative           | Jennifer Henry   | CSIRO Publishing                |
| Plants in Action             | Brian Atwell     | Macquarie University            |



# DISCIPLINE AND STATE PERSPECTIVES

## Plant Microbe Interactions

### International Conference on Biotic Plant Interactions

The International Conference on **Biotic Plant Interactions** ([www.uq.edu.au/plants/icbpi](http://www.uq.edu.au/plants/icbpi)) will be held on **27.-29. March 2008 in Brisbane**. Several hundred delegates from all over the world are expected. Plenary speakers include Shauna Somerville, Ian Baldwin, Jane Parker, Brian Staskawicz, Cyril Zipfel, Matteo Lorrito, Masaru Ohme-Takagi, Corne Pieterse, Brett Taylor and Brigitte Mauch-Mani.

Traditionally **plant-microbe** and **plant-insect interactions** have been looked at as two separate issues. The International Conference on Biotic Plant Interactions will bring together scientists, industry delegates and students who are interested in molecular plant pathology and beneficial interactions of plants with other organisms, including viruses, bacteria, fungi, oomycetes, parasitic plants, nematodes, insects and other herbivores. A special emphasis will be given on overlaps between plant-insect and plant-microbe interactions. There is also the possibility to organise special workshops.

Abstract submission and registration are open until **31. January 2008**. Registration and secure online credit card payments can be easily carried out online via our website [www.uq.edu.au/plants/icbpi](http://www.uq.edu.au/plants/icbpi) or by contacting Ms Julie-Ann Harlow ([j.harlow@uq.edu.au](mailto:j.harlow@uq.edu.au)). Please contact ASPS representative for plant-microbe interactions, Peer Schenk ([p.schenk@uq.edu.au](mailto:p.schenk@uq.edu.au)) if you have any questions or need assistance with registration or abstract submission.



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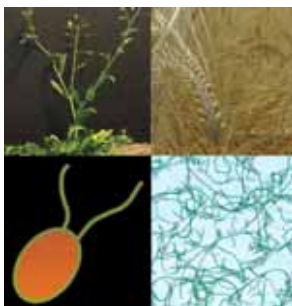
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# 50<sup>th</sup> Celebrations for ASPS in 2008

For the 50<sup>th</sup>, we discussed a few things at the AGM that are briefly outlined below.

- ✚ We hope to have a special event at the Discovery Centre at Plant Industry during or just before ComBio which will be held in Canberra September 21-25.
- ✚ We also will hold, possibly in Canberra, a summit on plant science education and the Academy of Science will support that.
- ✚ In addition we are also planning a new web roll out in the new year and will be having a major membership drive at that time.
- ✚ Meanwhile we call on all members to assemble some short articles about ASPS events over the last 50 years. Please forward articles to Helen Irving ([helen.irving@vcp.monash.edu.au](mailto:helen.irving@vcp.monash.edu.au)) who is collating them. We hope to collect a series of 50 stories to add to a historical perspective on our new web pages.







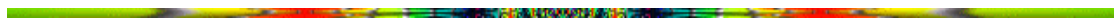
Focusing on one state's research per edition

This edition:

*Victoria*

*Collated by Michael Tausz  
(the Council representative resident in Victoria)*

The following feature highlights some of the current plant science related research activities in Victoria. It was compiled from contributions by those ASPS members, who responded to the call, and therefore only covers selected activities and workgroups.



### **The Ecophysiology and Ecosystem Processes (EEP) research group at the University of Melbourne's School of Forest and Ecosystem Science.**

*Contributed by M Tausz ([Michael.tausz@unimelb.edu.au](mailto:Michael.tausz@unimelb.edu.au))*

The Ecophysiology and Ecosystem Processes research group combines expertise in functional tree biology with broader ecosystem based approaches to develop a process based understanding of changes in native ecosystems related to land management practices and climate change as a basis for scientifically sound mitigation efforts. For the full suite of activities please visit our website at <http://www.forestscience.unimelb.edu.au/research/ecophysiology>. Highlights include the following projects:

#### ***Molecular 'fingerprints' of soil microbial diversity***

Traditional culture-based methods show only the tip of the iceberg in regard to the diversity and complexity of soil microbial communities. EEP researchers **Lauren Bennett** and **Sabine Kasel** in cooperation with **Josquin Tibbits** from the Tree Developmental Biology group in Creswick recently adapted a molecular approach – T-RFLP (terminal restriction fragment length polymorphism) – for native woodlands. This technique enables comparisons of soil fungal communities based on full DNA profiles. Multivariate analyses of DNA fingerprints from a range of land uses indicated an over-riding influence of dominant vegetation type on soil fungal composition. That is, despite geographic separation of about 150 km, native eucalypt forests were more similar to each other than to pine plantations. In contrast, soil fungal profiles from adjoining, but different land uses (e.g. eucalypt and pine plantation) were clearly separate, even when they had similar land-use histories (i.e. both were converted from pasture in the previous decade). Finer-scaled sampling within and around remnant buloke woodlands, indicated that soil fungal composition beneath buloke trees was similar to that in adjoining, cultivated paddocks but that most fungi were more abundant beneath the trees. These results indicate considerable plasticity in soil fungal composition, although responsiveness most probably relies on near proximity of potential propagules (e.g. in remnant vegetation).



*Remnant buloke woodland in northern Victoria (Photo L Bennett).*

Further development of the method will involve soil functional groups (e.g. methane consumers, nitrifiers) and improved measurement of microbial relative abundance.

This work was started with support from the University of Melbourne's Collaborative Research Grants Scheme with the North Central Catchment Management Authority as an Industry

Partner. It continues with funding from the Victorian State Department of Sustainability and Environment (DSE) within the "Advanced indicators of forest ecosystem health" project.

Contacts: Lauren Bennett; [ltb@unimelb.edu.au](mailto:ltb@unimelb.edu.au) or Sabine Kasel; [skasel@unimelb.edu.au](mailto:skasel@unimelb.edu.au)

### **Salt resistance of trees**

Approximately 7% of the world's land area contains soil too salty for growing agricultural crops. Australia is one of the worst affected countries. EEP researchers are tackling the problem by trying to understand how desert trees can grow in these conditions.

In cooperation with Fanjiang Zeng from the Chinese Academy of Sciences EEP researcher **Stefan Arndt** is investigating how *Populus euphratica* (Euphrates Poplar) tolerates extreme salty conditions. Poplars are the first tree species to have their entire genome mapped. This is an advantage in salt resistance research which makes poplars ideal "pets" for researchers.



*Euphrates poplar forest in the Taklamakan Desert in China (Photo S Arndt).*

So far, most studies in this area have been short-term glasshouse experiments with juvenile plants that do not reveal the full capacity of a tree species to deal with high salt concentrations over long periods of time. It is not known why the Euphrates Poplar, which lives for decades exposed to environmental stresses, is so salt tolerant. This project aims at filling this significant knowledge gap by investigating its adaptations to salinity in its natural environment in Taklamakan Desert in China.

The research campaign will start in June in China and first results are expected later this year.

Contact: Stefan Arndt; [sarndt@unimelb.edu.au](mailto:sarndt@unimelb.edu.au)

### **Drought stress markers in tree leaves**

A recent study conducted by EEP group coordinator **Michael Tausz** in cooperation with Helena Šircelj and Franc Batič at the University of Ljubljana, Slovenia (European Union), suggests that components of the cellular antioxidative defence system are among the most sensitive and reliable markers of drought stress in trees.

When apple trees were exposed to progressing drought stress, one of the first measurable responses was an increase in the oxidised form of glutathione, a central metabolite in the plant's redox control systems. In addition, zeaxanthin, a stress protective carotenoid, was also consistently elevated in drought stressed trees. Contrary to many other potential or widely used drought stress markers, these responses were consistent among trees in pots and field trials, and from moderate to severe stress. In contrast to commonly used physiological measures such as stomatal aperture or assimilation rate, the biochemical markers were insensitive to (irrelevant, but frequent) short term variations in air humidity. In particular with expected climate change, sensitive and reliable direct detection of stress in plants will become an essential tool to verify predictions of impacts on vegetation where it matters. These results will be published in an international horticultural journal soon and will significantly contribute to the DSE supported program "Advanced indicators of forest ecosystem health" as they become applicable to native forest trees.

Further reading:

Tausz M, Šircelj H, Grill D (2004) The glutathione system as a stress marker in plant ecophysiology – is a stress-response concept valid? *J Exp Bot* 55, 1955-1962

Tausz M (2001) The role of glutathione in plant reaction and adaptation to natural stresses. In: D Grill, M Tausz, LJ DeKok (eds) Significance of glutathione in plant adaptation to the environment. Kluwer Publishers, Amsterdam, pp. 101-122.

Contact: Michael Tausz; [michael.tausz@unimelb.edu.au](mailto:michael.tausz@unimelb.edu.au)

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## **Plant related research at Monash University's Department of Pharmaceutical Biology**

Contributed by Helen Irving ([helen.iring@vcp.monash.edu.au](mailto:helen.iring@vcp.monash.edu.au))

### **Plant signalling systems**

How are messages (e.g. hormones, stresses, etc) relayed from external sources to stimulate physiological responses in plant cells? This question forms the underlying focus of our research. We currently have two major projects underway that are supported by ARC Discovery grants.

- 1. Plant Natriuretic Peptides.** Plant Natriuretic Peptides (PNPs) are highly unusual excreted and systemic small proteins that affect several processes that are directly involved in the regulation of plant water and salt balance [1]. PNPs also appear to have a role in modulating plant responses to pathogens and we are investigating this relationship with **Assoc. Prof. David Cahill** at Deakin University. We identified this class of proteins using a reverse genomic approach and now are investigating its effects with our partner investigator **Prof Chris Gehring** (University of Western Cape, South Africa). PNP is important in modulating water volume of cells and opening stomata pores where it appears to subtly interact with abscisic acid [5]. Since growth and survival of all living organisms, including plants, is critically dependent on water balance PNPs are likely to play a major, albeit unknown at the molecular level, role in plant responses to salinity and drought stresses. **Yu Hua Wang, Lara Donaldson** and **Janet Wheeler** are all making critical contributions to this project.

**2. Guanylate cyclases.** Cyclic GMP is upregulated in an ever increasing number of physiological processes including regulation of the transcriptome and mediating plant development and responses to the environmental stresses such as salinity, drought and pathogens thus making cGMP a critical mediator of plant growth and responses to abiotic and biotic stresses. We used a rationally designed search motif of the catalytic domain of annotated GCs to identify and partially characterise the first molecules from higher plants with GC activity [2-4]. We identified several members of the family of leucine rich repeat receptor-like kinases (LRR-RLK) in *Arabidopsis* with novel domain organisation containing putative GC catalytic regions [2,4]. This finding opens up the exciting possibility of receptor type molecules having multiple functions (e.g. recognition, kinase and GC function). Now we are pursuing the biological importance of the GC functional domain in plant growth and development.

- [1] Gehring C.A., Irving H.R. (2003) Natriuretic peptides - a class of heterologous molecules in plants. *International Journal of Biochemistry & Cell Biology*, **35**, 1318-1322.
- [2] Kwezi L., Meier S., Mungur L., Ruzvidzo O., Irving H., Gehring C. (2007) The *Arabidopsis thaliana* brassinosteroid receptor (AtBRI1) contains a domain that functions as a guanylyl cyclase *in vitro*. *PLoS one*, **2**, e449, doi:410.1371/journal.pone.0000449.
- [3] Ludidi N.N., Gehring C. (2003) Identification of a novel protein with guanylyl cyclase activity in *Arabidopsis thaliana*. *J. Biol. Chem.*, **278**, 6490 - 6494.
- [4] Meier S., Seoighe C., Kwezi L., Irving H., Gehring C. (2007) Plant nucleotide cyclases - an increasingly complex and growing family. *Plant Signalling & Behavior*, **2**, 536-539.
- [5] Wang Y.H., Gehring C., Cahill D.M., Irving H.R. (2007) Plant natriuretic peptide active site determination and effects on cGMP and cell volume regulation. *Functional Plant Biology*, **34**, 645-653.

## Plant related research in Biological Sciences at Monash University's School of Biological Sciences

Contributed by Ros Gleadow ([ros.gleadow@science.monash.edu.au](mailto:ros.gleadow@science.monash.edu.au))

The school is cross-disciplinary, allowing projects to flow freely between plants, animals and genetics of aquatic and terrestrial system. There is plant ecology (**Jenny Read, Gerry Raynor, Partick Baker**), algal ecophysiology (**John Beardall**), molecular genetics (e.g. **David Smyth, John Bowman**); Plant vaccines (**Amanda Walmsley**) and a number of projects on plant-animal/ant interactions (e.g. **Martin Burd** and **Dennis O'Dowd**). Plant defence is the focus of several research groups at Monash. **Jenny Read**'s group concentrates on structural defence. **John Hamill** studies the genetic regulation of alkaloids, **Alan Neale** has projects on the molecular genetics of glucosinolates and **Ros Gleadow** studies cyanogenesis in tropical crops. Below are a few potted summaries of what is happening in some of the various groups.

### **Cyanogenesis**

The main focus of the cyanogenesis group is a project on the effect of drought on the production of toxic hydrogen cyanide by forage sorghum, as part of an ARC-Linkage project with Pacific Seeds in Toowoomba (together with Birger Møller from University of Copenhagen).

*A field of forage sorghum in Queensland: Photo. R. Gleadow*



At Monash, **Alan Neale**, **John Hamill** and **Cecelia Blomstedt** are also involved with the project. The project spans everything from field sampling and classical physiological experiments (Ros' end) through to RT-PCR and genetic modification. The twin aims are to try to get to bottom of the whole issue of regulation of secondary metabolites, and also to develop low HCN lines for agriculture. Another project of Ros' is the study of cyanogenesis in cassava under conditions of elevated CO<sub>2</sub> with **Tim Cavagnaro**, Howard Bradbury (BOZO) and John Evans (RSBS).

**The Plant Ecology Group** is led by **Jenny Read** and focuses on the integration of comparative plant biology with population demography to explain controls of composition and diversity along environmental gradients. Jenny collaborates with **Gordon Sanson** and others on leaf mechanics and its adaptive significance, and this year they hope to extend their studies to sclerophyllous communities in Chile. **Shaun Cunningham** is investigating health of red gum communities as part of an ARC Linkage grant with **Ralph MacNally** and **Patrick Baker** and industry partners. PhD student **Sean Gleason** is investigating plant-soil and plant-plant interactions in diverse rainforest communities in northeast Queensland focusing on mechanisms that drive diversity-productivity relationships, co-supervised by Dan Metcalfe (CSIRO). PhD student **David Drew** is investigating



the processes of differentiation of the various cell types, particularly vessels, in the xylem of *Eucalyptus*, co-supervised by Geoff Downes (CSIRO/ENSIS). Jenny's group also have projects studying rainforest ecology in New Caledonia (lucky Jenny).

*Dubouzetia campanulata* (Elaeocarpaceae) - a sclerophyllous shrub in New Caledonian maquis on ultramafic soils.(photo: Jenny Read)

### **Flower development**

**David Smyth** and his group are deducing how the ground plan of flowers is set up using *Arabidopsis* as a model. They are characterizing transcription factors that help define perianth architecture, and others that are involved in the morphogenesis of carpels and fruits.

*GUS* staining pattern reporting *PETAL LOSS* gene expression in young buds of *Arabidopsis*. (photo D. Smyth)



### **Below ground**

**Tim Cavagnaro** is a relative new comer to Monash, taking up a lectureship in Plant Functional Biology a year or so ago. Research in Tim's lab is largely focused on the below-ground half of plants and soil ecology. Projects currently underway include:

- Identification of above- and below-ground linkages in a range of ecosystems using soil molecular ecology techniques. Plant mutants are being used as model systems to study the effects of plant-microbe interactions on plant growth, physiology and ecology;
- The effects of global climate change on plant physiology, with an emphasis on roots.

### **Desiccation tolerance**

**Don Gaff** started researching resurrection plants 30 years ago. The research continues with the characterising of the molecular genetic response to severe drought stress in resurrection grasses by **Alan Neale, John Hamill** and **Cecelia Blomstedt** (and **Don** too). Resurrection plants can survive complete desiccation and also are tolerant of high levels of salt stress. Drought stress, often accompanied by high salinity, is a critical factor for sustaining agricultural production in many regions of the world. Knowledge relating to the various mechanisms that enable plants to cope with such stresses is crucial.

Determining which genes have an adaptive role in establishing tolerance to cellular dehydration is of critical importance. In angiosperms such as the monocotyledonous resurrection plant *Sporobolus stapfianus*, desiccation tolerance is believed to have evolved from the ectopic expression in vegetative tissues of genetic processes associated with the seed developmental program, as species spread into arid areas. This suggests that desiccation tolerance in these resurrection plants may be conferred by a unique pattern of regulatory gene expression rather than the presence of unique structural genes. Knowledge of regulatory genes likely to control desiccation-tolerant gene expression patterns in resurrection plants in general is very limited. Nevertheless, use of these extremophiles is required to identify genes specific to the desiccation tolerant state. Ultimately an understanding of the function of these genes and how their expression is regulated will throw light on the mysteries of desiccation tolerance. Transgenic experiments conducted in *Arabidopsis*, rice and other plant systems are being used to investigate the effects of over expressing specific *S. stapfianus* gene sequences to assess the extent to which stress tolerance is increased.



*Desiccated and re-hydrated Sporobolus stapfianus.*

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## **FBP in the heart of sunny Collingwood**

Contributed by Jennifer Henry ([jennifer.henry@csiro.au](mailto:jennifer.henry@csiro.au))

**Functional Plant Biology** (FPB) has close links with the ASPS, and grew out of *Australian Journal of Plant Physiology* (1975–2001: Managing Editor Laurie Martinelli) through a relaunch in 2002. Many seminal Australian plant physiology papers were published in *AJPP* by the likes of Farquhar, Osmond, Passioura and Pate. The name change reflects the changing nature of experimental plant science research, as well as the journal's international authorship, readership and reviewers. The Impact Factor has grown from the late 1990s (around 1.3) to its current level of 2.272.

*FPB* offers online submission and peer-review, and promises rigorous but sympathetic reviewing, prompt decision-making and rapid publication. The current average turnaround time from submission to acceptance decision is less than 5 weeks. *FPB* also sponsors several important ASPS awards: the Best Paper award and the Goldacre award.

*FPB* is managed out of the CSIRO Publishing offices in Collingwood, Melbourne. In the photo you can see our Editorial Assistant, **Chris Zalewski** (left), Managing Editor, **Jennifer Henry** (centre) and Production Editor, **Sussan Au** (right).



*FPB editorial staff outside their office in Collingwood. From left to right Chris Zalewski, Jennifer Henry, and Sussan Au. (Photo J Henry)*

The **Editorial Assistant**, Chris, checks all new submissions on our online system (OSPREY) and trouble-shoots any submission or login problems with authors and reviewers. Chris then alerts the Managing Editor, Jennifer, that a new manuscript has been submitted and requires assessment.

The **Managing Editor**, Jennifer, looks at each new manuscript, contacts an appropriate Editorial Board member to recommend whether the manuscript should go out for review, and, if so, to suggest suitable reviewers. Jennifer feeds these suggestions back to Chris, who invites reviewers, reminds them if they take longer than 10-14 days, and lets Jennifer know when two reviews are in. Jennifer then writes back to the authors with a decision: minor or major revision, or reject.

The **Production Editor**, Sussan, handles all accepted manuscripts, and co-ordinates the copyediting (outsourced to local freelancers) and typesetting (outsourced to a company in India) stages. Sussan also prepares the electronic web files for the manuscript and runs various programs that format the paper and cross-check references. She also paginates papers in an issue, co-ordinates reprint orders and prepares the covers and table of contents. She works with web staff to upload each issue and send the final files to the printer for hardcopy printing, and then sends the complimentary PDF reprint to the authors upon publication.

In addition to these staff, we also have several teams who work across our entire suite of journals. The Customer Services team handle personal and library subscriptions and single-issue back-orders. The Marketing team co-ordinate journal promotion through mail-outs and at conferences. The Finance team receive payment for colour figure printing and subscriptions, and the Publisher and General Manager manage the overall business strategy.

Feel free to drop by if you are ever in Collingwood, and we will happily show you around the office.



# *Functional Plant Biology*

## Summer - 2007 - 2008 Update

### **A new journal model**

For those of you who weren't at the AGM, CSIRO Publishing has made a business decision to change the way in which all of its journals are managed, and switch to an external Editor-in-Chief model. As a result, all Managing Editor positions are to be phased out over the next few years, and replaced by academic Editors-in-Chief with support from in-house Publishers and Editorial Assistants. FPB's Editorial Advisory Committee met in our Melbourne office on 9 November to debate various editorial models, and is currently working with management, to come to a mutually suitable position. I thank the members of the ASPS for some very interesting discussions at and since ComBio about various editorial and publishing models, and for your ongoing support of the journal. The message for the meantime is **'Business as Usual'**.

### **Author interview video**

In our December issue, we will feature our first author interview video, linked to the paper on the FPB website. Two authors of the paper **'Preliminary development of a genetic strategy to prevent transgene escape by blocking effective pollen flow from transgenic plants'**, DP Singh and Steve Swain, will talk about their exciting work. Hopefully this is the first of a series of interviews with featured FPB authors.

### **The latest Special Issues**

We are currently working on two Special Issues. The first is a collection of peer-reviewed papers based on work presented at the EcoFizz 2007 conference at Hawkesbury, following ComBio. The theme of this conference was global climate change, drought and their impacts on forests, so it will be a most timely issue of the journal. The second is a collection of peer-reviewed papers based on work presented at the Functional Structural Plant Modelling workshop held in Napier, New Zealand in November 2007. Stay tuned to read these excellent and focussed collections.

### **2007 FPB Best Paper**

A grand total of seven papers were nominated by reviewers as Best Paper in this year's issues of FPB. The papers and reviewers' reports will soon be assessed by the Executive of the ASPS, and a winner selected. As a reminder, the winner has their paper made available as a free download from the FPB website, and they receive a \$250 book voucher from CSIRO Publishing plus a framed reprint of their work. Past winners Bec Miller, Nick Gould and Megan Lindsay have enjoyed this honour. To be in their shoes, submit your next stunning paper to FPB.

Thank-you once again for your ongoing support, which is very much appreciated.

Regards,



Jennifer Henry, *Managing Editor, FPB*





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# From Our Seed Banks

*Meeting reports provided by members from around the country*

*We welcome meeting reports from all local and international meetings. Please contact Andy Netting (co-ordinating editor) at [anetting@unsw.edu.au](mailto:anetting@unsw.edu.au) for further details.*

*We also welcome book reviews.*

## ✚ Ninth Conference of the International Society for Plant Anaerobiosis – Matsushima, Japan

The conference dealt with response of plants to flooding, continuing a tradition of these small meetings (110 delegates) held each three years. Presentations ranged from the broadest social and economic aspects to whole plant responses, cell biology, intracellular signaling and molecular bioinformatics. Unsurprisingly, rice was a major species of interest but other plants discussed included wheat, halophytic succulents, seagrasses and *Arabidopsis*! Tropisms and space research also gave rise to some interesting papers that reminded us of the importance of signal molecules in plant–environment interactions. A portion of the meeting was dedicated to an OECD specialist conference titled: “*Improvement of Plant Performances for Sustainable of Agricultural Development in Wetlands*”.



The impeccably hosted conference (led by Professor Kimiharu Ishizawa) brought leading groups in Japan, Australia, Europe, Asia and North America together in the fishing village of Matsushima, reputedly one of Japan’s three most important natural treasures. About 50 talks and 40 posters were presented. The landscape-scale talks highlighted the importance of land-use practices as exacerbating factors in flooding. Particularly in West Africa, catastrophic floods devastate the local rice crop (*Oryza glaberrima*) and highlight the need for plant tolerance to total submergence. In SE Asia, cultivation of inappropriate soils such as acid peats has brought locally tolerant plants to the attention of agronomists. The complex interactions between flooding and micronutrient status of soils was highlighted in Australia and India. The history of land drainage in the Netherlands and lessons for modern Indonesia were outlined with startling figures on the carbon release through oxidation of peats.

Alternative mechanisms for flooding damage are still arising with energy deficits only providing part of the story. For example, ethylene and gibberellins are key hormones and diminished responsiveness to these growth regulators appears to confer tolerance to total plant submergence through conservation of resources. Dramatic evidence was presented on the role of the gene *Sub1A* in indica rice in field trials in the paddies where this gene allowed crops completely submerged for 10-14 days to survive and out-yield those without the gene by 1-2 tonnes per hectare. This gene has now been put into landraces from the Bengal region and japonica rice, where it does not occur

naturally. The potential for classical genetic improvement of submergence tolerance in rice, and possibly waterlogging tolerance other crops using different alleles (e.g. cereals, soybeans), without genetic engineering, is intriguing in a period of debate over transgenic food crops. Other genetic material of great interest included the wild relatives of barley, soybean and maize, giving hope that improved flood tolerance might arise through exploitation of more diverse germplasm, including chromosome addition and recombinant lines.

The many fundamental processes that explain flood tolerance across all plants taxa continues to grow, with evidence for oxygen free radical damage during and after flooding and elevated carbon dioxide levels around roots both raised. Emergent macrophytes from New Zealand were shown to vary widely in flood tolerance, as related to root aeration traits. Certain Amazonian trees, at the extreme, could tolerate total submergence in 10 metres of water in the dark for months on end! And the air films that form on leaves of submergence tolerant plants seem to be important, highlighting the critical role of both internal (aerenchyma) and external (air films) for gaseous diffusion to maintain photosynthesis and respiration in submerged plants. Even the ancient relative of the horsetails seen in the Carboniferous, the genus *Equisetum* has a spectacular internal aeration system driven by humidity gradients.

Hormones and signal molecules were the subject of many talks, largely focusing on ethylene (*Sub1A* being an Ethylene Response Factor), gibberellins (as with dwarfing of dryland cereals, GA responsiveness is critical for flood tolerance) and auxin. A fascinating talk on hydrotropism identified a mutant which failed to grow towards water. *Miz1* is expressed in columnar cells and appears to help separate gravitropic response from hydrotropism. The Japanese experiments in zero gravity (in clinostats or on the Space Shuttle) gave further support to the role of disequilibrium in basipetally transported auxin.

Salt was discussed as an important interacting factor with flooding, not least in irrigated and dryland agriculture in Australia where the two rarely fail to co-occur at some stage in crop development. The energy crisis and importance of membrane-bound ion-specific pumps continues to be a focus of the work.

Finally, the importance of nitrous oxide as a signal molecule, and its interaction with haemoglobin expressed under hypoxia, generated much interest in alternative mechanisms for surviving short-term oxygen deficits. A number of papers focused on these alternative cell responses through transcriptomics in both rice and *Arabidopsis*. In addition, the genes that give rise to aerenchyma were singled out for particular attention as efforts to describe gene expression in lysigenous cortical cells are underway.

The conference unified landscape and time-scales that were vast with events on phenological timescales and, shortest of all, subcellular events where nanomoles signal events in intervals of milliseconds. The Society meets next in 2010 outside the grand and (semi)upright mediaeval town of Pisa.



## Travel supported by the ISPMB2006 Awards

My recent overseas trip involved a conference and four laboratory visits, which were included for the purpose of either learning a previously unknown technique or to establish professional relationships to aid the development of my scientific career. Overall, all events on the itinerary were a success, and for this reason I am very grateful to the Australian Society of Plant Scientists on behalf of the International Society of Plant Molecular Biology for providing funding for this trip.

Firstly the 8<sup>th</sup> EMBO Meiosis Meeting was a truly remarkable conference to attend for many reasons. Being able to put faces to well-known names and discuss with them my project and the science of meiosis was both stimulating and enlightening. There were many talks of high quality that covered all aspects of meiosis, and while there were the obvious benefits of being presented with the most up to date work within the field, I think I benefited mostly from the discussion times which I used to fill gaps in my knowledge and build on ideas for my project. Following on from this it was encouraging to discover that questions I had within meiosis were also shared by some of the well-esteemed researchers of meiosis. The poster sessions were also of high quality, and it was pleasing that key people within the meiosis community, such as Prof. Chris Franklin and Dr Gareth Jones, were interested enough in my project to talk to me for an hour during the poster session. Perhaps the greatest benefit of attending this conference was that I was able to build friendships, or at least acquaintances, with key people within the meiosis community as well as up and coming key people, who I think I will be able work with throughout my scientific career. On this point, I think my supervisor will agree that I extracted as much as I possibly could out of this conference by being confident enough to approach everyone who I wanted to speak to.

Following the conference, I then visited four laboratories with another PhD student, Wayne Crismani. Our first visit was to Prof. Takashi Endo's laboratory at Kyoto University, where we collected seed of some wheat deletion lines that will be used by our group to position genes within the wheat genome. Due to Prof. Endo needing to attend a conference in China, we were able to meet with him for only a short time, but we did get the seed that we needed and continued a previously established link which will be helpful for our group in the future.

Secondly, we visited Dr Wojtek Pawlowski at Cornell University in Ithaca, U.S.A. The purpose of this visit was to learn techniques in fluorescent microscopy. Fluorescent microscopy is a difficult technique to master, mainly because methods presented in papers are never quite complete, and I am pleased to say that our time at Cornell was a great success, because by the end of the week we had obtained fantastic images of early meiotic cells using fluorescence microscopy. In addition, Wojtek and his group provided us with valuable personal insights into fluorescent microscopy of meiotic cells, which could only have been obtained through a visit such as this. All of the knowledge regarding these aspects will be passed onto members of our group here at the Waite, meaning that this resource should continue beyond my time in the lab.

Following our stay in Ithaca, we visited two laboratories in England. Our first visit was to the laboratories of Prof. Chris Franklin, Dr Gareth Jones and Dr Susan Armstrong at the University of Birmingham. Their groups are all closely connected, and focus on understanding aspects of meiosis using the model plant, *Arabidopsis*. We spent a day with them learning about their projects and having general discussions about both their work and ours, and during this visit they generously offered us samples of their antibodies that can be used to look at various aspects of chromosome behaviour during meiosis. These antibodies will be invaluable to our group, especially with the newly acquired skills of fluorescence microscopy, and will help rapidly advance areas of my project. Encouragingly, both Chris and Gareth openly said that they would be happy to have me work them upon completion of my PhD.

Our second visit in England was to Prof. Graham Moore's laboratory at the John Innes Centre (JIC) in Norwich. He talked us through the most recent information, including unpublished data of *Ph1*, a major locus involved in chromosome pairing during meiosis in bread wheat. While doing so, he answered many questions we had about the events of meiosis in wheat which could be answered by experience alone, and this is where the greatest benefit of this visit came from. While visiting the JIC I presented a talk on my work, which was well received.

Overall, I am very thankful to ASPS and ISPMB, as well as the Farrer Memorial Trust and Molecular Plant Breeding CRC who provided funding for this trip. Through your contribution, I was fortunate to have many experiences that have been valuable to my development as a scientist, which I would not have normally experienced during my PhD. Through these experiences, I feel as though my scientific progression accelerated greatly, and for this I am very grateful.

*Scott Boden*

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Thanks to the ISPMB2006 Award Scheme, I was fortunate to attend the 9<sup>th</sup> Conference of the International Society for Plant Anaerobiosis (ISPA). The conference was held at Matsushima (near Sendai in Japan) from the 18<sup>th</sup>-23<sup>rd</sup> November 2007. The theme of the conference was Molecular, Physiological and Ecological Adaptations to Flooded Conditions by Crops and Native Plants. This was highly relevant to my PhD research, which has focused on the interaction between salinity and waterlogging in *Lotus tenuis*.

The setting for this conference was inspiring in itself. Matsushima is on the northern coast of Japan and overlooks a beautiful bay dotted with hundreds of islands. This setting helped create a relaxed atmosphere that enhanced interaction with the many international scientists at the conference.

The talks presented at the conference were all of an excellent standard and given by the leading scientists in this field. Several of the talks were sponsored by OECD or the journal *Annals of Botany*. All talks presented the latest knowledge on many molecular and physiological adaptations to waterlogging stress that were highly relevant to me. The interactive nature of the conference also gave me the opportunity to discuss the research presented with the speakers.

I was fortunate to be invited by the conference organizers to present my PhD research at the conference. My talk was 25 minutes with 5 minutes discussion. By giving an oral presentation, I was able to receive immediate feedback on my research and have more people come talk to me during the conference about my work. This feedback was invaluable as it gave me new ideas for my research and important points to consider in the analysis of the data I already have.

By attending this conference, I have generated many excellent new contacts in this very exciting field of plant science. I have learnt much more about current knowledge and research techniques and have gained invaluable feedback on my own work. I am very grateful to ISPMB for providing me with the financial assistance required to attend the ISPA conference.

*Natasha Teakle*

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# IP Roots & Branches

## Disclosing your invention and the grace period

As a result of the imperative for scientists to publish their work, research will often be published or presented at a conference before it is covered by a provisional patent application. In some instances, this may occur before potential commercial significance of the work is identified. Where the published work is subsequently recognised as being of potential commercial importance, the earlier publication of the work may impact upon the validity of a subsequently filed patent application.

In some circumstances, not all is lost when you have publicly disclosed your “invention”. Some countries provide a 6 or 12 month “grace period” in which to file a patent application after publication. Your own disclosures during the grace period will not be taken into consideration when determining the validity of your patent application.

However, very few countries or regions provide the benefit of a grace period. For example, many important commercial jurisdictions, including the European Patent Community, do not provide a grace period. As a result, by publicly disclosing your work before filing a patent application, you may not be able to obtain meaningful patent protection for your invention in countries that may be commercially important.

### ***The Grace Period in Australia***

Australian law provides a 12 month grace period in some circumstances and allows certain prior art information to be disregarded when considering the validity of a later filed patent application. The grace period applies when:

- You have publicly disclosed the information, e.g., by presenting at a conference or by publishing your research in a journal article; or
- Someone else has disclosed the information with your consent; or
- Someone else has disclosed the information without your consent and derived the information from you; and
- You have filed a complete patent application within 12 months of the information being publicly disclosed.

### ***Limitations to the Grace Period in Australia***

#### Disclosure of the invention by a third party

In the period intervening the public disclosure of your work and the filing of a patent application, another person may independently publish their own research that discloses something that is the same as, or similar to, your invention. Such a disclosure is not covered by the grace period and may count against the validity of your patent application.

It is also possible that a competitor may use the information that you have disclosed as the basis for undertaking further research and then proceed to publish the work at a later date. In such a situation, it is not clear what would be required to demonstrate that the information published by your competitor was *derived* from your own disclosure. If it cannot be clearly established that your competitor derived the information from you, then the grace period may not apply and your competitor's disclosure may count against the validity of your subsequently filed patent application.

#### Prior users exempt from infringement in Australia

If, between the time that you publicly disclose your research and the time you file a patent application, another person uses (or takes definite steps to use) your invention in Australia based on the information you have publicly disclosed, they may be exempt from infringing your patent. In addition, that person is entitled to sell or transfer the exemption to infringement to another person.

In other words, while the grace period may still allow you to obtain a valid patent in light of your own public disclosure, it is possible that another person (e.g. a competitor) may be free to use your invention. The existence of prior user rights in Australia may ultimately diminish the value of your patent.

### ***Conclusions***

In view of the risks associated with publishing your research before filing a patent application, it is advisable not to rely on the grace period except as a last resort. Careful consideration needs be given, therefore, to filing a provisional patent application before publishing or presenting any new results or work that may have commercial value.

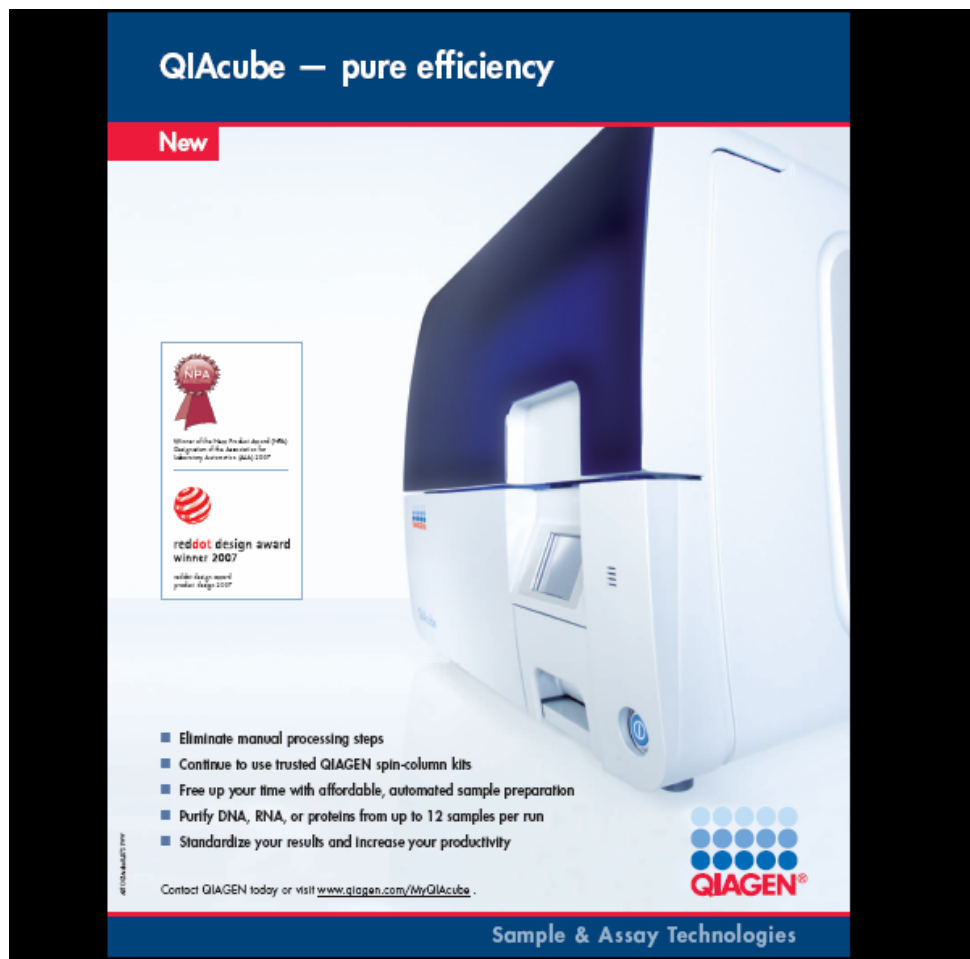
*Tony Davis*  
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## POSTGRADUATE section

We are proud to announce that student members who have recently completed their PhD and had their thesis passed can submit a summary that features in Phytogen. The editors feel that this is an important opportunity for our postgraduate students to showcase their research.

Such successful student members are advised that the summary can be accompanied by a key image in suitable format and that they should submit their items to the editors of Phytogen by the first of April, August or December to appear in the April (or May), September or December issues.



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## *Did you know... ?*

- ✚ **ASPS turns 50 in 2008.** Many celebrations are planned. Several will centre around the annual meeting of ASPS at ComBio in Canberra in September 2008. For further details see page 8.
- ✚ **Goldacre and Teaching Awards.** Nominations for these prestigious awards will close mid April, 2008. Please give thought to nominating a deserving recipient. Guidelines and selection criteria are outlined in the relevant web pages (click the button 'Awards').
- ✚ **ASPS Website.** The ASPS website is regularly updated. We'd like to remind you that if you wish to advertise jobs, PhD scholarships, conferences, books, etc. you can contact Lidia Mischis via [advertise@plantsci.org.au](mailto:advertise@plantsci.org.au). To cover the costs involved, the society has introduced a small charge of \$30 for members and \$70 for non-members **FOR EMPLOYMENT ADS ONLY**. Advertising conferences and books (edited by society members or containing chapters written by society members) are **FREE OF CHARGE**.
- ✚ **RN Robertson travelling fellowship.** The named Fellowship recognises and celebrates the sustained contribution made by RN Robertson (Sir Bob) in nurturing young plant scientists in Australia spanning across four decades from the 1950's. The Australian Society of Plant Scientists is indebted to Hank Greenway and Joe Wiskisch who generated and championed the early development of the RN Roberston Travelling Fellowship.
- ✚ **Student Travel Funds.** Funds are set aside each year to sponsor student travel to our annual conference (next year in Canberra), and contribute to their professional development in plant science. Support will vary from year to year depending on the Society finances, location of meeting and number of applications. The Treasurer will apply a formula in calculating individual entitlements and takes these factors into account. Applicants must be financial members of ASPS and presenting a paper or poster at the ComBio meeting.
- ✚ **Society funding for Workshops and Conferences.** The society has a total of \$10,000 available each year to provide seeding money and sponsorship for up to four conferences organised by members. The amount available to assist each conference will be about \$2500. For more details see the website: <http://www.plantsci.org.au> and take the link to conferences.
- ✚ **Corresponding and Life memberships.** Life Membership recognises an outstanding and sustained contribution to the Society by along standing ASPS member who, through their professional activities, has substantially enhanced the international profile of Australian plant science research. Corresponding Members are high profile overseas

colleagues who have contributed substantially to plant science research within Australia. If you know of a deserving recipient for Life or Corresponding Membership, please consider putting a nomination forward. The procedure to follow is outlined on the ASPS website (see: <http://www.plantsci.org.au/> and click on "About ASPS" where there is also a list of Life and Corresponding members).

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# TWIGS & BRANCHES

Some News & Comments from the Plant Science World

## **Plants own endocannabinoid system.**

N-acyl ethanolamines (NAEs) are bioactive acylamides and in mammals form part of the endocannabinoid system. The occurrence and metabolism of NAEs are conserved amongst many eukaryotic organisms. In plants they are elevated in desiccated seeds. Teaster *et al* (*Plant Cell* **19**: 2454-69, 2007) show that NAE metabolism interacts with ABA in normal seedling development depends upon the decrease of endogenous levels of both ABA and NAEs partly through the action of NAE degrading enzymes such as fatty acid amide hydrolase (FAAH). Interestingly, FAAH is a key component of normal endocannabinoid metabolism in mammals.

## **A third receptor for ABA**

Recently a G-protein coupled receptor protein (GCR2) has been identified as being the third and extracellular receptor for ABA (see Liu *et al. Science* **315**: 1712-16, 2007). This follows on the reports from last year that the nuclear receptor FCA (Razem *et al. Nature* **439**: 290, 2006) and the Mg chelatase H subunit as intracellular ABA receptors (Shen *et al. Nature* **443**: 823, 2006). These findings are a nice counterpoint to earlier physiological studies that indicated both intracellular and extracellular receptors for ABA. They also highlight the complexities of ABA (and other hormone) signaling pathways where not only are signal networks established but also

multiple receptors. The receptors all seem to activate different ABA responses: FCA regulates ABA related flowering control and lateral root growth; CHLH regulates the stomatal response; while GCR2 activates phospholipase D mediated responses. It is likely that further ABA receptors may be found that will relay specific spatial or developmental messages of the all encompassing effects of ABA – one possibility is an ABA receptor that directs the response to pathogens. Do other hormone systems also have multiple receptors ?

## **Genetically encoded sensors**

Green fluorescent protein (FP) and its analogues are a vital tool of the modern molecular biologist. Interest has developed in using FPs as more than reporters of the fate of a tagged protein to employing them as a key component of intracellular fluorescent proteins. Souslova and Chudakov (*Biochemistry (Moscow)* **72**: 683-97, 2007) have written an excellent review covering the range of compounds that can be detected by the FPs and the properties of different detectors. The review covers FRET-based sensors and FPs chimerically linked to one or more conformationally active domains.

*Helen Irving*



# UPCOMING CONFERENCES

## **ComBio2008**

National Convention Centre, Canberra, Australia. 21 - 25 September, 2008

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### ***International Conference on Biotic Plant Interactions***

[www.uq.edu.au/plants/icbpi](http://www.uq.edu.au/plants/icbpi)

**Brisbane, 27-29 March 2008**

Abstract submission and registration are open until **31 January 2008**. Please contact ASPS representative for Plant-Microbe Interactions, Peer Schenk ([p.schenk@uq.edu.au](mailto:p.schenk@uq.edu.au)).

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### ***12th International Lupin Conference***

**Fremantle, Western Australia**

**14-18 September 2008**

Convenors: Mark Sweetingham and Jon Clements

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