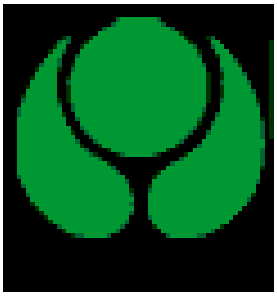


PHYTOGEN

A
NEWSLETTER
FOR
AUSTRALIAN
PLANT SCIENTISTS

Volume 9 Number 1
May 2007

PHYTOGEN

Volume 9: Number 1

INSIDE THIS ISSUE

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 new Queensland representative Peer Schenk highlights some of the research occurring in plant sciences in Queensland.

This issue alerts you to the ComBio 2007 which is being held in Sydney this year. The organising committee have organised an excellent array of speakers. It should be a great meeting; I hope to catch up with some of you there. ComBio is followed by EcoFizz which also has several excellent speakers and the opportunity for students to present orals or posters in a less formal atmosphere.

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 **Tasmania** 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) who is co-ordinating "From our Seed Banks".

I wish everybody a productive winter!

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)

DISCIPLINE AND STATE PERSPECTIVES

Melbourne Plant Group

This year sees the continuation of the very successful Melbourne Plant Group meetings of the molecular based Melbourne scientists. The meetings are held Monday evenings at the School of Botany, University of Melbourne on a bimonthly basis and usually involve two short (~20 min) presentations; each from a different lab. There is plenty of opportunity for discussion with pizza and drinks between the talks provided by the generosity of the Plant Cell Biology Research Centre.

The meetings are organised by John Golz (jgolz@unimelb.edu.au) and Ed Newbign (edwardjn@unimelb.edu.au). Please email John or Ed if you wish to be added to the mailing list.

Invitation to attend the 3rd Ecofizz conference for the Australian and NewZealander Plant Physiologists and Ecophysiologists

at

The University of Western Sydney (Hawkesbury Campus) Thursday and Friday 27th and 28th September, 2007

Dear Ecofizz colleagues,

This is our second announcement to you about the third Ecofizz conference - a Combio satellite meeting - which will be held at the Hawkesbury Campus of the University of Western Sydney (UWS).

At this year's Ecofizz meeting, we will have four visiting international speakers: Sune Linder (Sweden), Rowan Sage (Canada), Ram Oren (USA) and Richard Norby (USA). We will provide a half-day field trip to the Hawkesbury Forest Experiment, the site of the High CO_2 Whole Tree Chambers and large-scale Irrigation and Fertilization experiment at UWS.

Therefore, we invite you all to attend this year's Ecofizz meeting and contribute oral and poster presentations. We particularly encourage students to present their research in progress in a friendly atmosphere. We will take this opportunity to showcase our research, facilities, and hospitality.

If you wish to give an oral (15 min presentation + 5 min for questions) or poster presentation, please email your abstract to o.ghannoum@uws.edu.au or jp.conroy@uws.edu.au by the **30th of June 2007**. Please write in the subject heading of your message "Ecofizz-07 Oral" or "Ecofizz-07 Poster" depending on whether you want the abstract to be considered for an oral or poster presentation. For any queries or suggestions concerning Ecofizz-2007, please do not hesitate in contacting us.

For registration, please visit the following website:

http://www.nsw.conferenceonline.com.au/index.cfm?page=details_conference&pg=1&id=8525

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.

ISPMB2006 Awards

Supporting Overseas Travel for PhD Students involved in Plant Molecular Biology

The International Society for Plant Molecular Biology (ISPMB) held its 8th Congress in Adelaide last year. To encourage postgraduate research in plant molecular biology the ISPMB has decided to fund a series of travel grants leading up to the 9th Congress in the USA. The purpose of these grants is to support the attendance of PhD students to international meetings and overseas laboratories.

The Australian Society of Plant Scientists has agreed to manage the allocation of these grants which are called ISPMB2006 Awards.

Conditions and Eligibility

1. The ISPMB Awards will enable PhD students in plant molecular biology to travel to international meetings or to visit overseas laboratories.

2. Applicants should be enrolled in a PhD degree at an Australian university and a member of the Australian Society of Plant Scientists. The travel should occur while the candidate is enrolled as a student or within 3 months of the conferral date. Post-doctoral researchers are not eligible for these Awards.

3. Applications will be judged by an independent panel. Criteria for selection will include academic record, research progress, demonstrated support from supervisors and the likely benefits to the applicant of the proposed travel.

4. Up to five awards are available in each round of applications each valued to a maximum of $3,000.

5. Awards will be distributed in two rounds:
   Round 1: for travel up to 31 August 2008
   Round 2: for travel from 1 September 2008 up to, and including, the 9th ISPMB Congress in 2009

6. Application forms for Round 1 should be received by **30 June 2007**.

7. Successful candidates may be asked to provide a report of their travel for *Phytogen*, the newsletter Australian Society of Plant Scientists.

Conditions and eligibility may change without notice.

Applications for ROUND 1 close 30 June 2007. Send completed applications to:

Dr Peter Ryan (Hon. Treasurer ASPS)
CSIRO Plant Industry
GPO Box 1600
Canberra, ACT 2601
Australia

Tel: 61-2-6246 5053
Fax: 61-2-6246 5000
Email: peter.ryan@csiro.au

ComBio 2007 Update

CoMBio will be held at the slightly earlier time of 22 - 26 September this year at the Sydney Convention Centre, with a strong plant line up. There will be nine plant-based plenaries, featuring international stars, and seven plant-based symposia, the details of which are shown in the accompanying registration booklet. International speakers include Wolf Frommer, Giles Oldroyd, Rowan Sage, Jeremy Barnes, Olivier Vionnet, David Erhardt and Catherine Curie. The JG Wood lecture will be given by Rana Munns (CSIRO) and the Goldacre award and best paper ward are currently being judged. There will also be a lecture by the recipient of the ASPS teaching award. A range of accommodation is available, including some reasonably priced options for students and there are lucrative prizes for poster and oral presentations by students.

Registration forms are available on the ASPS and ASBMB web sites and on-line registration will open in May. I look forward to meeting you in September.

David Day
President of ASPS
(ComBio07 organising committee)

PROVISIONAL SYMPOSIA SCHEDULE

Symposia Streams	Gene Regulation	Protein Structure and Function	Cell Architecture and Trafficking	Receptors and Signalling	Plants and Microbes	Developmental Biology	Biomedicine	Genomics, Proteomics, Metabolomics, Bioinformatics and Systems Biology
	Thomas Preiss	*Nick Dixon*	*Geraldine O'Neill*	*Arthur Conigrave*	*David Day*	*Edna Hardeman*	*Roland Stocker*	*Marc Wilkins*
Sun 23 am	Protein/nucleic acid interactions	Membrane proteins	Integration of cell shape and function	Cell calcium	Ecophysiology	Neural development and disease		
Sun 23 pm	Epigenetics	Emerging techniques for protein structure/ function studies	Cell matrix/ cell-cell interactions		Plant energy biology	Organogenesis	Omics and human disease	
Mon 24 am		DNA-binding proteins and enzymes		Signalling mechanisms in metabolic control	Plant pathology/ symbiosis	Evolution and development	Development and disease	Bioinformatics
Mon 24 pm	Gene regulation in development	Large complexes – DNA replication machinery		Protein phosphorylation	Small RNA's and gene regulation in plants	Cell dynamics in development	Cardiovascular disease and diabetes	
Tue 25 am		Ribonucleopro teins	Protein trafficking in human disease	Lipid-dependent signaling	Plant cell dynamics	Patterning and morphogenesis	Cancer	
Tue 25 pm	Regulation and disease	Molecular machines – at the single molecular level	Membrane organisation		Molecular biology of plant development		Inflammation	Systems biology
Wed 26 am	RNA and gene control			G-coupled protein receptors	Plant physiology	Signalling and development	Infectious diseases	Genomics and transcriptomics
Wed 26 pm		Amyloid proteins/ proteins	Cell/membrane trafficking		Ion transport	Stem cells in development and repair	Ageing	Proteomics/ metabolomics

ComBio2007

see back page(p26) for further details of ComBio 2007

Focusing on one state's research per edition

This edition:

Queensland

Collated by Peer Schenk
(the Council representative resident in Qld)

Welcome to the feature article highlighting some of the research in plant science by ASPS members from Queensland.

CRC SIIB works towards a strong future for sugar

The Cooperative Research Centre for Sugar Industry Innovation through Biotechnology (CRC SIIB) has successfully been applying biotechnology to develop superior sugarcane and to map out new business opportunities for the future Australian sugarcane industry.

Following is a brief update on some of our latest project outcomes.

Agrobacterium technology

The CRC SIIB has been working with industry and its partner organisations to develop biotechnology tools that allow researchers to efficiently breed sugarcane with specific and highly desirable traits. In a major technological advancement for sugarcane molecular breeding, CRC SIIB researchers have established an efficient and practically useful Agrobacterium-mediated transformation system for sugarcane, whereby bacteria are used to incorporate genes of interest into the DNA of the sugarcane plant. The scientists have proven that this system is a reliable and very effective method of genetically transforming sugarcane. Additionally, it will allow for single or multiple new traits (ie smut and canegrub resistance) to be introduced simultaneously.

Agrobacterium-mediated transformation underpins the development of genetically modified sugarcane by researchers working for the CRC SIIB. The system may be used to enhance the function of genes involved in sucrose accumulation, shoot architecture, canegrub resistance and nitrogen use efficiency, to name just a few.

Mapping the sugarcane genome

Trials by scientists working for the CRC SIIB have shown that particular traits in sugarcane varieties can be identified by recognising and testing for certain DNA sequences, identified by DNA markers. Most recently, the scientists have shown they are able to identify markers associated with smut resistance.

DNA mapping means the industry's efforts to contain smut and other devastating diseases could be enhanced by sophisticated breeding techniques and fast tracking promising, new varieties. This technique has been used in the CRC SIIB smut marker project to assess a large number of varieties from the industry's peak research group's (BSES Limited's) breeding-program data base.

Researchers took samples from these varieties for DNA analysis and compared the DNA data to information from BSES trials in Indonesia where the same varieties were monitored to see how they performed in a high-risk smut environment. This study identified several smut-resistance markers. Potentially, the BSES Limited/CSIRO plant breeding program could benefit in terms of more high-yielding and smut-resistant varieties.

Enhancing shoot architecture

Sugarcane shoot architecture can affect both cane yield and sucrose content. Recently, significant progress has been made in understanding the genetic basis of plant architecture, especially the genes that regulate tiller production. In this CRC project, researchers have utilised new cutting-edge biotechnology tools to unravel genetic controls of sugarcane shoot development in order to maximise realisable yield potential.

To date, this project has uncovered a number of sugarcane branching genes and highlighted the interrelationships between stalk traits and CCS. Scientists have shown that of all the stalk traits, sugar content is most closely correlated with stalk height. However, we have not yet determined whether this is true in different environments or across a wide range of genotypes.

This work has also revealed that some of the genes regulating shoot architecture in other plants also affect shoot architecture in sugarcane. This will greatly facilitate the mapping of branching genes in the sugarcane genome and ultimately marker-assisted breeding of new varieties.

Developing the plant biofactory

The CRC SIIB project, 'Sucrose derivative production in sugarcane' has revealed the strong potential for sugarcane to be utilized as a plant biofactory (i.e. capable of producing valuable compounds in addition to sucrose).

This project set out to demonstrate the feasibility of using the sugarcane plant as a vehicle to produce commercially viable quantities of an alternative sugar, sorbitol. CRC scientists set about to determine whether or not the host organism (sugarcane) was affected when its normal cellular processes were altered using a single gene to accommodate sorbitol production. Ultimately scientists working on the project wanted to determine whether or not sucrose could easily be converted into sorbitol and if it was possible to influence the levels at which it formed.

Researchers cloned and transformed into sugarcane the gene responsible for the synthesis of sorbitol in apple. High sorbitol concentrations were achieved in the leaves of transformed plants but less sorbitol was detected in the cane plants' stalks. The cellular processes of the cane plant did not appear to be greatly affected by the introduction of sorbitol. This project provided a good model for evaluating the technical merit of converting sugar intermediates (i.e. sugar phosphates) into alternative products.

Enzymes to clean up herbicide residues

Sugarcane growers, like most Australian farmers, rely on agricultural chemicals for efficient and economic production. One of these is the widely used and extremely useful herbicide, atrazine. Unfortunately, atrazine is a mobile chemical with the potential to contaminate surface and groundwater at even the low levels that result from normal use. In a CRC for Sugar Industry Innovation through Biotechnology project, CSIRO Entomology is working with Orica Australia Ltd to develop a product that will be used to reduce the environmental effects of atrazine. This will ensure its continued availability for use in sugarcane growing. CSIRO and Orica collaborate closely on the project, with CSIRO primarily responsible for the investigative research and Orica primarily responsible for the downstream work. The end products are licensed to Orica through CSIRO.

The first step in the atrazine project has been to find an enzyme that degrades it. Bacteria were the obvious starting point. They multiply and evolve very quickly so in a few years of exposure to a herbicide they can 'learn' how to use it as a food source by evolving new enzymes. This initial search has been successful and the group has found a bacterial enzyme that breaks atrazine down to much less toxic compounds.

This bacterial enzyme works perfectly well for the bacteria but it wasn't efficient enough to use as an atrazine bioremediation product. The quantities of the enzyme that would be needed would make the product too expensive. So, with funding from the CRC, the group is working on improving the enzyme. With a more efficient enzyme, less of it would be needed to do the same amount of work and this would lower production costs and therefore costs to the farmer.

Developing nitrogen efficient plants

Vigorous growing sugarcane varieties that require less nitrogen fertiliser could drastically reduce costs to our environment and sugarcane growers. The CRC SIIB project "*Improving the nitrogen use efficiency of sugarcane*" has been addressing this topic as a path towards more sustainable and profitable sugarcane production.

Screening over 200 different sugarcane genotypes using the latest biotechnological tools, CRC SIIB researchers have investigated how efficiently different varieties use nitrogen, and how such knowledge could help design more efficient production systems.

The CRC research team found that considerable natural variation in nitrogen use efficiency exists between sugarcane genotypes. This variation allows nitrogen efficient plants to produce twice as much biomass (ie they grow larger) with the same amount of nitrogen than inefficient plants.

Another important discovery is that sugarcane has preferences for particular nitrogen forms. Research highlighted the ability of sugarcane to use organic forms of nitrogen, such as amino acids, which are the initial product when organic matter decays. In new cropping systems where a considerable amount of nitrogen is supplied by that which is naturally contained in the trash blanket, the ability to use organic forms of nitrogen is beneficial because the crop uses the nutrient before it is converted to ammonium and nitrate.

In addition to these outcomes, the CRC's nitrogen research has shown that metabolic engineering could be used to develop plants able to take up extra nitrogen from the soil when soil nitrogen supply is high and also improve movement of nitrogen from stalks to leaves (i.e. enhanced absorption and use of this vital nutrient). While it is still early days in terms of this research, progress is looking very promising.

A functional genomics approach to study plant-microbe interactions in changing environments

Peer Schenk, Plant-Microbe Interaction Group
School of Integrative Biology and Cooperative Research Centre for Sugar Industry Innovation through Biotechnology, University of Queensland, Brisbane
p.schenk@uq.edu.au

Biotic and abiotic stresses pose the biggest threat to crop plants. Increasingly crop production is challenged by a world-wide shortage of water and by pests and pathogens where pesticides are ineffective. Plants have evolved defences against these stresses by responding with dramatic physiological changes and by interacting with beneficial microbes in the soil. Using functional genomics, metabolomics and phenotypic analyses as tools, we are studying the molecular responses of plants following stress as well as the associated microbial communities. Plants challenged with biotic stress (viruses, bacteria, fungi, nematodes, insects) or abiotic stress (drought, UV, oxygen radicals) respond very rapidly by activating defence pathways that are characterised by signal molecules (e.g. ABA, SA, MeJA, ethylene). Our results have shown that the underlying signalling networks lead to interesting crosstalk (coordination or antagonism) between different components of the pathways. To this end, we have identified key regulatory genes whose expression is fine-tuned to act as master switches between pathways and hence resistance to stress. This decision making is crucial for the recognition of parasitic/beneficial microbes and for successful physiological adaptation. We have developed a collection of transgenic plant lines with signalling pathways altered by either transgene overexpression or insertional mutagenesis and many lines in this collection show increased resistance to either fungi, bacteria, nematodes or insects as well as tolerance against drought stress. This knowledge currently finds applications in crop plants with a heightened preparedness against biotic and abiotic stresses.

To understand how biotic and abiotic stresses affect the high diversity of microorganisms associated with the plant's rhizosphere, we have developed new functional genomics tools on mixed microbial communities, including the use of custom microarrays. This "Environmental Transcriptomics" approach has already demonstrated how expressed microbial genes can give clues about the underlying biochemical processes in the soil and the plant's rhizosphere. In particular, we are interested in the microbiome that is present on sugarcane fields in regards to its role for nitrogen cycling and greenhouse gas emissions.

Nitrogen and Ecophysiology

Susanne Schmidt, School of Integrative Biology, University of Queensland, Brisbane
susanne.schmidt@uq.edu.au

In our research, nitrogen is the main focus. Current projects include:

(1) Peptide and amino acid transporters for soil N acquisition in native species *Hakea actites* and molecular physiology of nitrogen use efficiency in sugarcane

(2) Nitrogen at the landscape scale in context of greenhouse gas emissions and soil carbon sequestration

(3) Effect of artificial polyploidy on stress resilience of trees

Crop Improvement

Prof. Mark Sutherland, Assoc. Prof. Grant Daggard, Dr. Anke Lehmensiek, Dr. Joan Vickers, Bill Bovill, Cassandra Percy, Friederike Eberhard, Priya Tah, Noel Knight, Benedette Watson, Peter Gous, Jessica Bovill, Ummey Akhtar, and Maree Horne.

Research conducted by the Crop Improvement Division of the Centre for Systems Biology (CSBi) at the University of Southern Queensland focuses on plant-pathogen interactions and the nature of disease resistance, the identification of molecular markers linked to disease resistance and quality traits in wheat and barley, and transgenic approaches for improving frost tolerance in wheat.

Wheat

Crown rot, which has been reported to cause $56M losses per annum to the Australian cereals industry, is a major focus for the CSBi Crop Improvement Division. In the past decade, a range of wheats with partial resistance to crown rot have been investigated. Unfortunately almost all of these sources of resistance are unsuitable for use as commercial varieties. Hence their resistance must be crossed into elite germplasm to produce marketable varieties. In each case these resistances are known to be quantitative traits, which are determined by multiple genes, making transfer of the resistance difficult. Our research has identified a series of molecular markers linked to the most important "resistance" genes in four different partially resistant wheats. To date, a team of USQ researchers led by PhD student Bill Bovill has identified molecular markers linked to resistance in three non-commercial wheats (lines 2-49; W21MMT70; and IRN497) as well as in Sunco. The genomic regions that have been identified in each of these lines are largely different, and thus represent opportunities for pyramiding these genes to provide new lines with improved resistance to this economically important disease. This work is being conducted in close collaboration with research staff at the Leslie Research Centre, QDPI&F.

Crown rot is also a major restraint on production for durum growers in Australia. To date, all commercial durum varieties are susceptible to this disease. In conjunction with colleagues at the NSW Dept of Agriculture in Tamworth, PhD student Friederike Eberhard is testing the effectiveness of markers for following the transfer of resistance from bread wheats into durums. Dr Ray Hare has made a number of bread wheat x durum crosses in order to transfer the resistance of the hexaploid wheat lines we have previously characterised into the tetraploid durums. Dr Peng Zhang from the University of Sydney is collaborating with us in a cytogenetic study of the progeny of these crosses.

PhD student Cassandra Percy has been examining the spread of the *Fusarium* fungus in seedlings and adult plants in the field that differ in their resistance to this disease. She has documented the spread of the pathogen in the tissues of the crown and upwards in the tillers as the plants mature. Partially resistant lines show a slower spread of the fungus in green tissues than do susceptible wheats. However, at crop maturity, the fungus appears to switch to saprophytic growth on the dead mature straw, resulting in rapid colonisation of the upper nodes of the tillers (but not the heads) around the time of harvest in both susceptible and resistant lines. This may explain why the growing of partially resistant wheats such as Sunco, does not necessarily reduce the inoculum level for the following season, since high levels of the fungus can still develop in the straw at the very end of the season, due to saprophytic growth.

Dr Anke Lehmensiek and PhD student Friederike Eberhard examining hexaploid/tetraploid crosses in the field at Tamworth NSW.

PhD student Noel Knight spraying a spore suspension of Bipolaris *onto barley lines.*

Barley

Dr. Anke Lehmensiek leads research focussed on identifying molecular markers linked to the physiological disorder black point of barley, as well as a range of diseases including (but not limited to) common root rot and spot blotch.

Black point results in discolouration of the embryo end of the grain and is associated with elevated humidity during grain development. It is a significant problem in most Australian wheat growing areas with losses of up to $50M annually. PhD student Priya Tah is confirming the usefulness of markers for black point resistance identified in wheat, and using the relationship between the wheat and barley genomes in order to assess the usefulness of these markers for improving levels of resistance to black point in barley. This GRDC funded project between USQ and LRC thus aims to locate molecular markers associated with black point resistance/susceptibility which would allow rapid and reliable screening in breeding programs throughout Australia.

Common root rot, caused by *Bipolaris sorokiniana*, is a widespread, but poorly understood disease, which causes losses in the range of 5-10% of yield in most years. The fungus mainly attacks the sub-crown internode and roots of wheat and barley plants, reducing their vigour and ability to set seed. Masters student Jessica Bovill has recently identified molecular markers for the resistance to common root rot found in the barley cultivar Delta. *Bipolaris sorokiniana* also causes the foliar disease spot blotch in barley and wheat. The relationship between these economically important diseases is poorly understood. Research student Noel Knight has been assessing the infectious abilities and genetic relationships of Australian *B. sorokiniana* isolates collected from common root rot and spot blotch infections of barley. Phenotypic screening has shown that isolates of *B. sorokiniana* collected from common root rot infections are not able to induce significant spot blotch infection responses from host barley plants. The degree of genetic variation or relatedness between Australian isolates of *B. sorokiniana* has been examined using cluster analysis of AFLP banding patterns. This indicates that *B. sorokiniana* consists of sub-groups which differ in host specificity and in their relative abilities to cause spot blotch or common root rot.

Transgenic Approaches to Improve Frost Tolerance of Wheat

Spring frosts in wheat growing areas of Australia can result in significant damage during the heading stage, resulting in losses of millions of dollars each year due to decreased yields. Research conducted by Dr. Joan Vickers involves co-transformation of wheat via micro-projectile bombardment with an antifreeze protein (AFP) gene, with the aim of increasing levels of frost tolerance. AFPs inhibit the annealing of ice particles into large crystals that have the potential to damage wheat heads and reduce

grain yield. Transgenic plants expressed AFP and showed the potential for frost tolerance in *in vitro* tests on plant extracts. In replicated whole plant trials at -4.5°C in a frost chamber (Australian Genome Research Facility, Adelaide), frost-induced sterility (FIS) for the frosted transgenic AFP-transformed plants was not significantly different from the unfrosted controls. Recent trials on advanced generation transgenic plants have confirmed this result and show that transformation of wheat with an AFP gene has the potential to significantly improve grain yield in widespread areas of the world where wheat is subjected in most years to frost at the heading stages.

Video thermography to detect the occurrence of freezing in wheat heads

Wine Science

A/Prof Rob Learmonth, Ursula Kennedy

Research undertaken in the Wine Science Division of CSBi, in collaboration with the QDPI&F, the Queensland Wine Industry Association and a number of local wineries, is investigating the effect of crop adjustment on fruit and wine quality. The target grape variety is Merlot, one of the principal red wine grapes grown in Queensland. This variety tends to be very fruitful, so a common management practice is to thin bunches, in order to allow fruit to ripen more rapidly. Early outcomes indicate that bunch thinning results in more rapid ripening, with little effect on other fruit quality measures. Small lot wines have also been made as part of this project, sensorial analysis of which will be carried out at a later date. This trial will be repeated with the investigation of additional parameters next season. Future research directions for the group include trials on different wine grape varieties and the impact of various vineyard management strategies and winemaking options for quality wine production.

Mycorrhizal Research

Dr John Dearnaley, Dr Andrew le Brocque, Alexandra Downie

Dr John Dearnaley, a member of the Australian Centre for Sustainable Catchments, is currently leading a team working on plant mycorrhizal interactions and has three main research foci. He is using ITS-PCR, cloning and DNA sequencing to determine the identity of the mycorrhizal fungi of threatened native flora which will facilitate successful reintroduction programs for the plant species. He is also examining the drought protective capabilities of arbuscular mycorrhizal fungi isolated from arid zone plants on crop species and is investigating the impacts of human based disturbance such as land clearing and weed infestations on mycorrhizal fungal populations.

Functional Plant Biology

Autumn - 2007 Update

Welcome back Jennifer Henry

FPB Editor Jennifer Henry returns from maternity leave on 30 April and we welcome her back. I thank ASPS members for their support as authors and reviewers during my period as Editor – it is wonderful to have such a talented pool of people who support the journal with submissions and editorial advice. I also thank Danielle de Maio, who stepped in to produce the journal. She has handled a huge number of papers as we've had two Special Issues on the go as well as regular issues. Her ability to keep copyeditors, typesetters and authors on the ball has been a great asset.

Forthcoming and recent Special Issues

We have just published (*FPB* vol. 34 no. 4) a collection of 14 papers arising from the international symposium held in memory of **Vincent R. Franceschi** at WSU in June 2006, guest edited by Gerry Edwards. The collection of papers in this special issue covers research in carbon assimilation; transport, partitioning and storage; calcium sequestration and function; and plant growth and defence, which were the key areas of Vince's expertise.

Also in the production pipeline is a Special Issue containing 10 papers arising from presentations made in the **Carbohydrate Metabolism** symposium of the 8th International Congress of Plant Molecular Biology (Adelaide, August 2006), guest edited by Alison Smith. The issue will be published in June as issue 6. It is already attracting plenty of interest amongst the authors and integrates the most recent work in the fields of carbohydrate biosynthesis and metabolism, and sugar signalling.

We are currently negotiating to produce a Special Issue based on work to be presented at the Ecofizz 2007 conference at Hawkesbury in September. The theme of this conference will be global climate change, drought and their impacts on forests, so it will be a most timely issue of the journal.

Most Read papers

You may have noticed the 'Most Read' function on the *FPB* website. This function provides a list of the journal's most heavily downloaded papers for the current 12 months. The ranking is based on the number of downloads from the **CSIRO** PUBLISHING website since we began collecting usage data in 2000. Usage statistics are updated daily and may be viewed for either the current year or from 2000. The five most-downloaded papers for the current year are:

1. *Agrobacterium*-mediated transformation and expression of foreign genes in *Medicago truncatula*
Jinghong Wang, RJ Rose and BI Donaldson *Australian Journal of Plant Physiology* 23(3) Published 1 June 1996

2. Whole-plant responses to salinity
R Munns and A Termaat *Australian Journal of Plant Physiology* 13(1) Published 1 February 1986

3. *Viewpoint*: The perils of pot experiments
John B. Passioura *Functional Plant Biology* 33(12) Published 1 December 2006

4. The global carbon cycle: a viewpoint on the missing sink
RM Gifford *Australian Journal of Plant Physiology* 21(1) Published 1 February 1994

5. Reexamining the empirical relation between plant growth and leaf photosynthesis
Eric L. Kruger and John C. Volin *Functional Plant Biology* 33(5) Published 2 May 2006

As you can see, both recent papers and some of our 'classics' are included in the list, highlighting the value of having the full *AjPP*/*FPB* archive online. To see the complete list of most-read papers visit: http://www.publish.csiro.au/nid/102.htm?nid=103&aid=4636

That's it from me in this current period as Managing Editor and I'm now off to look after some other journals within the **CSIRO** Publishing suite, so I thank you again for your support of *FPB* and wish you well in your research programs.

Amanda Ellery.
Managing Editor

From Our Seed Banks

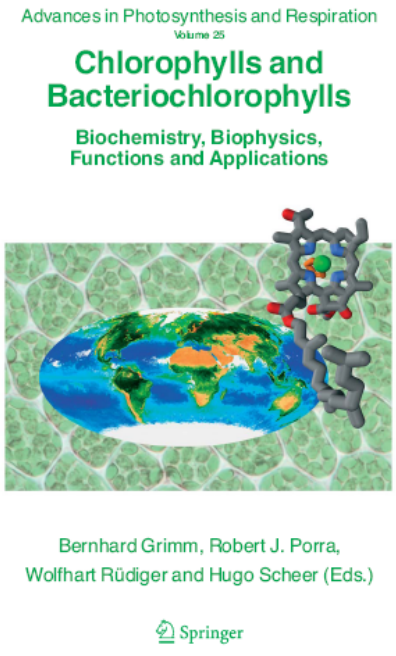
Meeting reports provided by members from around the country

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

We also welcome book reviews.

Green is all around us.

Book Review:
Chlorophylls and Bacteriochlorophylls: Biochemistry, Biophysics, Functions and Applications (2006) in *Advances in Photosynthesis and Respiration*, Volume 25. Eds. Bernhard Grimm (Berlin), Robert J Porra (Canberra), Wolfhart Rüdiger (Munich) and Hugo Scheer (Munich). 37 Chapters, 603 pages, Springer, Dordrecht, The Netherlands



The timely and keenly awaited book "*Chlorophylls and Bacteriochlorophylls: Biochemistry, Biophysics, Functions and Applications*" book, admirably edited by Bernhard Grimm, Robert Porra, Wolfhart Rüdiger and Hugo Scheer, was published in late 2006. A great deal has happened in chlorophyll and bacteriochlorophyll research since 1991 when the last book dedicated to these pigments (Chlorophylls, Edited by Hugo Scheer, CRC Press, Boca Raton) was published; it has been out of print since 1995. The devotion of the editors to the task of summarising basic concepts and the many recent major advances over the past 15 years has resulted in a splendid chlorophyll encyclopaedia that is

both complete and very interesting. Seventy authoritative scientists from 18 countries have been involved in the preparation of 37 concise yet very informative chapters of uniformly high standard.

"Green is all around us"[1] even visible from outer space or in oceans by satellite sensors. Some 100 chlorophylls are now known, the majority of newly-found chlorophylls occurring in marine algae or as bacteriochlorophylls in anoxygenic bacteria. These chlorophylls perform three functions: *firstly* the chlorophylls of the very diverse light-harvesting antennas absorb or dissipate light efficiently and *secondly* transfer the excitation energy to the few reaction centres where, *thirdly*, the chlorophylls perform the primary charge separation across the membrane which eventually leads to formation of chemical energy (ATP) and reducing power (NADPH) for the fixation of carbon dioxide to carbohydrates. For these extraordinarily important photosynthetic reactions that support all life on the planet, most of the chlorophylls, together with closely-associated carotenoid molecules, are non-covalently bound to membrane proteins to form marvellous molecular machines for powering the photosynthetic process. The central theme of this book is the attempt to understand the intricate chemical and physical properties of the chlorophyll pigments which suit them so ideally to their various roles and functions in this photosynthetic machinery.

The importance of the chlorophylls and the long and continuing interest in them is reflected in the four Nobel prizes which have been awarded for studies associated with the chlorophylls: Richard Willstätter (Munich), 1915, for chemical studies with chlorophylls and establishing their relevance to photosynthesis; Hans Fisher (Munich), 1930, for elucidating the complete structure of chlorophyll; Robert Woodward (Harvard), 1965, for organic syntheses of many compounds including chlorophyll; Harmut Michel, Hans Deisendorfer and Robert Huber (Munich), 1998, for the first high resolution structure of a chlorophyll-containing supramolecular membrane complex, namely, the purple bacterial reaction centre complex.

This book has five sections, each beginning with a succinct overview. The first section covers the structures and distribution of the chlorophylls of plants, algae and cyanobacteria and of the bacteriochlorophylls of the photosynthetic bacteria, their chemistry, and the spectrophotometric analysis of chlorophyll concentrations and their separation by high-performance liquid chromatography and modern column chromatographic techniques. The second section includes the biosynthesis of the chlorophylls and bacteriochlorophylls and their degradations. The native environment of the chlorophylls is explored in the third section, and their functions in the fourth section. Finally some interesting applications in the last section deal with chlorophyll and bacteriochlorophyll sensitizers in photodynamic therapy, monitoring chlorophyll in the ocean from outer space, and the geochemistry of chlorophylls. We can expect many future applications of the chlorophylls and related pigments extending from photosynthesis to solar energy conversion such as photocatalysis, photovoltaic cells, nanotechnology, and medical therapies.

This multidisciplinary book is essential for advanced students and both novice and experienced research scientists in basic and applied research in chlorophyll chemistry, plant-biochemistry, -biophysics and -physiology, and even in the medical and geo-sciences. Novice undergraduate students of plant biochemistry and physiology would probably need to first read the fascinating paperback introduction to photosynthetic research by Robert E. Blakenship[1], before undertaking a study of this more advanced text on the chlorophylls and bacteriochlorophylls.

[1] Blankenship, R.E. (2002) The Molecular Mechanisms of Photosynthesis, Blackwell Science, Oxford

Prof Jan M. Anderson, Research School of Biological Sciences, Australian National University , Canberra ACT 2601, Australia

IP Roots & Branches

EXPERIMENTAL USE OF PATENTED INVENTIONS FOR RESEARCH

Original experimental work is the cornerstone of most scientific research. However, original experimental work is rarely done in isolation. Experimental use of existing scientific work; that is, original experimental work **using** existing products, methods, published data, work or knowledge; or original experimental work **on** existing products, methods etc, can have important intellectual property ramifications for scientists.

For Example:

1. Experimental use of a scientist's own inventive work prior to filing a patent application can compromise the validity of a patent.
2. Experimental work using aspects of a patented invention, will expose a scientist to patent infringement issues.
3. Experimental work on aspects of a patented invention, can also expose a scientist to patent infringement issues.

Experimental Use of a Scientist's Own Work

If a scientist develops a potentially patentable method or product and then actively uses this work for any purposes other than any reasonable trials and experiments needed to assess the method or product, that is, any purposeful use of the product or methods, particularly in a commercial context; such use may be deemed "secret" use which can invalidate any patents subsequently filed. The reason ? Surreptitious use and benefit gained by using new work and subsequently filing for a patent effectively gives the patentee an extension of the term of the monopoly. For example, if a new invention is used secretly, that is without publishing the invention for 2 years, and then the inventor files a patent application. This will provide the patentee with an effective period of 22 years to exclusively exploit the invention. The maximum term of a patent is 20 years, so the secret use would have given this patentee an unfair advantage over other patentees. One exception for this is "reasonable trial and experiment". That is, any use of the invention needed and necessary in order for the work to be assessed prior to filing for a patent.

Experimental Use of, or on, a Patented Invention

Broad rights are given to Australian patentees. These rights include the exclusive right to exploit an invention, where exploitation includes making, hiring, selling, using or importing a patented product or method. The Australian Patents Act provides no specific exclusions for infringement with respect to experimental use for research and no case law is available to provide guidance on this issue.

Notwithstanding that patent infringement is generally associated with preventing unauthorised commercial exploitation damaging to a patentee; sufficient uncertainty exists to recommend a cautious approach when conducting scientific research whether commercial application is envisaged or not. One exception is where a generic pharmaceutical is being developed and is seeking regulatory approval. Here, active experimental work is allowed **during the extended term of a patent** to provide sufficient time for the generic product to seek approval and allow "springboarding" into the market as soon as the patent expires.

Unauthorised use of a patented method or product in the course of research will infringe a patent. However, the infringement potential of other experimental use, including testing for patent validity, improving and advancing on patented work, even without clear commercial intent, is far from clear and can inadvertently expose a researcher to patent infringement. Not being aware of a patent does not excuse infringement.

However, the expense of conducting patent searches and obtaining professional advice, will usually prohibit a researcher from making the necessary inquiries to determine exposure to patent infringement. Experimental work **on** a patented product or process may not require a large and on going supply of the product. It may be cost effective for the researcher to purchase a sample of the product in question from the patentee or obtain a licence with respect to any processes or methods required. In the absence of any conditions in the sale or licence, such a purchase will exhaust the patentee's rights and free the researcher to do what they like with the product or process so purchased.

In some cases a patent owner may provide a research only license to use a patented product or process for a reduced fee. *Taq* polymerase is one example of such situation where the patentee has endeavoured to distinguish research workers from direct commercial uses.

The issue of experimental use has recently been reviewed by the Australian Law Reform Council and the Advisory Council on Intellectual Property which has resulted in the following recommendations:

> "*The Commonwealth should amend the Patent Act 1990 (Cth) (Patents Act) to establish an exemption from patent infringement for acts done to study or experiment* ***on the subject matter*** *of a patent invention; for example, to investigate its properties or improve upon it. The amendment should make clear that:*
>
> *(a) the exemption is available only if study or experimentation is the* ***sole or dominant purpose*** *of the act;*
> *(b) the existence of a commercial purpose of objective does not preclude the application of the exemption; and*
> (c) *the exemption does not derogate from any study or experimentation that may otherwise be permitted under the Patent Act.*"

In response to the recommendation, the Advisory Council have proposed the following:

> *The Patents Act be amended to establish the following provision:*
>
> *The rights of a patentee are not infringed by acts done for experimental purposes* ***relating to the subject matter of the invention*** *that* ***do not unreasonably conflict with the normal exploitation of a patent****. Acts done for experimental purposes relating to the subject matter of the invention include:*
>
> - ***determining how the invention works***
> - ***determining the scope of the invention***
> - ***determining the validity of the claims***
> - ***seeking an improvement to the invention***

Whilst the recommendations are still to be implemented and details of how any exceptions for experimental research would be applied, there does appear to be some light at the end of the tunnel for researchers.

Mark Wakeham
Patent and trade mark attorney, FB Rice & Co
mwakeham@fbrice.com.au

CONGRATULATIONS

to our members who have recently been elected as Fellows to the Australian Academy of Science

Election to the Fellowship is a considerable honour as "it recognises a career that has significantly advanced the world's store of scientific knowledge". Each year there are 16 Fellows elected to the Australian Academy of Science and sometimes a plant physiologist is elected. It is remarkable that two plant physiologists were elected in consecutive years and that they are both female.

Susanne von Caemmerer – elected fellow of AAS 2006
Susanne von Caemmerer was born and grew up in Freiburg, West Germany. She moved to Australia in 1973 to commence studies at the Australian National University. There she completed undergraduate studies in pure mathematics in 1976 followed by a PhD in plant physiology in 1981. She is now Professor of Molecular Plant Physiology at the Research School of Biological Sciences at ANU. Her research focuses on photosynthesis, with an emphasis on the mathematical modeling of the carbon acquisition of plants, the biochemistry of carbon dioxide fixation and regulation of carbon dioxide diffusion in leaves.

Rana Munns – elected fellow of AAS 2007
Rana Munns received her PhD from the University of Sydney in 1972 at the CSIRO Plant Physiology Unit. Her research has focussed on mechanisms of stress tolerance in plants, in particular on adaptations to drought and salinity stress. This research continued at Macquarie University, the University of Western Australia and then at CSIRO Plant Industry in Canberra where she has worked since 1981 on the fundamental principles of crop adaptation to drought and salinity, and their applications. She is now Chief Research Scientist and leads a research team on the genetic and physiological basis of salt tolerance in wheat

Did you know....?

- ***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. 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***.

- ***ISPMB2006 Awards.*** ASPS has agreed to organise these international travel awards for post graduates students. The awards of up to $3000 support travel to international conferences and / or overseas institutions. Applications for the first round of awards close **June 30 2007**. See page 7 for further details.

- ***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 Sydney), 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).

TWIGS & BRANCHES

Some News & Comments from the Plant Science World

Easier to access than ever.

It is becoming even easier to access information about your favourite genes and their expression than ever. In these days of full sequenced genomes, it is sometimes mind boggling what information you can access. For instance at **TAIR** (The Arabidopsis Information Resource at http://www.arabidopsis.org/), there has been a recent update where 10,792 gene structures have been re-annotated, including 41 predicted gene structures that were split into 2 separate genes. You can browse the TAIR7 Locus pages, Seqviewer and Mapviewer to find details on all 32,041 *A. thaliana* genes. In addition, you can identify genes of interest from programs such as Patmatch and Blast.

BLAST at NCBI GenBank (http://www.ncbi.nlm.nih.gov/Genbank) has also had a magnificent facelift; the new Beta version has been available since April 16 2007. The new version is easier to use and allows genome specific searching which is rather handy when trying to find only slightly homologous sequences in your favourite organism or when you are checking out the specificity of PCR primers.

The Complete Arabidopsis Transcriptome MicroArray (**CATMA**; http://www.catma.org/) project is a European consortium designed to produce high quality Gene-specific Sequence Tags (GSTs) covering most Arabidopsis genes. The GST repertoire is used by numerous groups for the production of DNA arrays for transcript profiling experiments. In 2006 the fourth repertoire (v4) of GSTs was developed. In addition, probes were also allowed to simultaneously tag multiple members of gene families, leading to 990 GFTs (Gene Family Tags).

Genevestigator (https://www.genevestigator.ethz.ch/) is a web-based tool that can be used to examine publicly available microarray data. In its latest version, it is even easier to use and one can readily examine gene expression patterns in Arabidopsis (or now the mouse! – human and rice are coming soon). You can investigate your favourite gene though development, or in response to treatments, diseases or mutations. This data is a compilation of publicly available microarray data and forms an excellent starting platform to designing your own microarray experiments or follow up physiological or development experiments. Genevestigator OPEN-ACCESS and CLASSIC are free and readily accessible while ADVANCED (= CLASSIC + Biomarker Search, Clustering Analysis, andPathway Projector) requires a fee per lab.

Happy searching

Helen Irving

UPCOMING CONFERENCES

UPCOMING CONFERENCES

19th International Plant Growth Substance Association (IPGSA) Meeting

Puerto Vallarta, Mexico

21-25 July 2007

http://www.ipgsa.org/meeting/index.htm

Plant Biology Annual Meeting

July 7-11, 2007, in Chicago.

This will be a joint congress of the American Society of Plant Biologists, the Botanical Society of America, the American Fern Society, the Phytochemical Society of North America, and the American Society of Plant Taxonomists.

http://www.aspb.org/meetings/pb-2007/

7th APGC Symposium

'Responses of Plant Metabolism to Air Pollution and Global Change',

Edinburgh, Scotland

2 - 5 September 2007

See for further information: **www.apgc2007.org**

ComBio2007

Sydney Convention Centre 22 to 26 September 2007
For further updates visit:

http://www.asbmb.org.au/combio2007/index.html

ComBio2007

PROVISIONAL TIMETABLE

Saturday, 22 September

11:00 - 16:00	Biochemical Education Workshop
14:00 - 18:30	Career Development Forum
15:00 - 19:00	Registration

Sunday, 23 September

07:30 - 08:30	Registration
08:30 - 08:40	Opening of Conference
08:40 - 09:30	Lemberg Lecture – including presentation of Medal (Plenary 1)
09:30 - 10:15	Plenary 2
10:15 - 10:45	Exhibition/Morning Tea
10:45 - 12:15	Concurrent Symposia 1
12:15 - 12:45	Lunch Break/Exhibition
12:45 - 13:45	POSTER SESSION A
13:45 - 14:30	Plenary 3
14:30 - 15:15	Plenary 4
15:15 - 15:45	Exhibition/Afternoon Tea
15:45 - 17:15	Concurrent Symposia 2
17:20 - 18:05	Plenary 5
18:05 - 20:00	Welcome Mixer/Exhibition/Posters

Monday, 24 September

08:30 - 08:40	Presentation of Invitrogen Education Award
08:40 - 09:30	Roche Lecture (Plenary 6) (including presentation of Award) Goldacre Lecture (Plenary 7) (including presentation of Award)
09:30 - 10:15	Plenary 8 and Plenary 9
10:15 - 11:00	Exhibition/Morning Tea
11:00 - 12:30	Concurrent Symposia 3
12:30 - 13:30	Lunch Break/Exhibition
13:00 - 13:50	ASPS Teaching Award (Presentation and Lecture – Plenary 10)
13:30 - 14:30	POSTER SESSION B
14:30 - 15:15	Plenary 11 and Plenary 12
15:15 - 15:00	Exhibition/Afternoon Tea
14:00 - 17:30	Concurrent Symposia 4
17:30 - 19:00	Happy Hour/Exhibition

Tuesday, 25 September

08:30 - 08:55	GE Healthcare Bio-Sciences Award, Applied Biosystems Edman Award and Boomerang Award
08:55 - 09:45	ANZSCDB Medal Lecture & Presentation (Plenary 13)
09:00 - 09:45	J.B. Wood Lecture (Plenary 14)
09:45 - 10:30	Annals of Botany Lecture (Plenary 15) / Plenary 16
10:30 - 11:00	Exhibition/Morning Tea
11:00 - 12:30	Concurrent Symposia 5
12:30 - 13:30	Lunch Break/Exhibition
12:30 - 13:30	Student Lunch with the Overseas Speakers
13:30 - 14:30	POSTER SESSION C
14:30 - 15:15	Plenary 17 and Plenary 18
15:15 - 16:15	Exhibition/Afternoon Tea/PASSPORT PRIZE DRAW
16:15 - 17:45	Concurrent Symposia 6
14:00	ASBMB, ANZSCDB & ASPS Annual General Meetings
19:30	CONFERENCE DINNER

Wednesday, 26 September

08:45 - 09:30	Plenary 19 and Plenary 20
09:30 - 10:15	Plenary 21 and Plenary 22
10:15 - 10:45	Morning Tea
10:45 - 12:15	Concurrent Symposia 7
12:15 - 13:00	Lunch Break
13:00 - 14:30	Concurrent Symposia 8
14:35 - 15:20	Plenary 23
15:20 - 15:50	Afternoon tea
15:50 - 16:35	Plenary 24
16:30 - 17:00	CLOSING ADDRESS PRESENTATION OF AWARDS
17:00 - 18:00	Farewell Drinks

Submitted Papers

ABSTRACT SUBMISSION: Deadline 15 June 2007
All abstracts must be submitted online via the ComBio2007 website: http://www.asbmb.org.au/combio2007
Abstracts sent as attachments will not be accepted.