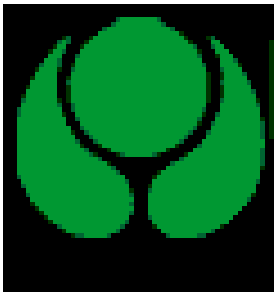


PHYTOGEN

A
NEWSLETTER
FOR
AUSTRALIAN
PLANT SCIENTISTS

Volume 9 Number 2
September

PHYTOGEN

Volume 9: Number 2

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 Tasmanian representative Mark Hovenden highlights some of the research occurring in plant sciences in Tasmania focussing on hormone biology and ecophysiology (see page 9).

There are several updates from the disciplines. I was delighted to see Education being a focal point. Teaching of our undergraduate and postgraduate students is an important commitment of our time even if you are only a casual demonstrator. It is important to highlight the achievements of innovative educational tools, so please visit the "leaf morphology tutorial" and see the excellent tools made by team from Charles Sturt (see page 6).

At the end of September, ComBio the annual national meeting of ASPS is held and it will be in Sydney this year. If you can go, it is a great opportunity to catch up with friends and colleagues and meet new ones. It is also an opportunity to see what is happening in the fields of plant science around Australia and learn about some of the latest research in various plenaries and symposia. I think of it as being an excellent opportunity to broaden one's horizons which can be very informative to your research. Perhaps there is a technique used in an unrelated discipline that sparks an idea on how to design your next breakthrough experiments. Further details about ComBio are on p8.

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 **Victoria** 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".

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

Plant Microbe Interactions

Announcing:

Biotic Plant Interactions Conference: 27-28 March 2008 – Brisbane, Australia www.uq.edu.au/plants/icbpi

The International Conference on Biotic Plant Interactions welcomes contributions in the areas of **plant pathology**, **plant-microbe interactions** and **plant-insect interactions**.

Traditionally plant-microbe and plant-insect interactions have been looked at as two separate issues. **Biotic Plant Interactions** is bringing together scientists and students who are interested in plant pathology and beneficial interactions of plants with other organisms, including viruses, bacteria, fungi, nematodes, insects and other herbivores.

It will be held at the Queensland Bioscience Precinct, University of Queensland, **Brisbane, Australia, 27-29th March 2008**.

If you have any queries regarding the conference please contact ASPS Plant-Microbe Interactions Representative Peer Schenk (pschenck@uq.edu.au).

Environment & Ecophysiology

The Hawkesbury Forest Experiment

A continuing rise in the concentration of carbon dioxide [CO_2] in the earth's atmosphere is inevitable and its impact on forests and woodlands must be factored into Australia's environmental and water catchment management strategies. The climatic changes accompanying the rise in [CO_2] – the Greenhouse Effect – could either magnify or reduce direct CO_2 effects on forest growth and water use. It is clear that understanding the impact of rising [CO_2] on forest behaviour is central to

our ability to manage water and forest resources into the future. An additional challenge for forest managers is the recent change in Australia's rainfall patterns, with annual rainfall declining by approximately 20% across southern Australia over the past 30 years. Unfortunately, there is little knowledge about how [CO_2] will impact on forests growing in typical Australian, water-limited conditions, because most experimental studies have been carried out in well-watered Northern Hemisphere conditions.

The Hawkesbury Forest Experiment has been established at the Richmond campus of the University of Western Sydney (UWS) to investigate how increased [CO_2] will affect Australian forests. The experiment brings together an expert team of researchers from the University of Western Sydney, University of New South Wales, University of Technology Sydney, NSW Department of Primary Industries and the Swedish University of Agricultural Sciences. Funding has been provided by the Australian and New South Wales Greenhouse Offices.

The project is a carefully integrated program of experimental and modelling approaches. The centrepiece of the project is a field facility with twelve CO_2 and temperature-controlled whole-tree chambers (WTCs) on loan from the Swedish University of Agriculture. The WTCs can house entire trees up to 10m tall and have previously been used to investigate the interaction between [CO_2] and temperature and [CO_2] and nutrient availability in a boreal Norway spruce forest in northern Sweden. This unique facility is the first of its type in Australia and the southern hemisphere.

Our broad focus is on developing a predictive understanding of the growth, carbon storage potential and water use of both managed and unmanaged eucalypt forests growing in typical Australian, water-limited conditions, and their responses to the rising [CO_2] that will occur during the next 50 years. Improvements in water-use efficiency at high [CO_2] are of huge potential importance to Australia, the driest inhabited continent. Consequently, our experiment will include contrasting watering treatments, which will allow us to test for the first time the effect of elevated [CO_2] on productivity of large woody plants under potential water-limitation. In addition, we will develop ecosystem models utilising our experimental data to test specific hypotheses about the response of water-limited forests to elevated [CO_2].

Contacts

Professor Jann Conroy	jp.conroy@uws.edu.au
Professor David Ellsworth	d.ellsworth@uws.edu.au
Professor David Tissue	d.tissue@uws.edu.au
Professor Ross McMurtrie	r.mcmurtrie@unsw.edu.au
Dr Craig Barton	craigba@sf.nsw.gov.au
Professor Derek Eamus	derek.eamus@uts.edu.au
Professor Sune Linder	sune.linder@ess.slu.se

Education

Leaf morphology tutorial web site

Please see: http://www.csu.edu.au/herbarium/; then go to '**Leaves – a guide to leaf structure**'.

The impetus for this project had the following beginnings: I had noticed that many of my second year students were consistent in incorrectly keying out plants in our local Flora where the key requires an early choice between simple/compound and pinnate/bipinnate leaves. I had assumed that these students would have a good understanding of leaf morphology as this is a basic botanical skill. My subsequent direct testing on leaf morphology showed that this was not the case.

To give the full-time students and the large cohort of distance education students (and any other interested botanists) better resources to improve their leaf morphology recognition skills Kylie Kent (CSU Herbarium) and I designed a web-based tutorial. We hoped that a logical arrangement of features, combined with a larger range of material than can be provided in a practical class, would allow students to better develop their skills in this area.

The tutorial is based on scans of about 50 species, with two interactive tests (designed by Scott Black using ToolBook) using an additional 22 species. The species are a mix of Australian natives, and crop, weed and garden species that have been introduced to Australia.

I haven't seen anything of direct equivalence on the www but wouldn't be surprised if there is. If this is the case hopefully the additional examples will be useful. We would welcome feedback on the tutorial and tests – from factual faults, layout improvements, the inability to run some or all of the tutorial or tests on some computers, etc.

Geoff Burrows
Charles Sturt University
gburrows@csu.edu.au

SPECIAL OFFER: FPB 2005-207 available free online

For the months of August, September and October, CSIRO PUBLISHING will provide you with an opportunity to "test drive" FPB — FREE of charge

Functional Plant Biology is a must-read! To access FPB, visit our website at: www.publish.csiro.au/journals/fpb

ASPS

ASPS dinner @ ComBio – Monday 24 September

Don Quixote Restaurant

http://www.donquixoterestaurant.com.au/

545 Kent St (Cnr Liverpool St)
Sydney, NSW 2000

The dinner will comprise a two-course fixed menu

Cost is $25 a head for ASPS non-student members and $10 for ASPS student members. Please pay cash at the ComBio Registration desk (receipt provided). Numbers are limited and it would be most helpful if you could indicate (a simple RSVP 'Yes' would suffice) to batwell@rna.bio.mq.edu.au.

Alcohol is a separate item with wines starting at $20 a bottle or so and Sangria about the same per litre.

ComBio2007
Sydney Convention & Exhibition Centre
September 22-26, 2007

An exhilarating scientific and social program promised in sunny Sydney this September!

The Sydney Plant Scientists are looking forward to welcoming you to Sydney for an exciting week of Plant Science and Social activities…

PROGRAM HIGHLIGHTS:

Plenaries

DAVID EHRHARDT : *A dynamic scaffold : cytoskeletal organization of cellulose synthase and plant cell shape*

WOLF FROMMER: *A new fluxomics approach: fluorescence resonance energy transfer nanosensors for metabolites*

ROWAN SAGE : *Low atmospheric carbon dioxide and the origin of the modern biosphere*

JEREMY BARNES: *Ground-level ozone: cause for concern?*

PETER WATERHOUSE: *RNAi, small RNAs and mobile signals in plants*

Peter Goldacre Lecture

ULRIKE MATHESIUS : *Manipulation of plant development by soil microbes*

JG Wood Lecture:

RANA MUNNS : *Salinity and agriculture: problems and solutions*

Annals of Botany Lecture:

CATHERINE CURIE *Iron uptake in plants: from soil to seed*

Symposia topics

Molecular biology of plant development (featuring Bill Lucas), Plant energy biology, Plant pathology/symbiosis, Small RNAs and gene regulation in plants, Plant cell dynamics (featuring Chris Staiger), plant physiology, ecophysiology, ion transport in plants.

SOCIAL HIGHLIGHTS

ASPS special dinner on Monday evening at Don Quixote Restaurant when Jan Anderson will be awarded Life Membership of the Society, mixer, cocktail party and ComBIO conference dinner.

Can't stand the thought of missing out? Then register now at:
http://www.asbmb.org.au/combio2007/registration.html

Focusing on one state's research per edition

This edition:

Tasmania

Collated by Mark Hovenden
(the Council representative resident in Tasmania)

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

HOBART HORMONOLOGISTS ATTEND INTERNATIONAL PLANT GROWTH SUBSTANCES MEETING

This update on plant hormone-related research in Hobart is presented in the context of the 19th International Plant Growth Substances Association (IPGSA) triennial meeting, held in Puerto Vallarta, Mexico, from 20 to 25 July 2007. Australia was well represented at this meeting, and Tasmania was even better represented, with 5 Tasmanian delegates out of 15 Australia-wide. (Each Tasmanian was included only once in the head counting). At the time of writing this update, abstracts from the conference could still be accessed, at https://www.aspb.org/ipgsa2007/abstracts/. The meeting dealt with the well-known plant hormones, auxin, gibberellin, abscisic acid, ethylene, cytokinins, and brassinosteroids, as well as other more recently-characterised compounds. There were many take-home messages from the meeting, but here I will concentrate on only four. That these are of interest to the Hobart group is not coincidental.

There appeared to be renewed interest in auxin biosynthesis. This is completely justified, since, as was apparent from this meeting, auxin still receives more research attention than any other hormone, and yet its biosynthetic pathways are arguably the least understood. The renewed focus was perhaps most graphically illustrated by the plenary talk of Joanne Chory, entitled "Brassinosteroid Signalling: The First Decade." Estimates as to how long she spent on brassinosteroids ranged from 5 to 10 minutes, with the remaining 20 minutes devoted to a new (putative) auxin synthesis mutant! This was of considerable interest to the Hobart group, since we have also turned our attention to the basic problem of auxin synthesis, although with a somewhat different approach (Quittenden *et al.*; Abstract PS1605; Hormone Metabolism).

Dr Corinne Jager (left) discusses auxin biology with Professor Peter Davies of Cornell University

Auxin and gibberellin signal transduction were popular topics. Since the last meeting (Canberra, 2004) both auxin and gibberellin receptors have been reported, and this seemed to buoy the meeting and give a sense of achievement and direction. Plenary talks reflecting this progress were given by Mark Estelle (auxin) and Makoto Matsuoka (gibberellin). Professor Matsuoka described how the gibberellin-receptor complex is thought to destabilise the growth-inhibitory "DELLA" proteins; this explains how gibberellins promote growth. At the meeting we reported, for the first time, the cloning of two DELLA-encoding genes from pea, *LA* and *CRY*. Mutations in these genes have been invaluable for progress on gibberellin biology, but their molecular nature was not known until now (Ross *et al.*; PS1106; Hormone Signalling). Patrick Achard (formerly of the John Innes Institute) delivered a plenary lecture on DELLAs and hormone interactions, but it was interesting to note that he did not mention auxin. Results presented by Diana Weston of our group indicate that in pea auxin primarily affects gibberellin synthesis rather than gibberellin signal transduction (Weston *et al.*; Abstract PS1003; Root Development).

Water relations received considerable attention. In this context Corinne Jager from Hobart presented evidence that in pea responses to water stress do not involve changes in brassinosteroid content, and furthermore, that changes in abscisic acid level after droughting do not depend on normal brassinosteroid content (Jager *et al.*; PS1307; Abiotic Stress).

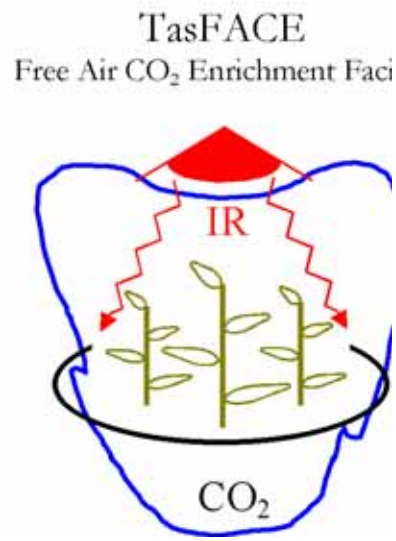
In a fascinating plenary talk, Ottoline Leyser expounded her theory that novel hormones that regulate shoot architecture do so by altering auxin-related processes. This theory has already been challenged by Christine Beveridge's group at the University of Queensland, and there is little doubt that within the polite context of scientific debate, some friction will ensue for the next few years. While both Beveridge and Leyser agree that there are novel branching factors awaiting discovery, they disagree on the extent to which these compounds work through auxin. Resolution of this question will be central to our understanding of how shoot architecture is regulated. At the conference the Hobart group contributed to the branching story by showing that the brassinosteroids and gibberellins, both potent promoters of shoot growth, also affect branching, but with opposite effects (brassinosteroids promoting, and gibberellins inhibiting) (Ross *et al.*; PS0203; Shoot Development).

In general terms, despite some minor organisational hiccups, it was a vibrant and rewarding meeting with excellent opportunities for interactions between attendees.

John Ross
School of Plant Science
University of Tasmania

Hobart hormonologists at the conference. From left: Diana Weston, Laura Quittenden and Corinne Jager.

The TASFACE climate change impacts facility



UTAS
FACULTY OF SCIENCE, ENGINEERING & TECHNOLOGY
School of Plant Science

Australian Government
Australian Research Council

Australian Government
Department of the Environment and Water Resources
Australian Greenhouse Office

The TasFACE climate change impacts facility was established during the 2001/2002 summer and commenced operation in February 2002. Since then it has operated continuously, providing Australia's longest field manipulation of temperature and atmospheric CO_2 concentration. The facility was developed as part of a collaboration between the University of Tasmania and the Italian Institute for Biometeorology (IBIMET). Since then the system has operated with support from the Australian Research Council Discovery Projects scheme and, more lately, with support from the Australian Greenhouse Office.

The TasFACE climate change impacts facility consists of 12 plots randomly arranged in a 2 × 2 factorial design with three replicates of each treatment combination located in a native lowland grassland in the southern midlands region of Tasmania. Elevated CO_2 and warming are applied in 1.5 m diameter circular plots (called rings, Fig. 1) with CO_2 concentration in the elevated CO_2 plots increased to 550 µmol mol^{-1} by pure-CO_2 fumigation **f**ree **a**ir **C**O_2 **e**nrichment (FACE), which operates from sunrise to sunset. The system uses proportional control of CO_2 concentration in the centre of each plot by manipulating CO_2 supply with electropneumatic flow control valves. Valves are controlled via a microprocessor-based control system. CO_2 control is excellent with the central $[CO_2]$ being within 10% of the set-point for 86.7 ± 0.3% of the time (Fig. 2). The pure-CO_2 injection system also ensures that $[CO_2]$ is stable both temporally and spatially. Thus, the plants within the TasFACE experiment do not experience large day-time excursions in $[CO_2]$ that can lead to undesirable effects.

Fig. 1. *The TasFACE facility at Pontville, showing experimental rings.*

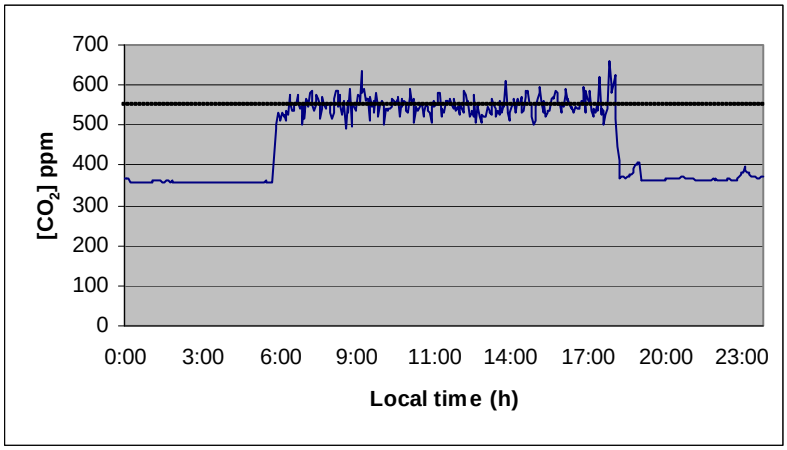


Fig. 2. *[CO_2] in the centre of a ring over a day. The set-point of 550 ppm is shown by the dashed line*

Warming of 2.0ºC is achieved by using overhead ceramic infrared heat lamps that operate continuously, supplying 140 W m^{-2} of infrared radiation. The IR lamps produce no visible radiation and on average during the growing season (April to December), elevate canopy temperature by 1.98±0.05ºC and soil temperature at 5 mm by 0.82±0.04ºC. Night-time warming is more pronounced than day-time because of the influence of direct solar radiation. Thus, canopy temperature is elevated by an average of 1.54±0.20ºC during the day and 2.61±0.14ºC during the night. Similarly, soil warming at 5 mm depth is 1.79±0.10ºC during the night but only 0.14±0.013ºC during the day. Warming and elevated CO_2 treatments interact to affect soil moisture content with the mean soil water potential being higher in warmed plots and lower in elevated CO_2 plots. Differences in soil moisture are most pronounced during periods of intermediate water availability and disappear under wet or dry conditions.

Over the five and a half years since the experiment commenced, we have measured many ecological and ecophysiological aspects of the plants, the grassland community and the ecosystem to warming, elevated CO_2 and their combination. While there isn't the space here to go into all the various details, I'll provide some overview of the responses and some interesting details.

Generally, it is expected that elevated CO_2 should increase the instantaneous photosynthetic rate and therefore the growth rate of most plants. If water is limiting, as it is in this grassland system, then the antitranspirational properties of increased CO_2 concentration should increase biomass production simply by extending the period of sufficient water availability. This often works in the glasshouse and in crop plants, but in the real world of a largely undisturbed ecosystem living with scant nutrients and all the vagaries of the real world, things aren't as simple as all that. We have seen almost no response of biomass production to the treatments.

The grassland at the TasFACE site contains in excess of 60 different vascular plant species but the dominant species are the perennial grasses *Austrodanthonia* spp., *Austrostipa* spp. and *Themeda triandra*. Introduced annual grasses fill much of the gap space between the perennial tussocks with *Vulpia myuros* most abundant and *Briza minor* and *Aira praecox* also being common. Abundant herbaceous dicots include the native species *Calocephalus citreus, Leptorhynchos squamatus* and *Solenogyne dominii* and the introduced species *Hypochaeris glabra, H. radicata* and *Leontodon taraxacoides.* The grassland community also contains the woody species *Hibbertia hirsuta* and *Bossiaea prostrata*, the latter of which is a nitrogen fixing species. Nitrogen fixing forbs, which include *Trifolium subterraneum* and *T. striatum*, are rare and form an extremely small fraction of the biomass. Of the species found so far at the site, only *Themeda triandra* is C_4.

Some of these species have been very responsive to the treatments and others haven't. Flowering, seed production, seed viability, seedling emergence, seedling survival and establishment have all

been affected by the treatments, but the effects have depended very strongly on the species involved. There have also been very few responses that allow species to be grouped along the lines of functional types. So, the result of all these differences in response is that the populations of some species are changing dramatically (Fig. 3). The consequence of effects at the population level is that the treatments alter plant community structure and composition. These changes in the community alter productivity in themselves, so the direct effects of the treatments are confounded by alterations in the botanical composition of the grassland.

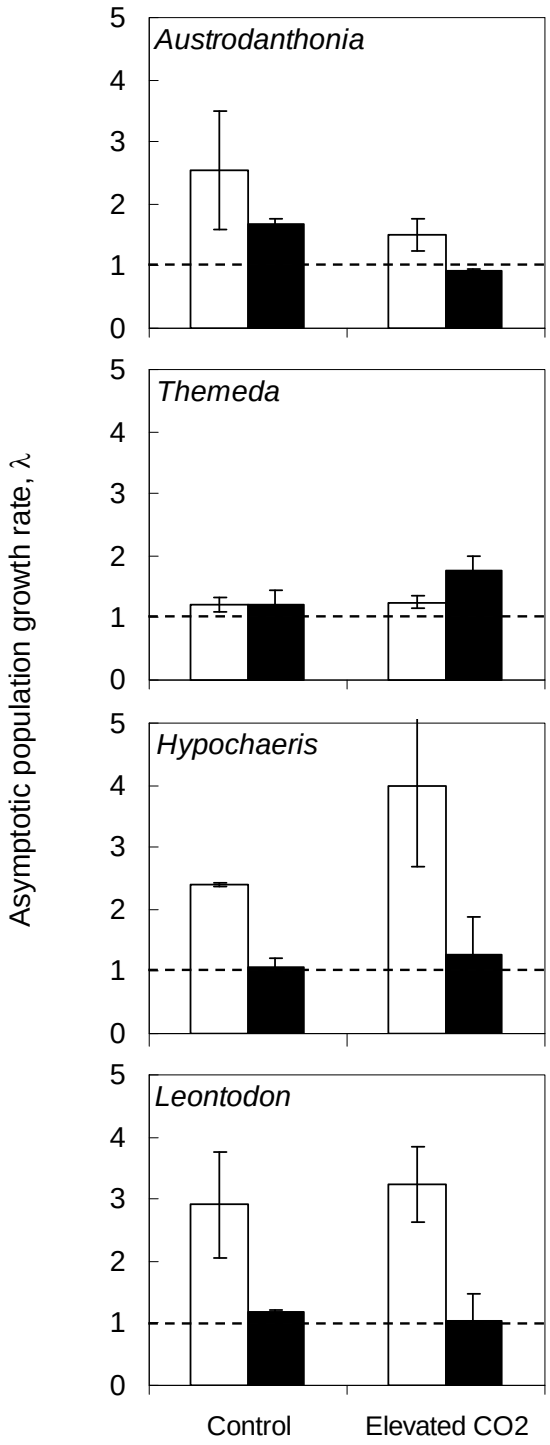


Fig. 3. *Population responses to warming and elevated CO_2 treatment in the TasFACE experiment. The graphs show population growth rate (λ) in unwarmed (empty columns) and warmed plots (filled columns) at either ambient or 550 µmol mol^{-1} CO_2. Values of λ greater than 1 indicate population increase and those less than 1 show population decline.*

Another factor that has affected the productivity response of the grassland to elevated CO_2 and warming treatments is the low nutrient availability in this soil type. A stimulation of biomass depends upon the availability of sufficient nutrients to support the increase in biomass. It has been hypothesised that nutrient limitation, particularly that of N, can inhibit the CO_2 fertilisation effect where legumes don't form a major component. We have evidence to support this proposition, although we have found very interesting interactions between warming and elevated CO_2 on nutrient availability. We are currently investigating nutrient cycling, microbial activity and composition and carbon dynamics of this ecosystem in response to elevated CO_2 and warming.

With support from the Australian Greenhouse Office, we are also embarking on modelling studies of the responses to elevated CO_2 and warming of productivity and nutrient cycling in Australia's temperate grasslands, both native and improved. This work will build on existing information from the TasFACE and the New Zealand Grazed FACE experiments.

As can well be imagined, the amount of data we collect from the experiment is enormous and this depends on the dedicated involvement of many people. Most important amongst these is the work done by the research staff and students, including Herculean efforts from Karen Wills, Jackie Vander Schoor, Amity Williams,

Jasmine Janes, Yui Osanai and Michaela Nolan. This work would also not be possible without the dedicated, friendly collaboration with Dr Paul Newton (AgResearch, New Zealand), Dr Elise Pendall (University of Wyoming, USA) and Dr Pauline Mele (Rutherglen Centre, Victorian DPI).

The TasFACE project has funds to continue operating until the end of 2008 and we hope to extend the timeframe until we have a decade of results. Only long-term responses are really relevant in global change experiments and many of the effects (such as those relating to nutrient cycling) take several to many years to develop. Long-term experiments like this are also exceedingly rare so the information we obtain is vital in understanding the responses of ecosystems to the changing climate.

Dr Mark Hovenden
School of Plant Science,
University of Tasmania

Functional Plant Biology

Spring - 2007 Update

I'm back!

It's official: staying home with two kids is harder than dealing with authors and reviewers every day. Many thanks for a great job done by Acting Editor, Amanda Ellery.

SPECIAL OFFER: FPB 2005-2007 volumes to be **free online** to all for next three months

We are in an exciting promotional phase, during which all papers published in 2005-07 are freely accessible online (for a limited time only). **Please see the ad in this edition of *Phytogen* for more details.**

Open Access

In July, another of the journals published its first Open Access paper. The authors paid a publishing fee of US$2500 for this service. The paper is available without subscription barriers and, while it remains CSIRO copyright, it may be used, copied and transmitted for non-commercial purposes by anyone, subject to acknowledgement of the author and journal. We have put up a page on the website explaining OA to authors. See http://publish.csiro.au/nid/247.htm. There is a link to this page from the 'For Authors' section of the FPB website. Also in our 'Copyright/Licence to Publish' page there is a section explaining what may and may not be done with OA papers. See http://publish.csiro.au/nid/54/aid/4022.htm#1b

The latest Special Issues

We have just published (*FPB* vol. 34 no. 6) a very exciting 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), with Guest Editor Alison Smith. The issue 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. Our next Special Issue will be based on work to be presented at the EcoFizz 2007 conference at Hawkesbury, following ComBio. 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.

CONGRATULATIONS to Rebecca Miller! 2006 FPB Best Paper

The ASPS Executive examined the list of papers published in FPB last year with reviewer nominations for 'Best Paper' (to an early-career researcher), and Dr Rebecca Miller's paper '**Cyanogenesis in the Australian tropical rainforest endemic** *Brombya platynema* **(Rutaceae): chemical characterisation and polymorphism'** with Judy Simon and Ian E. Woodrow. This is now available as a free PDF from the FPB website. More information at http://www.publish.csiro.au/nid/102/aid/2285.htm

Trip report on Plant Biology 2007 in Chicago

This was a lovely trip: the weather was hot, I met Govindjee (first time) and Steve Long (again), and got to be a fly on the wall at the Editorial Board dinner for *Plant Physiology* and *Plant Cell*. The FPB exhibit was also a hit (particularly the Vegemite tasting – people now come looking for it!) and I managed to talk to many current and potential authors and reviewers, and attend some really interesting sessions.

Regards,

Jennifer Henry
Editor, FPB

From Our Seed Banks

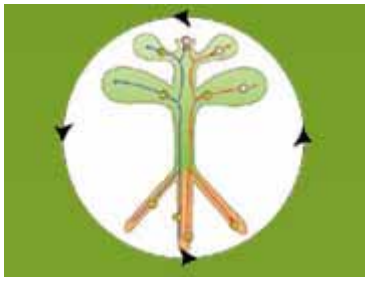
Meeting reports provided by members from around the country

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.

Report of the International Conference on Plant Vascular Biology 2007

Academia Sinica, Taipei, Taiwan, May 7-11.



The first International Conference on Plant Vascular Biology (PVB 2007) was held May 7-11 at the Academia Sinica, Taipei, Taiwan. The conference, organized by Professor Ning-Sun Yang (Academia Sinica) and Professor Bill Lucas (UC Davis), enjoyed the magnificent facilities of the newly constructed Building for Humanities and Social Science on the grounds of Academia Sinica. The atmosphere and facilities of the lecture theatre were more akin to voting on UN Resolutions rather than listening to the latest developments in plant vascular biology, and so everyone lifted to the occasion appropriately!

The conference evolved from the seventh meeting of the Phloem Transport Workshop, held in Bayreuth, Germany in 2003, and was established to bring together for the first time scientists working on all aspects of plant vascular biology. PVB 2007 was attended by some 300 plant scientists from all corners of the world, and thus from this perspective alone it was an extremely successful event. Australian plant science was well represented with talks from John Bowman (Monash), David McCurdy (Newcastle), Peter Gresshoff (Queensland), John Patrick (Newcastle) and Stephen Dibley (Newcastle), and poster presentations from students and staff at ANU, Charles Stuart University, The University of Newcastle and CSIRO Plant Industry (Canberra and Brisbane).

Photograph of the impressive Building for Humanities and Social Science at Academia Sinica, venue for the International Conference on Plant Vascular Biology 2007.

The talks at the meeting were divided into sessions focusing on vascular development, structure-function relationships, environmental influences, local and long-distance communication, transport systems, proteomics and metabolomics, metabolism and nutrition, insect and pathogen challenges, and agricultural and biotech applications. Presentations across the board were all of a very high standard, with two highlights for me being the talk by Patricia Zambryski (UC Berkeley) reporting the discovery of a putative DEVH box RNA helicase which is suggested to regulate the size exclusion limit of plasmodesmata and thus their functions in plant development, and Hiroo Fukuda

(University of Tokyo) describing the identification of TDIF (Tracheary element Differentiation Inhibitory Factor) as a dodeca-peptide related to the CLE family containing CLAVATA3. Wolf Frommer (Carnegie Institute, Stanford) also presented an update on his ambitious project to provide a comprehensive Arabidopsis protein interactome map of all predicted integral membrane proteins (>5,000) and a large number (>1,000) of proteins predicted to be involved in signaling pathways and protein modifications.

The outstanding success of PVB 2007 will ensure that this conference will have a long future as the premier occasion for sharing exciting new discoveries in plant vascular biology. The next PVB conference is scheduled for 2010 at Ohio State University.

Associate Professor David McCurdy
Plant Science Group
School of Environmental and Life Sciences
The University of Newcastle

Travel supported by the ISPMB2006 Awards

Report on the 19th International Plant Growth Substance Association (IPGSA) Meeting

I recently attended the 19th International Plant Growth Substances Association (IPGSA) triennial meeting, held in Puerto Vallarta, Mexico from the 20th to the 25th of July. I was among 5 Tasmanian, and 15 Australian delegates that attended this conference. Overall, the meeting covered topics on the well-known plant hormones auxin, gibberellin, abscisic acid, ethylene, cytokinins and brassinosteroids, as well as some more recently-characterised compounds.

Some of the more popular topics included updates on auxin and gibberellin signalling, the latter of which was of particular interest to myself. Makoto Matsuoka presented a plenary lecture on gibberellin perception and signal transduction in rice, and focussed on how the GA receptor GID1 binds to the DELLA protein SLR1, a process believed to be required for the degradation of DELLA proteins. Another interesting talk was that given by Patrick Achard, who concentrated on the role of DELLA proteins in GA signalling and how this regulates growth. It was quite clear that DELLAs were a popular subject at the meeting, and it was noted that while everyone is in agreement that gibberellins destabilise these proteins, not once was there any mention of this process requiring auxin. This was of particular interest to myself, as a paper (published in *Nature*), noted that auxin facilitates the GA-degradation of DELLA proteins in roots of *Arabidopsis*. In my studies, thus far, I have found no evidence for this interaction in pea roots. On the contrary, I have found that auxin interacts with gibberellins by promoting their biosynthesis. This 'silent' support from the conference gives me more confidence in my findings during my Ph D.

Although the talks were very interesting and widened my knowledge of what is happening in my research area, I also found the interaction between these researchers was of importance. During the conference, I had ample time to discuss my research with many researchers who work in my general area of study. One of these included Jocelyn Ozga (University of Alberta Edmonton, Canada), with whom I was lucky enough to be seated next to at the Mexican Fiesta. Jocelyn's research involves studying the interaction(s) between auxin and gibberellin in the pea pericarp, and thus far, our results appear to be in agreement with each other. I was also fortunate to be able to meet Tai-ping Sun (Duke University, USA), who expressed great interest in my work, and provided me with a few insights into the DELLA proteins, an area in which she has studied extensively. Tai-ping and I have agreed to stay in contact about my future findings. However, one of the most fortuitous communications was with Frank Gubler of (CSIRO Plant Industry, Australia). This proved to be a

very significant contact as I have now organised to go to Frank's lab in Canberra to be guided in some protein expression studies (an area of research I have limited knowledge in). I hope that from this collaboration, I will be able to elucidate whether auxin plays a role in the destabilisation of DELLA proteins in pea roots, and include this finding in the paper I aim to get published in *The Plant Cell*.

Overall, this experience has been extremely beneficial to my PhD, providing me with an insight into studies that are being undertaken in my own area of research, but also piquing my interest in other areas that, before the conference, I had little knowledge of. I believe I made a good impression on the people that I met and represented the University of Tasmania well. Best of all, I am confident that I have formed some great contacts in my area of research, with whom I will be able to collaborate with in my many years of research to come.

Diana Weston
University of Tasmania

IP Roots & Branches

PATENTS, PRIORITY DATES, PROVISIONALS AND PRESERVATION OF RIGHTS.

The generally understood folk-law of the patent world holds that a provisional patent filed in Australia (or elsewhere) provides a priority date that remains available for up to 12 months. Providing an associated "complete" or "international" application is filed within 12 months the priority date of the provisional is retained.

The “breathing space” of 12 months allows the applicant time to organise foreign filings and is also understood to provide additional time to fully "develop" the invention and "fine tune" the work for presentation in the complete or international application.

The genesis of the 12 month grace period is the "Paris Convention" where almost 150 years ago, it was recognised that the simultaneous filing of many patent applications in foreign countries was prohibitive and logistically challenging. Hence, in order to avoid invalidating patents filed subsequently in other countries, Article 4 of the Paris Convention provides:

Article 4A
"*Any person who has filed a patent in one of the member countries shall enjoy, for the purposes of filing in the other member countries, a right of priority for 12 months*".

Article 4B
"*Consequently, any subsequent filing in any of the other member countries shall not be invalidated by any act accomplished in the 12 month interval*".

Article 4C
"*A subsequent application concerning the same subject matter as a previously filed first application, filed in the same country, shall be considered as the first application if at the time of filing the subsequent application, the previous application has been withdrawn, abandoned or refiled without being published and without leaving any rights outstanding or being used as a basis for claiming a right of priority*".

All this is fine providing you file a complete or international application within 12 months of filing your first provisional.

However, things can become complicated when you deviate from this simplified filing regime.

The following examples are based on an interpretation of Article 4C and appear to suggest the following:

Example 1
Sometimes more than one provisional is filed during the 12 month convention period.

A good reason for this is to "top up" the priority date with important developments to the invention during the 12 month period. However, if you wish to "extend" the available 12 months by "dropping" the first provisional it is vital that the first provisional is actively withdrawn before the second provisional is filed. Only in this manner can the “second” provisional acquire the status of “first application filed in a convention country”.

Example 2
Sometimes there are advantages in filing a provisional in the USA rather than Australia.

However, complications can arise as follows:

1) If you then have reason to file a second provisional. In particular, if you decide to file the second provisional in Australia this time. Article 4C states that the second provisional must be filed in the same country if you wish to drop the first and reset the priority date.

2) A similar problem can occur if you wish to file your first provisional in the US; but decide to also file a “backup” provisional in Australia at the same time. Again, when Article 4C is read carefully, such a “safe” filing strategy will prevent you from withdrawing either of those first filings and resetting to priority date

3) Another possible scenario which can result in similar complications is where you decide to withdraw the first provisional and refile in a different country.

In summary, multiple provisional filings should observe the following:

a) Always be made in the same country.

b) If the withdrawal of a first provisional is required, the withdrawal must be done actively and before a second provisional is filed.

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

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.

Did you know....?

- ***Over 1000 citations for AjPP article.*** In May 2007, an AjPP Citation Classic, *AjPP* **9:** 121-137 (1982), received over 1000 citations:

'On the Relationship Between Carbon Isotope Discrimination and the Intercellular Carbon Dioxide Concentration in Leaves'

GD Farquhar, MH O'Leary and JA Berry

Abstract: Theory is developed to explain the carbon isotopic composition of plants. It is shown how diffusion of gaseous CO_2 can significantly affect carbon isotopic discrimination. The effects on discrimination by diffusion and carboxylation are integrated, yielding a simple relationship between discrimination and the ratio of the intercellular and atmospheric partial pressures of CO_2. The effects of dark respiration and photorespiration are also considered, and it is suggested that they have relatively little effect on discrimination other than via their effects on intercellular $p(CO_2)$. It is also suggested that various environmental factors such as light, temperature, salinity and drought will also have effects via changes in intercellular $p(CO_2)$. A simple method is suggested for assessing water use efficiencies in the field.

- ***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***.

- ***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).

TWIGS & BRANCHES

Some News & Comments from the Plant Science World

Ethylene controls root meristem cells.

The quiescent centre in the root meristem of Arabidopsis contains four cells that rarely divide (they are the stem cells). Ortega-Martinez *et al* (*Science* 2007 **317**: 507-10) used a molecular screening approach to identify genes controlling cell proliferation in the meristem. They identified two mutants where the quiescent centre cells divide more frequently and the defective gene encodes ethylene overproducer (ETO1) resulting in excessive ethylene. They then show that ethylene promotes cell division in normal quiescent centres. They conclude with speculation that the ethylene effect is a means by which the plant can respond to environmental cues to enhance root growth and development.

Moonlighting proteins

Moonlighting proteins is a term coined by Jeffery (*Trends Genetics* 2003 **19**:415-7) to describe proteins that have dual functions; one of which may be obscured or hidden. Kwezi *et al* (*PLoS one* 2007 **2**: e449) used a catalytic search strategy to identify additional guanylate cyclases (the enzyme that converts GTP to cGMP) and found a surprising number of candidate molecules in Arabidopsis. Several are annotated as leucine rich repeat receptor like kinases (LRR LRKs) including AtBRI1 (brassinosteroid receptor). They went on to show that recombinant AtBRI1 protein fragment containing the catalytic GC domain formed cGMP in vitro. These findings raise intriguing questions about the whereabouts of GC domains (hidden in other proteins) and their functionality (in vivo role). Both of which may be higher than previously predicted.

Getting down to the channels

Ion fluxes and currents across membranes need to be measured simultaneously to determine selectivity and stoichiometry of transporters and channels. Gilliham *et al* (*Plant J* 2006 **46**: 134-44) demonstrate how this can be done using patch clamping and ion selective microelectrodes. Interestingly, they observed that Ca^{2+} fluxes in the wheat root protoplasts were often large but not electrogenic indicating that they were coupled to compensatory charge movements. Hence it is important to measure both flux and currents to properly study Ca^{2+} transport mechanisms.

Funky green fluorescence

Chlorophyll fluorescence emission is used to assess the status of photosystem II and its use has risen with the increase of portable field fluorometers. Logan *et al* (*Funct Plant Biol* 2007 **34**: 853-9) provide some highly useful advice on how to avoid common pitfalls in using and interpreting data from these devices. Well worth reading.

Helen Irving

UPCOMING CONFERENCES

UPCOMING CONFERENCES

ComBio2007

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

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

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

2008

12th International Lupin Conference

Fremantle, Western Australia

14-18 September 2008

Convenors: Mark Sweetingham and Jon Clements

www.lupins.org