PHYTOGEN

A
NEWSLETTER
FOR
AUSTRALIAN
PLANT SCIENTISTS

Volume 14 Number 1
April 2012

PHYTOGEN

Volume 14: Number 1

In This Issue

Thanks to all the contributors for being prepared to give their time to provide informative articles for this issue of Phytogen.
It takes something extra to make these contributions.

AUSTRALIAN SOCIETY OF PLANT SCIENTISTS

President's Report April 2012

The new council is now well and truly in place. I want to just take a moment here to again thank outgoing executive members Rana Munns (Past President) and John Evans (Hon Secretary). These two have been stalwarts of the Society and have contributed a huge amount over the years. Thank you to John for staying on as the Public Officer (that's a paper work thing). Thank you to Rana for continuing to stay on the executive as "President's brains trust" for 2012. At the moment it is really up to the discipline reps themselves how much they do, unless the executive makes particular requests. As a society we could make better use of this network. One option would be to set up Discussion Forums for special interest groups on our website, but I'm open to any other suggestions.

We recently asked all the councillors for feedback on what does and doesn't work on our rather static website. The reason it is static is that it is not straightforward to change anything. I don't know about you, but I like to be able to do things the moment I think of them (e.g. posting notification of conferences) rather than having to email a Web Master. That is one reason why I set up FaceBook and Twitter @ASPS_Ozplants (#plantscience, #ozplants). We are now setting up a new webpage that will have feeds from Twitter and FaceBook so all information can be in the one place, and be constantly updated. Twitter, I have discovered, is not necessarily about reading about what celebrities eat for breakfast - mostly it is a comment and a web link, a bit like a list of headlines. Another part of the new webpage will be a repository where we can store our society memory, and not have to call up Rana or John ☺. Rob Shepherd, our executive assistant, is putting it together and we hope to be able to go live sometime in June.

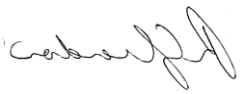
The most important task for the Council is the make sure our annual meeting runs well and has symposia of interest to our members. Organisation is well underway for ComBio 2012 in Adelaide in September. This year we are combining with the New Zealand Society of Plant Biologists and the Australasian Plant Pathology Society (Molecular and Physiology Special Interest Group) as well as the usual biochemists, molecular biologists (ASBMB) and the cell and developmental biologists (ANZSCDB), so the program will be rich and interesting. I am really keen on ComBio being more inclusive like this. The plant science community is not large, and we really need to stick together if we are going to have an impact.

The motto of the Global Plant Council is "*Plant research to save the planet*". Our representative on the GPC is Barry Pogson. Their first significant activity is International Fascination of Plants Day on 18th May 2012. Thirty-eight countries are now registered for the day. You can see a listing of what is happening around Australia on the webpage: www.plantday12.eu/australia.htm. The ASPS is marking the day with a photo competition, and a series of commissioned articles. To enter the photo competition just post your photo of a fascinating plant to the Wall of our webpage (Australian Society of Plant Scientists), and get all your friends and colleagues to click "Like". The three photos with the most "Likes" on 18th May midday will be the winners. There are three beautiful books to be won. *Out of the Scientist's Garden* and *Australasian Nature Photography* have been kindly donated by CSIRO, publishers

of Functional Plant Biology. The third book *Genome Generation* has been donated by the author, Elizabeth Finkel. So far there have not been a lot of entries, so your chances of winning are high!

Finally, thank you to Tina Offler for putting the newsletter together.

Best regards,



Ros Gleadow
ASPS President

Message from the President Elect – Tim Colmer (UWA)

I thank Ros Gleadow and the Executive Team of ASPS for their warm welcome as President Elect. More importantly, I thank Ros and the Team for their work to guide our Society in recent years.

I look forward to working together with the Executive Team, our Discipline Representatives, and members, to continue delivery of benefits of our Society to us all as members. This will involve a major role in organising ComBio 2013 to be held in Perth, and I thank Hans Lambers for agreeing to join me on the main ComBio 2013 Organising Committee. I also thank the many other Perth-based plant scientists who have already shown a keen interest to become involved in ComBio 2013.

More generally, continuing the tradition and good functioning of our inclusive Society will also be an important role for me and the Executive Team, when I am President. ASPS promotes plant sciences in Australia, provides professional opportunities (e.g. conferences, lectures, teaching resources, awards), and plays a key role in networks of our members in Australia and beyond. The strong history of ASPS, and contributions of our members to worldwide knowledge of plant sciences, is recognised internationally by our peers – plant scientists from other countries. Of particular interest to me, and of great importance to the future of ASPS, is the critical role in enhancing opportunities for early-career researchers in the plant sciences in Australia.

I look forward to catching up with many of you at ComBio 2012 in Adelaide, during September 2012.

Tim Colmer

ASPS COUNCIL MEMBERS – 2012

Executive:		
President	Ros Gleadow	Monash University
President Elect	Tim Colmer	University of Western Australia
Honorary Secretary	Christine Beveridge	University of Queensland
Honorary Treasurer	Helen Irving	Monash University
Discipline Representatives:		
Genetics & Molecular Biology	Oliver Berkowitz	Murdoch University
Cell Biology	Zhonghua Chen	University of Western Sydney
Plant Microbe Interactions	Uli Mathesius	Australian National University
Whole Plants	Tim Cavagnaro	Monash University
Plant Development	Jim Reid	University of Tasmania
Environmental & Ecophysiology, Global Climate Change	Belinda Medlyn	Macquarie University
Plant Science Education	Kathleen Soole	Flinders University
Student Representative	Jessica Bovill	ACPFG, Adelaide
Public Officer	John Evans	Australian National University

ASPS SUB-COMMITTEES

FASTS Representative & Global plant Council	Barry Pogson	Australian National University
Phytogen Editor	Tina Offler	University of Newcastle
Functional plant biology Editor in Chief	Rana Munns	Functional plant Biology

SUPPORT SERVICES

Webmaster	Michael Major	Michael Major Media Pty Ltd, Adelaide

A message from the editor

Dear Fellow ASPS Members,

This, the first Phytogen for 2012, contains some great articles and some new activities for Plant Science together with 'ideas' for the society to consider.

First we all need to be aware of '*Fascination of Plants Day'* on May 18, an initiative of the Global Plant Council and supported worldwide. Both Ros and I have some *'ideas'* for you to consider – the website and rapid dissemination of information – see Ros's President's Report, and creating an 'ASPS Family Tree' – see my Historical Perspectives section. Our president-elect, Tim Colmer has a message for you and of course there is a lot of information about *Combio 2012, Adelaide* – an exciting program is promised and of course in a special city.

To continue our '*Some Highlights from Combio2011'* our Goldacre and Teaching award winners Chanyarat Paungfoo-Lonhienne and Gonzalo Estavillo have provided articles about their research and teaching. Gonzalo Estavillo's article is a 'must read' for all academics using Arabidopsis as a teaching tool. In *'Our new PhDs'* section Sarah Rich has written an interesting and comprehensive account of her research on aquatic adventitious roots undertaken at UWA. Queenslanders under the editorship of Ian Godwin have added a touch of humour to their fascinating science for this issue's *'State of Affairs'*. Western Australians it is your turn next!!

A very sincere thanks to all who have contributed to this issue. As always, any suggestions for articles, and of course contributions – book reviews, reports, significant issues for plant science, education issues, are most welcome. I have a couple of offers already for the next issue but am looking for more.

I hope you all find something of interest in this issue.

Tina Offler

Remember 18 May this year is:

International Fascination of Plants Day

This day is a new endeavour by plant scientists to raise awareness of the importance of plants

This event is an initiative of The Global Plant Council. Thirty-eight countries are now registered for the day. Our Australian organisers have provided the following information about

Fascination of Plants Day in Australia

Why do you find plants fascinating? And how would you explain that in a video?
These are exactly the questions that Australian secondary students are asking themselves before Fascination of Plants Day as they prepare their entries for a national video competition. But they aren't the only ones who will be thinking about plants this May.

On 18 May 2012, and in the week around this day, over 30 countries worldwide will celebrate Fascination of Plants Day. The day is being organised by the European Plant Science Organisation to promote the importance of plants and plant science worldwide.

Australian plant scientists from around the country are organising events to showcase why plants are fascinating. From getting hands on with salt-tolerant samphire plants, to a lecture on 3-D plant imaging and a tour of a permaculture garden, the activities for Fascination of Plants Day are sure to give Australians a new insight into plants.

One national event is a video competition for high school students. Students who make the best videos about plants and plant science have the chance to win $1000. They will make videos up to 3 minutes long, and upload them on YouTube. They then enter the competition at **www.acpfg.com.au/videocomp** The entries will be judged by a panel of science communicators with interests ranging from plant science to science video production.

A full list of Australian Fascination of Plants Day events can be found at
http://www.plantday12.eu/australia.htm

If you would like to run an event and advertise it on the Fascination of Plants Day website, please contact Dr Monica Ogierman the Australian co-ordinator of Fascination of Plants Day by emailing **monica.ogierman@acpfg.com.au** Monica is based at the Australian Centre for Plant Functional Genomics. She is working with Dr Arwen Cross and Ms Alison Hay to organise the Fascination of Plants Day video competition, and to compile information about events organised by other Australian organisations for Fascination of Plants Day.

Like Ros Gleadow in her President's report, I strongly encourage you to go to the website and "get involved" in this event. The "Girls in the glasshouse" below are the Australian Fascination of Plants Day committee: Dr Monica Ogierman, Ms Alison Hay and Dr Arwen Cross.

Tina Offler

State of Affairs – Queensland

Queensland – "beautiful one day, perfect the next"

Yes Queensland certainly is a great place to be a plant scientist. The fact that most of the plant scientists featured here are from other parts of the country, or from outside Australia is testimony to that. Unlike totally mobile mammals, the plants in Queensland have to put up with what nature throws at them. Whether that's the rich and deep volcanic soils of the Darling Downs, or some of the most inhospitable salty stuff in the dry tropics that even the most devoted would struggle to describe as soil, it's all here. And like the rest of Australia we have droughts and flooding rains too.

From Coolangatta on the border with … (what's that place below us on the map, I can never remember) right up north to the Torres Strait it's over 3,000 km. So as well as the famous tropical rainforests, there is savannah, eucalypt forest, deserts, sub-tropical and temperate environments. We even have an outcrop of Antarctic beech in Lamington National Park. Our most productive crop, sugarcane, grows in the wet tropics and the dry tropics. What's the difference? Well, in one you are irrigating like water came free from the heavens. In the other you are implementing drainage systems the Dutch would be proud of, to get that 4,000+ mm of annual rainfall off the land as quickly as you can. Agriculturally we grow the whole gamut of tropical, sub-tropical and temperate fruits, as well as winter and summer cereals, winter and summer pulses and winter and summer oilseeds. Queensland is home to Australia's only significant contribution to the world food supply – the macadamia. And nobody who has been to plant science lectures in Queensland can ever forget that C4 photosynthesis was discovered right here in Brisbane.

Plant Science research and training is flourishing at the universities (Queensland, QUT, Griffith, James Cook, Sunshine Coast, Southern Queensland, Central Queensland), and also within a number of CSIRO Divisions and the State Department of Agriculture, Fisheries and Forestry. The Queensland government, with its "Smart State" initiatives in the early 2000s, invested significantly into sciences. Plant sciences, as a key science underpinning agriculture and environment, has benefitted significantly from some of these initiatives.

So whether you are a plant scientist wanting to conserve rainforests, understand how plants and plant communities work, access them for natural products or germplasm for plant improvement programs, Queensland has it all here waiting for you. Plant sciences are flourishing and are an extremely vibrant part of the Queensland scientific community. I hope this small sample of interesting research profiled in the following pages will showcase some of the excitement that makes us all get out of bed every day (and an hour later because we don't do daylight saving).

Ian Godwin
The University of Queensland

The State of Plant Science

Queensland 2012

Alison Shapcott (Genecology, University of the Sunshine Coast)

Conservation genetics research at the Genecology research group

The plant conservation genetics group is part of the USC's Genecology research group which focuses on research that integrates genetics, ecology and physiology. It is led by Dr Alison Shapcott who has been working in this field for over 20 years.

The group is currently undertaking a range of projects many of which focus on threatened species and integrate ecology and genetics studies to advise for conservation and restoration actions including species reintroduction and translocation projects. We utilise habitat and dynamic population modelling, demographic surveys and population genetic studies and studies also investigate climate change impacts.

Collecting endangered palms in Madagascar

Current reintroduction projects include *Macadamia jansenii* which is a collaboration with the Australia Macadamia Society, National Parks and Traditional owners. Recent projects include several collaborations with Royal Botanic Gardens Kew, UK to work on endangered palms in Madagascar and Lord Howe Island.

Collecting threatened palm species on Lord Howe Island, NSW

We are currently expanding our focus by undertaking a SE QLD rainforest plant barcoding project in collaboration with the Qld Herbarium and the Smithsonian Institute Natural History Museum Washington DC, USA where we aim to barcode all SE Qld rainforest plants.

Interested in more info? Please contact me on: ashapcot@usc.edu.au

Milos Tanurdzic (Biological Sciences, University of Queensland)

Epigenetic Regulation and Inheritance in Plants

I am a new academic in the School of Biological Sciences having moved here to start my own research group at the end of 2011. My interests are focused on the role and mechanisms of epigenetic regulation and epigenetic inheritance in plants. To address these questions, we utilize genomic technologies, in particular next generation sequencing and bioinformatics and the model plant *Arabidopsis thaliana* and its relatives.

Our current knowledge on epigenetic inheritance is dotted with examples of epigenetic phenomena in gene regulation, genome stability, and heritable changes in plant phenotype without underlying DNA changes, but the mechanistic nature and the extent of these phenomena in plant biology remains poorly understood.

Our recent discovery or heritable epigenetic variation in plants and availability of genome-wide DNA methylation profiling technology remains a research focus in the lab. We are particularly interested in the role DNA methylation plays in DNA recombination in plants. Heavily methylated regions of the genome, like heterochromatin, have long been known to recombine less frequently than the rest of the genome, so we are looking into whether the same logic applies to genes which are methylated, a discovery we made several years ago while I was a postdoc with Rob Martienssen. We are also pursuing

Next Generation Sequencing is revolutionizing genomics and epigenomics and plants lead the way.

Milos Tanurdzic out in "the paddock" – a field of model plants

research projects investigating the roles of small RNA and various RNAi pathways in affecting genome stability and non-additive transcriptome responses in plant hybrids, presently in Arabidopsis, but we are expanding this research direction into epigenetics research in crops. Do you know of a motivated Honours or PhD student interested in plant epigenetics? Are you looking for a postdoctoral project to work on plant genomics and epigenetics? Give us a call: tanurdziclab@gmail.com

Josh Mylne (IMB, The University of Queensland)

An apprenticeship in biochemistry

It was just over six years ago I left my post-doc position in *Arabidopsis* developmental molecular genetics and epigenetics at the John Innes Centre in the UK to join the Institute for Molecular Bioscience (IMB) at The University of Queensland. Under the wing of drug designer and peptide chemist Prof. David Craik and with support from the IMB and an ARC QEII Fellowship, I've had the opportunity to learn new skills in biochemistry, start collaborations in evolutionary biology and build a small plant biology 'oasis' in the middle of a biomedical setting.

The most interesting finding to date has been the discovery of the biosynthetic origin and processing of a small peptide ring from sunflower seeds called SFTI. For me what was so interesting is the way the protein sequence for SFTI was unexpectedly buried within an unrelated protein – a precursor protein for a napin-type seed storage protein albumin. Seed storage proteins accumulate to high levels in seeds and are broken down during germination for their nitrogen and sulphur.
In the 90's a lot of work was done on the processing of seed storage proteins by Ikuko Hara-Nishimura and colleagues. We extended this work by studying the processing of SFTI and how it emerged from its precursor protein PawS1. We showed PawS1 was matured into albumin – a process that uses an endoprotease called asparaginyl endopeptidase. Using *Arabidopsis* mutants we showed this same enzyme

was required to mature SFTI from PawS1. We also created a series of over two dozen mutations in PawS1 which we expressed in plants to reveal the residues critical for processing SFTI.
We referred to the way seed storage albumin and its processing machinery was being used by this 'extra' bit of adjacent protein sequence as 'protein hijack'. It prompts many questions, but particularly where did this extra piece of protein sequence come from and is protein hijack more common than we might think?

I found combining the tools of biochemists (mass spectrometry, targeted proteomics, recombinant protein production) with molecular genetics approaches (*Arabidopsis* transgenesis, genetic mutants, gene cloning) to be an especially powerful way to study biosynthesis and would encourage anyone to consider juxtaposing stints in completely different research environments. From within IMB's Division of Chemistry & Structural Biology (with help) I have also been able to crystallize an *Arabidopsis* protein, learn triple resonance nuclear magnetic resonance (NMR), the intricacies of HPLC, manipulating 3D protein structures ... I even make my own C18 for flash chromatography!

It has been fun to go from not being absolutely sure what the 20 amino acids were (seriously who is going to remember glutamic acid is E) to being familiar with all their side chains and regularly bandying about terms like thioester, carbonyl carbon and protonation. I am becoming increasingly interested in the genetic events that evolve new proteins. Prof Craik and I currently have another manuscript being

considered which shows that the biosynthetic route that we characterized so well for sunflower PawS1 is being used by several unrelated types of peptides and their precursors from phylogenetically distant plant families. It suggests we have in fact stumbled upon a very interesting case of biochemical parallel evolution. For more details including current grants, active projects and a full list of publications see www.mylne.org or www.imb.uq.edu.au/mylne

Suggested reading: Mylne et al. (2011) Albumins and their processing machinery are hijacked for cyclic peptides in sunflower. *Nature Chemical Biology* 7: 257-259. Mylne & Wigge (2011) Florigen takes two to tango. *Nature Chemical Biology* 7:665-666.

Graeme Hammer (Centre for Plant Science, QAAFI, The University of Queensland)

Connecting crop physiology with crop improvement

Graeme Hammer is the Director of the Centre for Plant Science, which is part of the UQ-Qld government Queensland Alliance for Agriculture and Food Innovation (QAAFI). Graeme obtained Bachelor degrees in Science (Forestry) (Univ of Melb) and Arts (Mathematics) (Univ Qld) before completing a research masters on forest growth modelling (Univ Melb) and a PhD in crop physiology and modelling (Kansas State Univ).

Graeme conducts research on the physiology and genetics of complex adaptive traits in field crops with a focus on water productivity in cereals. His research underpins the development of mathematical models of crop growth, development and yield that enable simulation of consequences of genetic and management manipulation of crops in specific target environments.

This provides unique opportunities to:

- Aid crop management and design for enhanced production in water-limited environments;
- Enhance the utility of genomics capabilities in molecular breeding for drought adaptation;
- And, identify avenues to cope with climate risk and adapt to climate change in field crop production.

In the photo Graeme Hammer is leading a discussion at a sorghum research field day. Graeme's interests are focused on the major cereal crops: sorghum, maize and wheat. His expertise in crop ecophysiology and modelling enable Graeme to investigate traits and management systems that have the potential to deliver productivity gains in water-limited production environments. He collaborates closely with plant breeders, geneticists, molecular biologists and agronomists in a range of national and international research projects in both public and private sectors.

His research has focussed on traits and management systems that influence resource capture and resource use efficiency, including tillering and canopy development, root system architecture, maturity, carbon and nitrogen partitioning, light use and transpiration efficiencies. The detailed understanding that transpires from such work can generate approaches to phenotyping that provide avenues for linking with advanced approaches to molecular breeding and crop improvement.

Graeme with David Jordan, QAAFI sorghum breeder

This research approach and some of the applications are summarized in –
Hammer, G.L. et al. (2010). Adapting APSIM to model the physiology and genetics of complex adaptive traits in field crops. *Journal of Experimental Botany*, 61:2185-2202.
Hammer, G. et al. (2006). Models for navigating biological complexity in breeding improved crop plants. *Trends in Plant Science*, 11: 587-593.

Graeme's e-mail is: g.hammer@uq.edu.au

Anne Rae (CSIRO Plant Industry)

Sugarcane Research at CSIRO Plant Industry

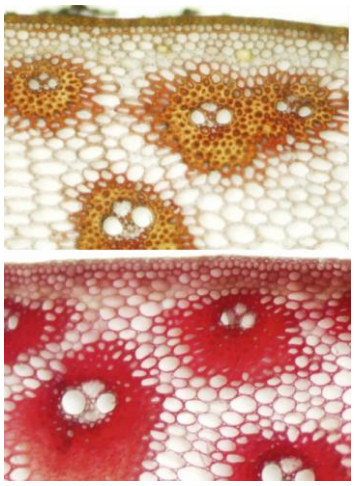
The Sugarcane Improvement group at CSIRO Plant Industry in Brisbane is a well-integrated team of senior scientists, postdoctoral fellows, technical officers and students. Led by Dr Anne Rae, the group uses a range of techniques to understand the growth of the sugarcane plant and apply this knowledge to the development and selection of more productive varieties. Our projects are concentrated into three major themes; sugar accumulation, genome science and GM regulation.

Anne Rae, CSIRO Sugarcane Improvement

Sugarcane is remarkable for its ability to accumulate large amounts of sucrose and biomass. The mechanisms that underpin this highly effective carbohydrate biosynthetic and storage metabolism have been a focus of research for the group for many years. Starting from a functional genomics perspective, we have characterised the membrane transporters responsible for transferring sugars between compartments and identified potential control points for carbon flux. Working with partners, BSES Ltd, we have also investigated the genetics and biochemistry of fibre composition, highlighting varieties that would be more productive as a biomass crop.

Graham Bonnett and Anne Rae collecting sugarcane seeds from a field site in north Queensland

Sugarcane has the most complex genome of all crop plants. Commercial varieties are hybrids between two species and are highly autopolyploid with variable numbers of chromosomes ranging from 100 to 120. Our group has developed a high-density genetic map of sugarcane and is now working with an international consortium to produce the first genome sequence. Using a combination of whole genome shotgun and BAC sequencing, the genome sequence will allow us to identify the genes underlying quantitative trait loci and give us the tools to explore, for the first time, the control of gene expression in a complex polyploid.



Sections through the sugarcane stalk stained to highlight the lignin content of the cell walls

As in many other crop species, genetically modified (GM) varieties of sugarcane are forecast to improve profitability by reducing input costs, increasing product yield or introducing novel products. GM varieties of sugarcane are under development in Australia and overseas. However before these can be grown commercially they will need approval from regulatory authorities including OGTR and FSANZ. The CSIRO group has been working to provide baseline data on the reproductive biology and composition of sugarcane which can be used for comparison during the assessment of GM sugarcane. The group has shown that hybrid seed can be formed in commercial fields and we are now testing the factors that limit germination and establishment.

The research topics described above, led by Dr Karen Aitken, Dr Rosanne Casu, Dr Graham Bonnett and Dr Phillip Jackson showcase our approach of integrating fundamental science with application in sugarcane genetics and breeding. There are exciting times ahead in sugarcane research, as new technologies revolutionise our understanding of this complex crop plant.

For more information, contact Anne Rae on (07) 3214 2379 or anne.rae@csiro.au

Pete Prentis (Queensland University of Technology)

Plant evolutionary genomics at QUT

The research in my group employs a combination of high throughput genomics, bioinformatics and field experiments to address fundamental questions in plant evolutionary biology. The questions my group are currently investigating include the role of genome evolution in plant speciation, the relative influence of the landscape and environmental conditions on gene flow and local adaptation in widely distributed plants and how species persist in human modified landscapes.

Pete Prentis in his lab at QUT, Brisbane

Recent research in the lab has been using next generation sequencing and genomic techniques to examine the influence of local adaptation and speciation on the genome of island plant species. Determining which genes and environmental factors are responsible for rapid adaptive radiations on islands is a significant and largely unanswered question.

Southwest Pacific Islands are an ideal setting to study the role of genetics and ecology in species diversification because of their small size, their diverse and unique flora and the strong ecological and environmental gradients that occur across many islands. This project is using genome wide patterns of genetic diversity to identify genes that show molecular signatures of local adaptation using an analysis technique specifically designed to identify the ecological variables that are responsible for local adaptation. A preliminary paper on speciation in island plants, Diversification history and hybridisation of Dacrydium (Podocarpaceae) in remote Oceania, was published in the *Australian Journal of Botany*.

Pete can be contacted at p.prentis@qut.edu.au

Melissa Fitzgerald (Agriculture and Food Sciences, University of Queensland)

Metabolomics at UQ

At the end of 2011, I vacated my office as head of the Grain Quality and Nutrition Centre at the International Rice Research Institute in the Philippines to join UQ as Professor and Australian Food and Grocery Chair. I bring with me my interest in rice quality, and rice will form the launching pad for my move over to metabolomics, an exciting new discipline for illuminating that dark space between the genotype and the phenotype. That space is buzzing with compounds that are produced from expression of the gene, and that may stand alone as a phenotype or contribute to a biochemical pathway, which subsequently leads to a phenotype.

Our recent research on rice from many countries of the rice-growing world shows that many compounds can be found in the polished grains that affect taste, flavour and that participate in many pathways of physiology leading to human health. Using the new genotyping tools available for rice, we showed that the genome (defined by 1536 SNPs) associates very nicely with complete metabolome of the grain, showing that we can use metabolomics data as a new plateau of phenotyping data to associate in mapping populations, to come closer to defining the sensory and nutritional quality of rice.

The new metabolomics capacity I am establishing at UQ will be widely used on a range of plant and food samples. My group will focus on defining the compounds of flavour, aroma and nutritional value in different populations of rice, and identifying QTLs for those compounds using SNP profiling and next generation sequencing. We will also be investigating metabolites in blood after people consume rice or other foods of low glycaemic index and/or elevated resistant starch. As time moves on, and my linkage to rice starts to fade, I will be moving into more diverse projects focussed on a range of plant foods, with emphasis on metabolomics for nutrition, quality, taste and flavour, coupled with plant physiology and biochemistry. The ultimate aim of my group is to stay as close as possible to the forefront in providing new generations of phenotypic data and phenotyping tools in order to make the best use of the genotyping tools.

A few relevant papers:

Boualaphanh, C, D Daygon, M Calingacion, Jirawat, D Jongithoon, R Mumm, R Hall, and Fitzgerald M. 2011. Use of new generation SNP genotyping for rapid development of near-isogenic lines in rice. Crop Science 51: 2067-2073.

Calingacion, M, C Boualaphan, D Daygon, R Anacleto, B Biais, C Deborde, M. Maucourt, A Moing, R Mumm, C. H. Ric De Vos, Erban A, T Hansen, K Laursen, J Shoerring, J Kopka, R Hall, and M. Fitzgerald. 2011. A metabolomics approach to identify new traits of rice quality in traditional and improved varieties of Laos. . Metabolomics.

Fitzgerald, M., J Concepcion, S. Rahman, A. Resurreccion, Bird AR, and Morell MK. 2011. Identification of a major genetic determinant of glycaemic index in rice. Rice 4: 66-74.

Bergman, S. D. Indrasari, T. Herath, R. D. Hall, H-H Lee, F. Habibi, P. Bassinello, E. Graterol, J. Ferraz, and M. A. Fitzgerald. in press. The potential of rice to offer solutions for malnutrition and chronic diseases. Rice.

Melissa can be contacted via e-mail: m.fitzgerald2@uq.edu.au

AAS Fenner Medal : Congratulations

Congratulations to ASPS member Harvey Millar (University of Western Australia), this year's winner of the Australian Academy of Science Fenner Medal for distinguished research in biology (excluding the biomedical sciences).

Professor Millar's research focuses on energy production in plants and how the process of respiration is affected by harsh climates. His work has shown how respiration can be protected in plant cells during environmental stress, how production of the antioxidant vitamin C is controlled in plants, and how the complex links between respiration and plant growth can alter plant yields. His discoveries underpin our understanding of respiratory damage in cell ageing and disease, relevant to both plants and animals.

It is fantastic to see one of our members recognised with such a high profile national prize. Harvey won the prestigious ASPS Goldacre Award in 2003.

OUR SOCIETY
AN HISTORICAL PERSPECTIVE

Introducing an Idea – An ASPS Family Tree

This is not a particularly new idea but one that has sat in abeyance since the Society's Golden Jubilee.

We all belong to biological families and many people spend much effort to trace their ancestors. They find out who they were, where they came from, their professions, their partners and children. We, the members of ASPS, also have a family tree of supervisors and mentors who have been instrumental in shaping our careers. The *'Idea'* is to document this *ASPS Family Tree*. With Ros Gleadow's enthusiasm and suggestions for revamping the ASPS website perhaps we can set up a mechanism for members to help build this idea into a reality.

In the first instance I would like to hear your perspectives on this idea by e-mailing me at:
tina.offler@newcastle.edu.au

I have prepared a table of a **small part** of the information collected at the Golden Jubilee Dinner using the foundation members of the Society as starting points (see next page). It is **NOT** complete and **NOT** necessarily accurate as some of the entries are not clear. I have put it together as an indication of the information we might gather and compile as a family tree and I haven't tackled Bob Robertson's sheet!! AND of course we have not all descended directly from the foundation members.

An interesting idea? Could it be done? Is it worth doing?

Tina Offler
Phytogen Editor

Foundation Member	First Generation	Second Generation	Third Generation
Alan Walker	Peter Ryan (PhD)		
	Steve Tyerman (PhD)	Megan Sheldon (PhD)	
Joe Wood	Peter Brownell (PhD)	Joe Holtum (PhD)	
		Stuart Boag (PhD)	
		Chris Grof (PhD)	
Don Adamson	Ray Rose (PhD)	Kim Nolan (PhD)	
	Rana Munns (Tutor)		
	Barry Pogson, Ian Newman, John Patrick (undergrad)		
D. J. Carr	Robyn Overall (PhD)	Leila Blackman (PhD)	
	Margaret McCully (PhD)		
	Ian Wardlaw (PhD)		
	TJ Higgins (PhD)		
	Don Gaff (PhD)		
	Rosemry White (Technician)		
Hal Hatch	Tony Ashton (QE II)		
	Bob Furbank (QE II)		
	David Day (QE II)	Susan Howitt (PhD)	
	Colin Jenkins (Post-doc)		
	John Andrews (PhD)		
Hank Greenway	Rana Munns (Postdoc)		
	Brian Atwell (PhD)		
	Tim Colmer (Honours)		
Joe Wiskich	David Day (PhD)	Kathy Soole (PhD)	Crystal Sweetman (PhD)
			Crista Burbidge (PhD)
			Chevaun Smith (PhD)
		Harvey Millar (PhD)	
		Patrick Finnegan (Postdoc)	
	Di Millard (PhD)		
	Ian Menz (PhD)		
	Ian Dry (PhD)		
	Simon Robinson (PhD)		
	Brent Kaiser (PhD)	Megan Shelden (PhD)	

From Our New PhDs

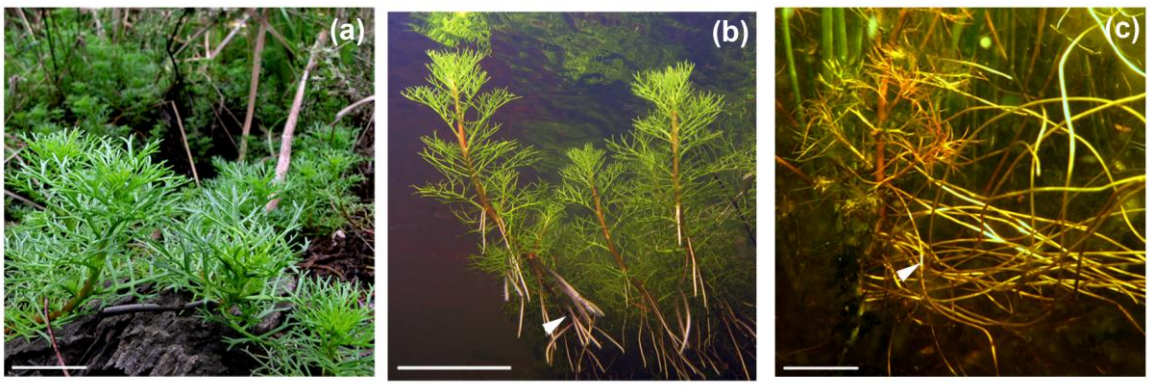
Our recently completed PhDs who are the future of plant science and our society are encouraged to provide highlights of the research that earned them their new degree. Supervisors please encourage your graduating PhDs to contribute to this section of Phytogen.

Tina Offler

Aquatic adventitious roots: growth and internal O_2 dynamics during partial and complete submergence of shoots

Sarah Rich

Flooding of the plant environment, to either the soil surface (waterlogging) or above (submerging part, or all, of the shoot), is a stress faced by many terrestrial plants worldwide. Plant roots are severely affected by flooding, as inundated soils quickly become anaerobic as O_2 is utilised by roots and micro-organisms, and the low solubility and slow diffusion of O_2 in water impedes re-oxygenation. This anoxic soil environment results in roots becoming reliant upon the shoots as a diffusive source of O_2. Partial or complete shoot submergence further heightens root stress as gas exchange to the shoot is inhibited and the resultant decrease in photosynthetic rates can reduce both plant carbohydrate status and shoot to root O_2 movement. These environmental challenges adversely affect growth and survival of most terrestrial plants during a flooding event, however, species from habitats experiencing frequent flooding have evolved numerous traits, allowing them to survive and even flourish under flooded conditions. One of the common morphological responses to flooding is the growth of new adventitious roots. Adventitious roots resulting from flooding can grow down into surface sediments or remain suspended in the water column and it is these aquatic adventitious roots which were the focus of my PhD research.



Meionectes brownii; (a) terrestrial form, (b) recently submerged plants with new aquatic root growth (arrowhead), and (c) a shoot submerged for several months, showing extensive aquatic root growth (arrowhead). Scale bar =50 mm.

Although the growth of aquatic adventitious roots is a common plant response to shoot inundation, our understanding of these roots is limited. It is also widely acknowledged that O_2 deficit is one of the major stresses to flooded plants and therefore, the overall aim of my thesis was to elucidate the sources of O_2 to aquatic roots, and the overall O_2 status of these roots under various conditions. I was particularity interested in the O_2 status of these roots after finding during my honors research that they can contain photosynthetically active chloroplasts (Rich *et al.*, 2008).

The two herbaceous perennials I focused on during my PhD, *Cotula coronopifolia* L. and *Meionectes brownii* (Hook. f.), are not well characterised, especially in terms of their aquatic root growth. Therefore, much of my initial work involved growth experiments investigating full and partial submergence tolerance and aquatic root growth and physiology of the two species (Rich *et al.,* 2012). Both species tolerated 4 weeks of complete submergence in glasshouse experiments and grew an extensive aquatic adventitious root system from submerged stems of both partially and completely submerged plants. Aquatic root systems were largest in partially submerged plants and were a major constituent of the total plant biomass (up to 26.3 % in *C. coronopifolia* and 20.8 % in *M. brownii*) and contributed up to 90% of the total root biomass. As aquatic roots potentially confer some benefits to plant health and biomass accumulation during flooding, an aquatic root pruning experiment was conducted on both completely and partially submerged plants. Compared to controls with intact aquatic roots, plants with pruned aquatic roots showed reduced relative growth rates in both completely and partially submerged plants and reduced stem and leaf Chl*a* in completely submerged plants. No reduction in leaf Chl*a* was found in partially submerged plants.

M. brownii was chosen as the focus species for investigations of O_2 dynamics in aquatic roots. Like sediment roots, aquatic roots can source their O_2 via diffusive movement from the shoot. In addition, due to their growth into illuminated floodwater, aquatic roots can also potentially produce endogenous O_2 via photosynthesis and utilise dissolved O_2 from the water column. I examined the role of each of these three O_2 sources in aquatic root aeration.

The aquatic roots of *M. brownii* contain a complete photosynthetic pathway (Rich *et al.*, 2011). The capacity for photosynthesis was demonstrated by determining underwater photosynthetic light and CO_2 response curves for aquatic-adapted leaves, stems and aquatic roots and using O_2 microelectrode and $^{14}CO_2$-uptake experiments to determine shoot inputs of O_2 and photosynthate into aquatic roots. Illuminated aquatic roots do not rely on exogenous inputs of O_2, producing endogenous O_2 at rates similar to stems, with a P_{max} of 0.38 μmol O_2 m^{-2} s^{-1}; however, this was around 30-fold lower than in aquatic-adapted leaves. Under saturating light with 300 mmol m^{-3} dissolved CO_2, aquatic roots fixed carbon at 0.016 μmol CO_2 g^{-1} DM s^{-1}.

In situ studies determined that root photosynthesis is of importance to aquatic root aeration in the early morning, when dissolved O_2 in the water column drops to very low levels, however, diffusion from the water column is likely of more importance in the afternoon and evening when aquatic root pO_2 is slightly lower than the O_2 saturated water column. In *M. brownii* the movement of O_2 into aquatic roots from the shoot is of little importance as high diffusion resistance within the stems restricts O_2 movement down stems from either the atmosphere or the highly photosynthetic aquatic leaves growing near the water surface. The high diffusion resistance in stems results from reduced porosity at the nodes. This low nodal porosity results from interruptions to the aerenchyma formed through a combination of new emerging organs (leaves, aquatic roots, and stems) and numerous small cortical cells in the areas surrounding the new organ. These interruptions to the stem aerenchyma result in shoot emergence above the water offering little benefit to the aeration of submerged plant organs such as the aquatic roots.

My PhD would not have been possible, or as enjoyable, without the considerable inputs of my supervisors Tim Colmer and Martha Ludwig as well as Ole Pedersen who worked with me in the field in Australia and supervised me during a stint at The Freshwater Biological Laboratory in Hillerød, Denmark. I was also lucky enough to have generous funding from Land and Water Australia and the Future Farm Industry CRC. Since finishing my PhD, I am excited to be able to continue working on root physiology, as a post-doc working on root architecture and water use in wheat under the supervision of Michelle Watt at CSIRO.

Rich SM, Ludwig M & Colmer TD. 2008. Photosynthesis in aquatic adventitious roots of the halophytic stem-succulent *Tecticornia pergranulata* (formerly *Halosarcia pergranulata*). *Plant, Cell and Environment* **31:** 1007–1016.

Rich SM, Ludwig M, Pedersen O & Colmer TD. 2011. Aquatic adventitious roots of the wetland plant *Meionectes brownii* can photosynthesize: Implications for root function during flooding. *New Phytologist* **190:** 311-319.

Rich SM, Ludwig M and Colmer TD. 2012. Aquatic adventitious root development in partially- and completely-submerged wetland plants *Cotula coronopifolia* and *Meionectes brownii. Annals of Botany*. doi: 10.1093/aob/mcs051.

Rich SM, Pedersen O, Ludwig M, & Colmer TD. 2012. Shoot atmospheric contact is of little importance to aeration of the wetland plant *Meionectes brownii*; submerged organs mainly acquire O_2 from the water column or produce it endogenously in underwater photosynthesis. SUBMITTED

From the 2011 Recipients of: The Goldacre and Teaching Awards

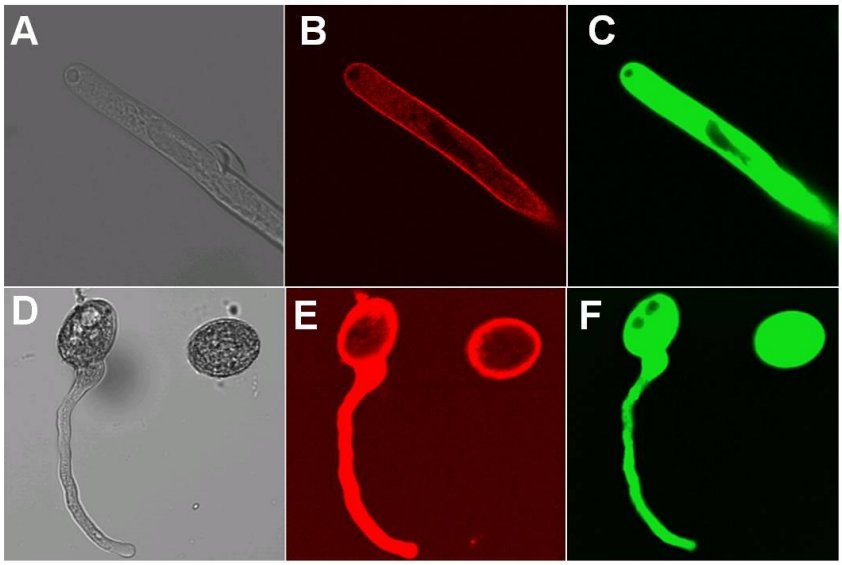
The Goldacre Award -- Chanyarat Paungfoo-Lonhienne

Chanyarat Paungfoo-Lonhienne (The University of Queensland) was awarded the Goldacre Medal for her innovative and significant work on organic nutrients and plant nutrition and gave a very impressive plenary talk. Chanyarat has provided the following comment on the context of her research.

My Research Aspect

Chanyarat Paungfoo-Lonhienne

Increased application of fertilisers, improved crop varieties and agronomic practices enable today's high-yielding crop production. However, these advances come at great cost. Environmental Pollution with reactive nitrogen is considered a global problem. It is a formidable challenge to transform crop production to reduce pollution and dependency on energy-intensive fertiliser production and finite natural resources, while increasing food production for a growing human population. What practices can deliver high crop yields at low environmental costs? One avenue may be to decrease reliance on synthetic and mineral fertilisers by successfully incorporate organic nutrients into agriculture. Evidence is emerging on the ability of plants to access organic forms of nutrients and to undergo physiologic changes in order to optimise this process. There is much opportunity to successfully incorporate organic nutrients to improve nutrient use efficient agriculture, but knowledge has to be obtained to ensure optimal use by crop systems. My research aims to produce fundamental knowledge in this area of plant nutrition.



Uptake of Cy3-labeled S-DNA by Arabidopsis root hairs (A-C) and pollen tubes (D-F). Bright field images are shown (A and D) for root hairs and pollen incubated with Cy3-S-DNA (B and E) and fluorescein diacetate (C and F) indicating cell viability

The Peter Goldacre award is very much rewarding and is encouraging me to continue on this path of research. I would like to sincerely thank ASPS for giving me an invaluable opportunity of receiving this prestigious award.

Paungfoo-Lonhienne C., Lonhienne T.G.A., Mudge S.R., Schenk P.M., Christie M., Carroll B.J., Schmidt S. (2010). DNA is taken up by root hairs and pollen, and stimulates root and pollen tube growth. *Plant Physiol*, 153, 799-805.
Paungfoo-Lonhienne C., Schenk P.M., Lonhienne T.G.A., Brackin R., Meier S., Rentsch D., Schmidt S. (2009). Nitrogen affects cluster root formation and expression of putative peptide transporters. *J Exp Bot* 60, 2665-2676.
Paungfoo-Lonhienne C., Lonhienne T.G.A., Rentsch D., Robinson N., Christie M., Webb, R.I., Gamage H.K., Carroll B.J., Schenk P.M., and Schmidt S. (2008). Plants can use protein as a nitrogen source without assistance from other organisms. *Proc Natl Acad Sci USA 105*, 4524-4529.

Teaching Award – Gonzalo Estavillo

The Teaching Award which recognises excellence, innovation and/or contributions to teaching to undergraduate students at an Australian University in any area of plant science was presented to Gonzalo Estavillo (Australian National University, ACT). Gonzalo has written the following account of training students to be "Plant Detectives".

Training Modern Plant Detectives

Dr Gonzalo M. Estavillo
Research School of Biology, ANU, 0200 Acton, Canberra, Australia

Class re-design – "Plants: Genes to Environment"

I have been very fortunate to be able to share my knowledge and excitement about plant biology by engaging in teaching activities during all stages of my scientific career to date.

"Arabidopsis mutant", by Erin Walsh (2009 student).

Shortly after I started my post-doctoral appointment with Professor Barry Pogson at ANU, I was offered the opportunity to participate in the development of a practical session for the second year undergraduate plant physiology class "Plants: Genes to Environment" (BIOL2121). The course had been taught by Dr Adrienne Nicotra and Dr Ulrike Mathesius for several years, with positive reviews, but in 2008 a desire to increase the course's immediacy and accessibility in terms of research-led education had given rise to a thoughtful redesign and more team-based approach.

One of the guiding principles in this redesign was an awareness that, if they are to tackle effectively the challenges of food production and biodiversity management in the face of climate change, the next generation of plant science graduates will need to be able to think creatively in the context of high quality knowledge and investigative skills.

Having just recently started working with the model plant *Arabidopsis thaliana*, I soon realized that this system could be an excellent tool for teaching important concepts of plant biology. Not only is there a wealth of basic knowledge about the physiology and genetics of Arabidopsis, but also a wide range of protocols are already available, as, even more importantly, is a large collection of mutants.

Seeing the potential of using my own research tools with Arabidopsis thaliana as the model plant, I volunteered to design a comprehensive, research-led practical module to teach basic concepts of plant biology by linking gene mutations to physiology. So, from 2008 to 2010, I took on the role as coordinator of all the course's practical sessions, which required the design and implementation of new experiments, the development of a detailed laboratory manual, lecturing on practical aspects, and the supervision of practical sessions.

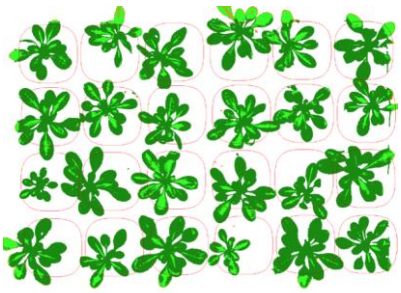
Students have to "discover" the genetics basis of the differences between normal (left) and mutant (right) plants.

To do all this in a coherent and authentic way, I developed the research-centred *Plant Detectives* project, which engages students with the puzzle of pinpointing a plant's genetic mutation. In groups of 4 or 5, students create their own detective teams to conduct eight weeks of intensive laboratory-based research. Using cutting-edge laboratory techniques, the students must apply the theoretical knowledge newly acquired in the course lectures to investigate the effect of an unidentified gene mutation on the physiology, form and environmental response of the individual Arabidopsis mutant assigned to their group.

The Scope of the *Plant Detectives* Project

Each team of students receives wild type seeds as well as seeds of an undescribed mutant. The students are then guided through a series of procedures in their effort to identify the mutant and explain the effect of the mutation on form and function under a range of growth conditions. The mystery is quite real as we use a double blind approach: only I (the practical coordinator) know which team has which mutant, or which tests may prove conclusive. This strategy was developed quite deliberately, based on educational research that suggests students are motivated to sustain the necessary investment of time and intellectual effort when their interest is sparked by a genuine puzzle. Students report that this approach really helps them understand the links between theory and practice, and encourages them to start thinking like scientists: curiosity and creativity come into play as they negotiate with team members, design their own investigative pathway, and assess their various results in the search for clues. To maintain a focus on the element of fun, although we never give them 'answers', we do limit the risk of students becoming frustrated or going off track by providing frequent feedback and excellent technical support.

A key element of that technical support is the "*Plant Detectives*" Manual (Estavillo et al.) which I developed to provide students with detailed, well-explained, step-by-step protocols that allow them to access the latest investigative techniques in plant science. The Manual is based on my own experience throughout years of research and teaching in this field, and is tailored to allow a relatively easy identification of mutant phenotypes. The rule of thumb for the course was to choose mutants that will show phenotypes clearly different to those of the wild type in at least two out of the many tests performed. This concept is easily adaptable to other systems or to the specific skills of the teaching staff. After significant interest from universities in and outside Australia, the manual is currently being prepared for publication to allow it to reach a wider audience.



Students apply leading-edge techniques to investigate plant morphology.

Before each laboratory session, students complete an online quiz (for which they gain course marks) as preparation for that session's topic, approach and purpose. The laboratory session itself starts with sets of cross-team discussions (one member from each team). The aim of this is for the students to share their findings across teams and compare results from the previous sessions, reflecting the way in which scientists collaborate. Instead of classic demonstrators, we use paid *Peer Mentors*, who are enthusiastic students from the previous year's cohort identified through a selection process. The *Peer Mentors*

facilitate the cross-team discussions and work closely with laboratory groups to bridge the gap between researcher and student. In this process, the *Peer Mentors* also benefit, as they are taught by the teaching team how to facilitate critical thinking rather than reveal 'answers'. In this way, they develop further as plant scientists themselves and gain valuable teaching experience early in their career, with many moving into Honours or other research activities.

Of course, for this practical approach to work, the students must have the required theoretical background. For this reason, the *Plant Detectives* project has a delayed start to give emphasis to the theory in the first weeks of the course. During that time, a highly interactive lecture/discussion format ensures that students gain high levels of understanding without teaching staff sacrificing the depth or breadth of research knowledge they are aiming to convey. Students are required to prepare themselves for each class with a set of online readings and focus questions. In the 'lecture', they discuss the topic in randomly assigned groups (which vary each lecture). One member of each group is then nominated to respond to the lecturer's questions. In this way, we use the lecturer's limited time to target learners' attention most effectively on the concepts which students find most difficult. We find students are more willing to admit to confusion in small groups, when they can see their peers struggling with the same question or concept. Even better, one student in a group may voice their thinking in a way that clarifies the confusions of his or her peers. We have found that, during the semester, student responses often improve markedly as they engage with the topics and develop confidence in speaking out. This approach does not make challenging topics any easier to communicate, and still requires all four lecturers (each an established plant science researcher) to be fully confident in their own knowledge. However, the evidence from students' assessment tasks shows that the resultant learning by students is deeper and more holistic, and the lecturers all report that the teaching effort feels very worthwhile.

Student and Peer Mentor (2011)

The *Plant Detectives* project concludes with each group using its own data and public online resources to identify the unknown mutant phenotypes, as far as possible, and then presenting those findings in a course symposium. Each student then writes an individual paper formatted in the style of the journal *Functional Plant Biology*. Each year, the symposium and papers prove tremendously rewarding for students and staff alike, as students demonstrate that they have genuinely developed the ability to link mutation to biochemistry, and hence to the function, form and performance of their plants.

Impact of this Teaching Approach

The innovative "*Plant Detectives*" module has had a positive impact in the learning experience for many undergraduate science students at ANU, with particular benefits accruing from developing technical skills and experiencing the workings of an authentic research laboratory environment. This research-led approach has also enriched the value of the class and recognition among research and teaching peers. Several academics from Australian and overseas universities have requested the "*Plant Detectives*" Manual so as to introduce aspects of it into their own teaching., The teaching team has also received several teaching awards, including Citations for Outstanding Contribution to Student Learning from the ANU Colleges of Science and ANU Vice Chancellor in 2009, and from the Australian Learning and Teaching Council in 2011.

However, for me as a teacher, the best measure of the impact of this class, and in particular of the innovative "*Plant Detectives*" component, is reflected by students' expressed opinions on the positive impact *"Plant Detectives"* had on their academic life as undergraduates and future scientists:

- *"I learned more from the labs in this course than all the other labs from my other courses combined."*

- *"The experimental work was particularly stimulating and challenging. It gave me a glimpse into what real research would be like and a feel for some of the practicalities."*
- *"…one of the most interesting and influential courses I have taken in my degree."*
- *"[I liked] applying knowledge learnt in lectures to the practical component."*
- *"The whole idea of planning a series of experiments to identify different mutants is a really good one!"*
- *"It'll be a long time before I could face counting any part of an Arabidopsis plant you'd care to mention, but hey, I ended up with a brand new scientific skill set …' (Extract from student blog)"*
- *"Practical component of course very good. High interest and well designed…"*
- *"The practicals […best part of the course]: I learnt a lot of new techniques and a lot about how to present data and write lab reports. I've done a large number of science courses and never learnt as much about these as I did here.*
- *"[It was] interesting going from the genetic/ molecular level to a physiological level."*
- *"This was the best course I have taken so far during my time at university, not only for the academic/ scientific knowledge I gained, but for the invaluable lessons regarding the importance of team work and interpersonal."*

Final remarks and acknowledgements

Despite the considerable amount of initial preparation for the delivery of the class (especially the practical section), the outcomes have been well worth it, for staff and students alike. I would like to propose that part of the beauty of the BIOL2121 model is that it has the potential to be applied to any plant science or related course, because it uses readily available plant material, and can be modified to the equipment available and the specific expertise of the teaching staff.

Being part of such a creative and exciting teaching team has been the highlight of my teaching experiences so far. I would like to thank Adrienne Nicotra and Uli Mathesius for their supervision and for giving me the possibility to participate in the class (and "experiment" with my teaching ideas). I am also very thankful to Dr. Beth Beckmann. From 2008, Beth supported the BIOL2121 teaching staff as an educational designer. She suggested many of the new ideas, pedagogical concepts and learning activities that we incorporated and trialed, and organized many student and staff formative and summative feedback sessions that contributed to improving the delivery of the course.

For more information:

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W: http://biology.anu.edu.au/gonzalo_estavillo/

Biol2121-ANU: http://studyat.anu.edu.au/courses/BIOL2121;details.html

ComBio 2012, Adelaide

Adelaide Convention Centre, 23 – 27 September 2012

ComBio 2012, in Adelaide is shaping up to be a great meeting with plenty of plant options together with excellent Plenaries from other disciplines. We look forward to seeing you there!!

There are a record seven societies participating in the meeting including the New Zealand Society of Plant Biologists and for the first time the Australasian Plant Pathology Society - Molecular and Physiological Plant Pathology Special Interest Group.

The plant "people on the ground" are Steve Tyerman, David Day, Brent Kaiser and Geoff Fincher with Rachel Burton and Margaret Barbour as joint coordinators for the Plant Stream.

The **streams and stream co-ordinators** are:

- Cell biology, Architecture and Trafficking (Yeesim Khew-Goodall / Alpha Yap)
- Developmental Biology (Paul Thomas / Patrick Tam)
- Gene Regulation, Genomics and Bioinformatics (Greg Goodall / Philip Gregory)
- Plant Biology (Rachel Burton / Margaret Barbour)
- Molecular and Physiological Plant Pathology (Klaus Oldach / Richard Oliver)
- Protein structure, function and proteomics (Grant Booker / Michael Parker)
- Signalling (Angel Lopez / Roger Daly)

For the **Plant Biology Stream** Rachel and Margaret are organizing Chairs and Co-chairs for the nine Symposia and a Colloquium. The topics are:

- Plant Cell Walls
- Plant Genomics and Epigenetics
- Photosynthesis
- Plant Ecophysiology
- Plants and Human Nutrition
- Plants and Climate Change
- Water and Solute Transport in Plants
- Plant Phenomics and Imaging
- Plant Development
- Colloquium session for students and ECRs

For a full list of the **Plenary Speakers** see: http://www.asbmb.org.au/combio2012/
Some of particular interest for ASPS members will be:

Ryan Lister - UWA, formerly Salk Institute – Plant biology - DNA methylation, genomics
Susan McCouch - Cornell University, USA - Rice genetics, GWAS, SNPs
Anne Osbourn - John Innes Centre UK - Crop and model plants - genetics, genomics, computational biology, cell biology, protein and small molecule biochemistry
Dale Sanders - John Innes Centre, UK - plant Ca signalling/transport
Richard Dixon - Samuel Roberts Noble Foundation, USA - plant cell walls.

The RN Robertson Lecture will be delivered by **John Patrick** – University of Newcastle

2013 Conferences

International Plant Nutrition Colloquium

Istanbul, Turkey 19 - 22 August 2013

http://www.ipnc-istanbul.org

The colloquium will focus on research topics dealing with agro-ecological, environmental, physiological, genetic and molecular aspects of plant mineral nutrition. Major attention will be paid to i) soil nutrient dynamics, ii) root biology and microbe interactions, iii) nutrient management, iv) ion toxicity and remediation, v) nutrient uptake, transport and remobilisation, vi) nutrient functions and vii) mitigating impacts of mineral nutrition on various environmental stress factors such as drought, salinity and diseases. The main theme of the 17th IPNC will be "Plant nutrition for nutrient and food security".

International Conference on Arabidopsis Research

Sydney, Australia 24 - 28 June 2013

http://wwwicar2013.com.au

We warmly invite you to be a part of the 24th International Conference on Arabidopsis Research (ICAR), the largest annual international scientific conference devoted to Arabidopsis thaliana – a model plant worked with by an estimated 16,000 labs around the world. Experiments performed in Arabidopsis often underpin plant research in general and Arabidopsis-driven research leads the way with technologies and concepts.

International Conference on Plant Vascular Biology

Helsinki, Finland 26 – 30 July 2013

http://pvb2013.org/

The conference will focus on recent progress in vascular plant biology, including development, evolution, structure, function and regulation, environmental influences, metabolism and nutrition, transport systems, local and long-distance communication, insect and pathogen challenge, proteomics and metabolomics, and agricultural and biotechnological applications.

Update on:

Functional Plant Biology

Editor-in-Chief: Dr Rana Munns

We are pleased to announce that the winner of the ASPS-FPB Best Paper Award for 2011 is Dr Arati Agarwal, for her paper:

Analysis of global host gene expression during the primary phase of the *Arabidopsis thaliana–Plasmodiophora brassicae* interaction. Arati Agarwal, Vijay Kaul, Robert Faggian, James E. Rookes, Jutta Ludwig-Müller and David M. Cahill.
Functional Plant Biology **38**, 462–478 (2011).

Arati was a PhD student at Deakin University. She now has a position of Research Scientist with the Victorian Department of Primary Industries, Ferntree Gully.

Arati will present her findings in a symposium at ComBio2012 in Adelaide.

FPB is finding its niche in the environmental biology arena, especially a/biotic stresses, and in cross-discipline studies that integrate across different levels of organisation from molecular to whole plant. It continues to increase in submission and citation rates.

Special issues attract readers, and Research Fronts act to highlight specific areas and draw attention to papers published as a group that may not get the same recognition if published separately. This year we are publishing a large Special Issue on plant phenomics (guest editors Hendrik Poorter and Roland Pieruschka from Germany), and two Research Fronts coming out of symposia at the International Botanical Congress:

- Crops for a changing climate (guest editors Michael Tausz and Ros Gleadow)
- From genome to phenome in cereals (guest editor Rudi Appels).

Special issues in planning are on halophytes, on common pathways for abiotic stress tolerance, and on mechanisms for crop productivity during drought. Ideas for further special issues are welcome.

Editor-in-Chief, Rana Munns

Were you aware that….?

- ***ASPS Website.*** The ASPS website has been thoroughly revamped and is being continuously upgraded.
  - Membership dues can now be paid on line.
  - You can advertise jobs, PhD scholarships, conferences, books by contacting Rob Shepherd via advertise@asps.org.au. To cover the costs involved, the society has introduced a small charge of $34 for members and $74 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.*** This 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 Wiskich 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 (2012 ComBio, Adelaide), 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.

- ***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. Members of the Council 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 editor of Phytogen at any time for inclusion in the next issue.

- ***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 $2,500. For more details see the website: http:/www.asps.org.au and take the link to conferences.

- ***Corresponding and Life Memberships.*** Life Membership recognises an outstanding and sustained contribution to the Society by a long-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.asps.org.au and click on "About ASPS" where there is also a list of Life and Corresponding members).