



# on the mark

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The Newsletter of Molecular Plant Breeding CRC

## Teacher placement for Adelaide node

Science teacher Elizabeth Hope from the Urrbrae Agricultural high school will be spending 10 days with MPBCRC at the Plant Genomics Centre in Adelaide throughout second term.



Elizabeth Hope

As a part of the 2005 Premier's Industry Award, maths and science teachers are paired up with an industry of their choice, and given a chance to witness

applied science in action.

'I put in for this one because I teach year 12 biology and I wanted to find out what was at the cutting edge of biology in plant breeding,' Elizabeth said.

Elizabeth is working with Education Officer Heather Bray to produce educational materials for high school students.

'It's a mutually beneficial thing. At the end of it I get some teaching materials and so will a lot of other teachers who'll have access to it via the MPB website. Heather will end up with students who have a better background in genetics before they come to do the Get into Genes workshop.'

Elizabeth said that she enjoys the break from the classroom, but that the work can be challenging.

'I've really thrown myself into the deep end here. I'm trying to come to grips in ten days with things that the people here have been working with for years!'

'Heather's been introducing me to all the people here and I feel I can talk to them all on first name terms. I can knock on their door and ask them a question no matter how basic the question might be! Everyone's so approachable and so welcoming.'

'Ten days is not a very long time to achieve all the things we're aiming to do. I think we'll do a little bit now and get it to a stage where we can pass it on to other people.'

Elizabeth said she plans to keep in contact with the staff and students she's met in the program after the program finishes.

## Juicy genes featured at Adelaide expo

Genes are in virtually every kind of food you're ever likely to eat. That was the message being spread by the volunteers from the 'Gene Juice Bar' at the Adelaide 'Only Way to Live' expo this May.

DNA was extracted from kiwi fruit, bananas, strawberries, paw paw, pineapple and wheat germ just to prove the point.

MPB staff and students ran the event in conjunction with ACPFG to help break down some of the misconceptions held by certain members of the community.

'We know that there are a number of people out there who think that only genetically modified foods contain genes,' said gene juicer and PhD student Scott Boden. 'We wanted to show people that we eat genes every day, and to explain a little bit about agricultural research.'

One passer by was surprised to learn that DNA was in every meal she ate. 'I knew that people had DNA but I didn't know that plants did,' she said.

Education Program Leader Amanda Able said the stand was a good vehicle for getting the message across. 'The people who came through really enjoyed it. Holding it at a lifestyle expo certainly attracted a different sort of crowd.'



Belinda Barr and Heather Bray at the 'Gene Juice Bar'

## Students shine at the CRC Association Conference

Melbourne-based PhD student Natasha Petrovska wowed the delegates of the CRC Association Annual Conference this year with her presentation 'Allergy-free grass snuffs out sneezes'. Natasha was one of only eight students selected from PhD applicants from the entire CRC Association to present at the conference.

Natasha's selection was based on her ability to present her science in an interesting and easily understandable way for a lay audience.

All winning applicants received one day's media training and free full conference registration.

'I thought it was good fun', Natasha said. 'The students I presented with were really nice and the other conference sessions were very interesting.'

Natasha also found her media training useful. 'After my presentation I was asked by a lot of different journalists to do media interviews. The media training we did on the first day really came in handy!'

This year's winning student, Carrie Newbold from the CRC for Cochlear Implant and Hearing Aid Innovation, took home a cash prize of \$2,000.

Natasha's presentation was part of the Showcasing CRC PhD students session – an annual highlight of the CRCA conference.

If you would like to be considered for the 2006 conference contact MPB Head Office (03 9479 1698).



Natasha Petrovska (bottom right) with other PhD students selected to present at the CRCA conference 2005





## From the CEO

We've reached a critical point in the history of our CRC.

As the second financial year of the MPBCRC draws to a close, we can be proud that our research portfolio is now achieving the targets we set for ourselves at our inception. Our cash budget has now increased to a healthy \$9.5 million per annum, plus another \$2.3 million from the R&D corporations. When you consider that the old CRCMPB cash budget was \$3.5 million per annum, it's clear that we have come a long way. We are now at a stage where much of our research is ripe for commercialisation, and it is essential that we channel our energies to ensure that this occurs.

The March Portfolio Review has played a key role in helping us to determine the most appropriate and effective pathways to commercialisation for our different technologies. I want to stress how important I think that meeting was, and how seriously the Board is taking the suggestions expressed by senior researchers in attendance.

At the Board meeting in June, the Board heard about the enormous breadth of commercial opportunities available to us. Many of these opportunities we are vigorously pursuing, but owing to time limitations we have been forced to set other opportunities aside. To ensure the successful commercialisation of our research, the Board has decided to appoint a new staff member to assist Cheryl McCaffery and the Head Office staff in achieving these outcomes. The new person will take up the role of Commercial Manager, and Cheryl will move to the new role of Commercial Director. This is an exciting development that will help to speed the delivery of our technologies to market.

Our participant organisations are also undergoing change. In May I met with Masa Iwanaga and Peter Nannes from CIMMYT to discuss the proposed alliance between CIMMYT and the International Rice Research Institute (IRRI). I am convinced that this union will only further enhance CIMMYT's involvement in MPBCRC and may help to deliver additional synergies.

With July just around the corner I hope you have all registered to attend our Annual Research Meeting 20-22 July. The ARM is a great opportunity to meet with you all personally, and I look forward to hearing updates on the progress of your efforts.

Bryan Whan CEO

# Digging for DNA diamonds



## By Jason Able

It's a centuries-old dilemma; how do you get wheat to crossbreed with other related species, and produce fertile hybrids?

At the moment we can cross wheat with a number of wild species, but the offspring are infertile. If we could discover the genetic solution to this problem, we could introduce useful genes from any number of wild relatives. It would be a revolution in agriculture!

As a CRC we tackle crop improvement from a number of different approaches. One of the more basic, fundamental ways is our investigation into recombination and chromosome pairing.

Our approach is to 'dig' through the many thousands of genes in the wheat genome to find those responsible for controlling the cellular processes known as recombination and chromosome pairing.

Humans, animals and many plant species have genomes made up of two sets of chromosomes; one set from each parent. Bread wheat is far more complicated, with six sets of chromosomes organised into A, B and D genomes. During meiosis in bread wheat, the A chromosomes only pair up with other A chromosomes, B with B, and D with D. This makes it extremely complicated for introgression of alien chromatin from other wheat relatives.

If we could find the gene (or genes) responsible for controlling chromosome pairing and recombination, then knock it out, we might get those interactions that do not normally occur. This would enable us to introduce genes from other species and produce fertile hybrids.

From a farming or plant breeding perspective, this research is particularly important. There is a large gene pool out in the wild that has not been 'tapped' into yet, and thus represents a vast and potentially important source of genetic variation that could be made available for plant breeding programs of the future.

Let's say there's a wild relative out in the Simpson Desert that has a great gene for insect resistance. Such genes are currently unavailable to plant breeders other than through transgenic means. However, once we understand the genetic mechanism controlling chromosome pairing, we can easily backcross it into commercial varieties.

We know there are genes responsible for this mechanism located along a section of chromosome 3D. Our work involves identifying genes in that region, and testing each candidate's function to determine whether it's our gene of interest. However, the research does not stop there, with several other interesting candidates having been isolated from other

chromosomes of the wheat genome. While we have one eye on chromosome 3D, we are vigorously pursuing a more broad scale expedition digging up meiotic genes in general, irrespective of their location.

We use genetic engineering to work out the function of the gene when we believe we have a candidate. We want to be able to knock that gene out and see what the plant is like when that gene is not present.

Although slow going, the research is unearthing a wealth of knowledge. You have to dig through a lot of rock to find a diamond! Luckily, we're finding a lot of other gems along the way. We're discovering a lot of information about reproduction in wheat and the functions of different genes.

One such discovery has recently earned our latest publication a spot on the front cover of the journal, *Functional Plant Biology*. The paper describes one of the candidate genes that turned out to be involved in shoot and flower development in wheat. This information will be of use to other researchers who are interested in the timing and control of these functions, but we're putting this gene behind us because we know it's not our pairing gene. However, we have a number of other candidates that we're pursuing that fall within our region of interest on chromosome 3D and elsewhere from within the genome. Of the eight new candidates isolated within the past year, two are currently being examined in both wheat and barley transformation systems, and it is envisaged that by the end of 2005 early 2006, we will be able to confirm the function(s) of these genes. In addition to their proposed roles in DNA repair, it is anticipated that these two candidates will have a role in recombination.

Another candidate of particular interest, and forms the basis of Scott Boden's PhD, is meiosis-specific. This alone makes it automatically attractive, irrespective of where it is located within the genome. Based on sequence identity with genes from other organisms, we are confident this gene will be involved in chromosome pairing. Again, by early 2006 we will have substantial evidence to confirm or refute this hypothesis.

Our University of Adelaide-based team is the only group in the world to be examining this particular stretch of DNA on chromosome 3D (at the molecular level) for the solution to chromosome pairing in bread wheat, and I'd like to think we will have our gene(s) of interest within the next five years. We've already come a long way, and now with 4 students (Scott Boden, Wayne Crismani, Andrew Lloyd and Hayley Jolly) working on the project we're going to start unearthing a lot of other gems – with at least one of them being the diamond.

# Have PhD (almost), will travel



By Meredith Carter

Last June I had the opportunity to travel to California, USA to spend some time in Professor Jan Dvorak's lab at the University of California (UC) Davis. The trip was part of my PhD studies, which is concerned with using large wheat bacterial artificial chromosome (BAC) libraries to isolate new markers/genes for traits of interest to the WA wheat breeding program – quite a challenge considering the genome size of wheat! Even so, with the help of my supervisors and international collaborators I have been fortunate to access some really excellent wheat genomic resources.

Professor Dvorak's group have developed a large BAC library from *Triticum tauschii*, and developed protocols for the analysis of BAC libraries. The aim of my trip was to use this genomic resource and learn the skills associated with it.

The University is situated in Davis, a small town which is about an hour by train from San Francisco and half an hour by car from Sacramento. It's a pretty relaxed place to work, full of students, lots of wide streets, and big old



Workshop participants outside Plant Sciences building at UC Davis. (Prof Dvorak is leftmost in the back row)

trees. Riding your bike is the main mode of transport there – thankfully Davis is pretty flat! As I was there to do work I didn't get a chance to see much of the countryside, but it was great living and working in a town where the University was the focus of everything that went on.

I spent a total of 9 weeks there and the workload was pretty full-on! However, my time spent there was very exciting, rewarding and certainly fulfilling. The first week I spent attending a workshop, with other students and scientists from all over the USA, learning all the techniques associated with BAC libraries, such as high-throughput BAC fingerprinting, contig assembly, physical mapping and anchoring your BAC clones to the genetic map of wheat. The next 8 weeks was putting this into practice and applying it to my project. Initially an intimidating thought! Thankfully there people there were very willing to provide the training and advice I needed. One of the Post-docs was a great help, she was very patient and taught me all the techniques I needed.



The Silo – the place to get food at UC Davis

Another thing that amazed me about the lab was the cramped conditions they had to work in and the age of the building and equipment available. The building itself had been condemned but everyone was still working there! It made me appreciate the quality of the labs we had back in Australia. What was impressive at UC Davis was how they had made the most of what they had and achieved results at a phenomenal rate. It's true what they say about scientists working in the US, the hours and commitment they put into their projects is pretty impressive.

It was very motivating and stimulating being in this environment. I was able to achieve all I set out to and more! I learnt heaps and it was great for building up my confidence in my scientific abilities, and for applying those networking skills I learnt at last year's MPBCRC student retreat! It certainly positioned me well for the final year of my PhD and I would urge anyone who has an opportunity to travel overseas to jump at the chance, it really is worth it.



## Conference update

By Elysia Vassos

### Grains Week 2005 5th - 6th April The Sofitel Brisbane

Grains Week 2005 was a two day conference organised by the Grains Council of Australia covering international market trends, plant technologies, environmental management and emerging market demands in the Australian grains industry. This year's conference program also featured the first reports on the implementation of the grains industry 'Single Vision' strategy, which was launched in March 2004.

My main desire to attend this conference was to learn more about the grains industry as a whole. Being involved in barley research is

only one part of the long chain that makes up the grains industry and it is important to be aware of who you are working for and the expectations and demands of the industry as a whole. Leadership Scholarships covering the costs of accommodation, conference and dinner fees, were offered to young professionals currently working or studying within the grains industry. Jason Able, Jason Eglinton and I were fortunate enough to each receive one of these scholarships.

The first day of the conference covered a diverse range of subjects including grain prospects in the middle east, using ethanol produced from crops as a fuel for our cars, climate change, and what the grains industry can do to reduce greenhouse gases. Dr Alan Green from the CSIRO gave an interesting presentation stating that the CSIRO Food Futures Flagship has demonstrated that plants can be bred to contain docosahexaenoic acid (DHA) which is the main omega3 polyunsaturated fatty acid of nutritional importance. Currently the only way to obtain DHA is from seafood, however this fatty acid is actually produced by a microalga which is then eaten by the fish. Land plants have not evolved the ability to produce DHA, but they do produce alpha-linolenic acid (ALA). Microalga can readily convert ALA to DHA. This conversion pathway was successfully assembled in *Arabidopsis* first, and has opened

up the possibility to deliver DHA to consumers via grains.

The second day of the conference concentrated on the implementation of the Single Vision strategy. Single Vision's mandate is to increase the value of the grains industry and work with producers to capture the wealth from that growth. Their main aim by 2015 is to increase the producers' market share of the grain dollar from \$0.19 to \$0.25. This will be no small feat, with one of the main barriers currently being limited continuity from the paddock to the plate, with regards to industry unity. Task groups were established to outline specific initiatives required to ensure the long term productivity and encourage industry leaders of the future. The young leadership scholarship holders were encouraged to attend and contribute to the task group discussion. Each task group session gathered the participants' thoughts on what should be implemented and were recorded via a voting system.

Attending Grains Week 2005 helped to increase my knowledge of the grains industry as a whole and gave me an opportunity to make new contacts through the young leaders program. It was a great opportunity and I would encourage other young scientists to apply next year to attend Grains Week 2006.

# In brief

## Fact sheets

The MPB website now has a series of five fact sheets available. Aimed at high school students, the fact sheets cover topics such as genetic engineering and molecular markers. In time, we hope to add other fact sheets on specific areas of MPB research. If you have a burning desire to tell the world about your own area of research, why not start with a fact sheet?

## Jenny Macklin visits Vic Node



Ulrik John and Jenny Macklin at PBC

Opposition Deputy Leader Jenny Macklin visited the Plant Biotechnology Centre in Melbourne this month. Jenny was given an overview of the CRC's research by CEO Bryan Whan and Research Director German Spangenberg, before taking a tour of the PBC laboratories.

Jenny was interested in the funding and organisation of the CRC, and was particularly keen to hear about the strengths and weaknesses of the CRC program.

## Congratulations to:

...Jason Able, Elysia Vassos and Jason Eglinton for being awarded free registrations for Grains Week 2005. Jason Able has also been awarded a free registration for the 2006 conference for providing the most insightful conference feedback for 2005.

...Natasha Petrovska for being selected to present at the 2005 Cooperative Research Centre Association conference.

## Movers and Shakers

Maarten van Ginkel has recently moved from CIMMYT in Mexico to join DPI Victoria at Horsham. Maarten will be working on MPB projects including germplasm development in cereals, and phenotyping in transgenic wheat. Welcome Maarten!

Owing to a recent restructuring of the breeders' software project, Guoyou Ye will be moving from the University of Queensland to DPI Victoria in Horsham. As our single link with UQ was via Guoyou, UQ will no longer be a participant in the CRC. Also relocating is the leader of the breeders' software project Howard Eagles. Howard will be moving to Adelaide to be closer to family, although links with Horsham will still remain strong.

## Diary dates

### 2005

#### Annual Research Meeting 2005

Student retreat: 18-19 July  
ARM: 20-22 July  
Ballarat Convention Centre, Victoria

### 2006

#### 13th Australasian Plant Breeding Conference

MPB is sponsoring the Plant Gene Technologies section of the 13th Australasian Plant Breeding Conference in April 2006.

18-21 April 2006  
Christchurch, New Zealand  
[www.apbc.org.nz](http://www.apbc.org.nz)

#### Agricultural Biotechnology International Conference (ABIC)

6-9 August 2006  
Melbourne  
[www.abic2006.org](http://www.abic2006.org)



## on the mark

The Newsletter of Molecular Plant Breeding CRC

*On the mark* is produced quarterly. All contributions are welcome. If you have news about MPBCRC activities, events, research or international travel please contact us for inclusion in the next newsletter.

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## The final word...

"You can't build peace on empty stomachs."

Norman Borlaug  
Nobel Peace Prize Winner, 1970