

# the INNOVATOR

Charles Sturt  
University



Department of  
Primary Industries

SPRING 2011 EDITION

The Newsletter from the EH GRAHAM CENTRE for Agricultural Innovation



## From the Director's desk

Welcome to the Spring 2011 Edition of *the Innovator*. After extensive consultation with stakeholders the Graham Centre Strategic Plan 2011-2016 was presented to the Board of Management and Industry Advisory Committee (IAC) for ratification at their meetings in late September. Both committees enthusiastically endorsed the plan, which outlines a pathway for increased future growth in our research capacity (staff, students and facilities) and research activities. The Plan will soon be available on the Graham Centre website. I would like to thank the IAC for their contribution and support in developing the plan.

Our annual field day attracted a strong crowd of farmers and advisors this year, and focussed on weed management, cropping and pasture rotation options, and soils. The wetland area at the site was excavated in late September with support from the Murrumbidgee Catchment Management Authority. In partnership with local aboriginal groups, the surrounding area has been planted with native shrubs and grasses. We encourage you to visit the site and take a self-guided tour to monitor the progress of the crops, pastures and wetlands. Our agribusiness and industry advisor field day in late October will further showcase our research in the field and encourage greater interaction between advisors and researchers.

We have been working closely with two of our key farmer groups to develop true partnerships in RD&E, addressing regional problems and constraints to our productivity in mixed farming systems. Recently, Graham Centre scientists, FarmLink and Holbrook Landcare Network met with Meat and Livestock Australia management in Wagga Wagga. The meeting highlighted our research capacity, close links to farmers and opening opportunities to provide an efficient pathway from research to on-ground adoption. Our farmer

Canola is an important break crop and we are a major R&D node for canola pre-breeding and systems integration. Photo: Jen Fury.

links are essential in providing input to develop research for our diverse mixed farming systems.

The research activities outlined in this issue clearly show the growing capacity of our scientists to undertake a broad range of molecular to field research in the soil, plant and animal sciences. We are supporting our members to attend and present this research at both national and international conferences.

Enjoy reading this edition of *the Innovator*.

Regards

Professor Deirdre Lemerle

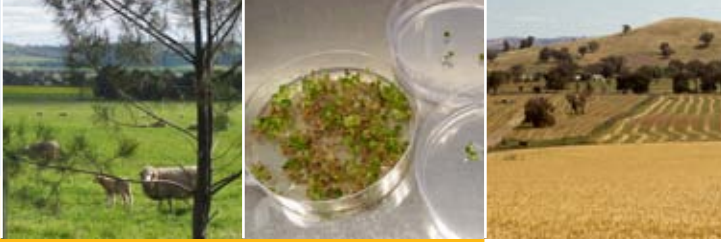
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## NEWS



**Genetic improvement in Brassica.** A range of commercial canola varieties, released from 1987-2008, have been sown to demonstrate the move from open-pollinated canola varieties to F1 hybrids. Later sowing, in this case 15 June 2011, has delayed development. Photos: Toni Nugent.



**Benefits of broadleaf crops and pastures:** Growers heard about the productivity and financial implications of growing break crops and pasture legumes in various genotype x environment x management combinations in cereal-based systems at the recent Graham Centre Annual field day.



## Graham Centre annual field day ticks all the boxes

The annual Graham Centre field day held on 7 September proved successful with farmers and agribusiness, with about 90 people attending. Graham Centre researchers presented research results with a particular focus on canola, stubble in cropping sequences, water movement and weed management.

Graham Centre Director Professor Deirdre Lemerle said the Graham Centre annual field day provides an opportunity for growers to meet and network with industry experts to further build and expand their knowledge base, assisting them to overcome the challenges facing agriculture and farm businesses in today's changing climate.

"Our aim is for the field site to be 'owned' by the industry. We enjoyed some good discussion and debate at the field day and hope to continue this into the future," Professor Lemerle explained.

The Yield Profit prediction, an online crop production model designed to provide grain growers with real-time information about the crop during growth, is updated regularly and the reports are available on the Graham Centre website ([www.grahamcentre.net](http://www.grahamcentre.net)).

The Wetland area is under construction in partnership with the Murrumbidgee Catchment Management Authority and local schools. It is located at the northern end of the field site next to the dam, and will be planted with local native species over the next 12 months.

"We encourage the community to visit the site during the remainder of the growing season and observe the development of the crops and pastures," Professor Lemerle said.

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**Managing glyphosate resistance ryegrass:** Managing resistant populations on crop margins stops resistance moving into cropped areas. Glyphosate mixtures and alternative herbicides are being evaluated for their control of glyphosate resistant ryegrass populations. To enhance residual control, a combination of glyphosate based products with some mixtures has been used.



## Top crop of students

Agricultural science students at Charles Sturt University (CSU) have again excelled at the 3<sup>rd</sup> Australian University Crops Competition held in Temora in September.

The group of CSU agricultural students won the 'University Teams' award and two students were named in the competition's top five among 56 competitors from six universities across Australia. The top five competitors now participate in an overseas study tour.

The entrants in this year's competition were Donald Benn, Laura Donoghue, William Porter, Ally Dingjan (placed 5th), Candice Robinson (placed 2nd), Robert Harris and Samantha Louise Beer.

The students were tested on crop seed identification and grain production; business management; pulse identification, analysis and classification; grain grading; oilseeds; live crop identification, foliar disease analysis, weed identification and soil analysis, and live crop yield potential and production practices.

Mr Richard Early and Dr Sergio Moroni accompanied the students to the competition and had the privilege of sharing in their excellent and confident performance during the competition.

"The Charles Sturt University team performed extremely well throughout the competition. The seriousness of the event did not deter them from enjoying themselves. They made me proud," said Dr Moroni.



**Honours to CSU students:** CSU Agricultural Science students excelled at the 3<sup>rd</sup> Australian University Crops Competition. From left, Candice Robinson, Samantha Beer, Richard Early (Technical Officer), Dr Sergio Moroni (Lecturer), William Porter, Laura Donoghue, Ally Dingjan, Donald Benn and Robert Harris. Photo: Sarita Bennett.

## Wagga hosts successful national canola meeting

The 17<sup>th</sup> Australian Research Assembly on Brassicas (ARAB) was held in Wagga on 15-17 August 2011. The meeting brought together scientists, agronomists, and growers to discuss the latest developments in canola and mustard research.

Over 100 participants attended, both from throughout Australia and overseas. A total of 40 presentations were given over two days. The first day consisted of a tour of canola (*Brassica napus*) research activities being undertaken by the Graham Centre in the field, glasshouse, and laboratory. Of particular interest was the new NaLSH rhizolysimeter facility where experiments are underway examining canola root structure with the aim of understanding and improving canola performance in water-limited situations.



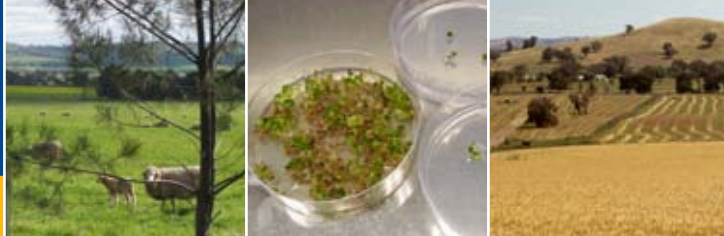
**Canola research:** Over 100 participants from Australia and overseas attended the 17<sup>th</sup> Australian Research Assembly on Brassicas conference in Wagga on 15-17 August.

The conference was organised by a hard-working and dedicated team of NSW DPI staff - led by Don McCaffery (Technical Specialist - Oilseeds, based in Orange). Conference sessions covered breeding and genetics, pathology and entomology, quality end-use and agronomy.

The papers from the conference will soon be available for download from the Australian Oilseeds Federation (AOF) [www.australianoilseeds.com/conferences\\_workshops/ARAB](http://www.australianoilseeds.com/conferences_workshops/ARAB)

The conference received generous sponsorship from the Grains Research and Development Corporation, Australian Oilseeds Federation, MSM Milling, Pioneer Seeds, Nuseed, Incitec Pivot, Pacific Seeds, Monsanto, Cargill, and Canola Breeders. The Graham Centre funded the attendance of five local growers who had a wealth of practical experience from growing canola and mustard commercially. Their contributions served to bring the theoretical scientists 'back to earth'.

The conference dinner was held at 'Cotton-tails' restaurant



## NEWS

where excellent food, local wine, and imported Chinese beer aided the scientific collaboration process.

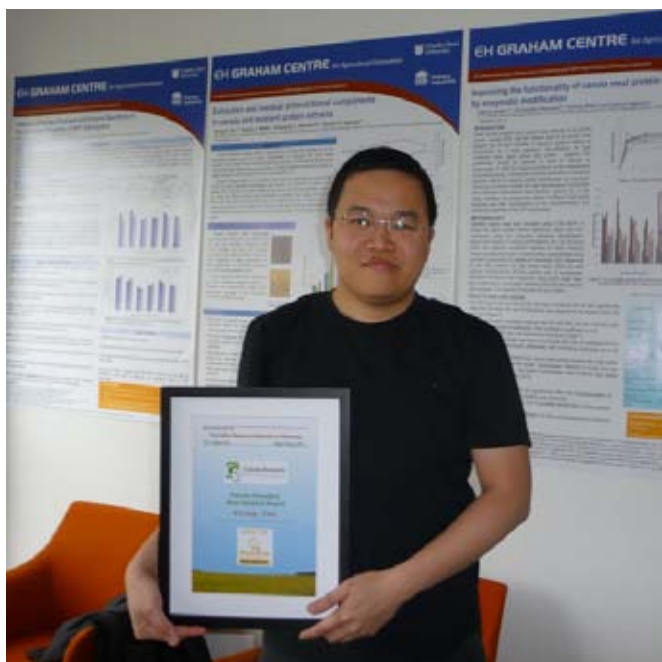
The ARAB conference has been held every two years, but the next meeting will be held in South Australia in 2014 to avoid future clashes with the International Rapeseed Congress.

### Student prize winner at ARAB conference

Congratulations to Siong Tan for his award for Best Student Prize at the recent 17th Australian Research Assembly on Brassicas (ARAB).

Siong is a Graham Centre PhD student researching *“Isolation and characterisation of proteins from Australian canola varieties”*.

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**Top Student:** Siong Tan holding his framed certificate for winning best student prize at the 17<sup>th</sup> ARAB conference, Wagga Wagga. Photo: Adeola Alashi.

### Livestock field days highlight industry research

Now in their third year, the Graham Centre Annual Beef and Sheep field days were held on 4-5 August. This year’s field days focussed on reproduction, with industry experts from Charles Sturt University, Department of Primary Industries and local producers discussing issues of key relevance to producers and the industry.

Speakers at the Beef field day discussed grazing management and profitability, herd management to increase

profits, anthelmintic resistance in beef cattle and breeding evaluation and soundness of bulls. At the Sheep field day producers heard results from field trials looking at the effect of omega-3 on reproduction, a review of *Campylobacter*, grazing ewes on dual purpose wheat, lambing time and profitability and breeding management.

The afternoon sessions saw producers participate in hands-on sessions with bulls and rams and reproductive materials, and working through setting up a reproductively efficient cow herd - herd management and genetics. Producers who attended the Sheep field day learnt how to use the tool GrasGro to look at the effects of lambing time on lamb turn-off, economics and feeding ewes.

“Since their inception in 2009 the Graham Centre Beef and Sheep field days have increased in size and importance and are now a key event in the diary of livestock producers across the Riverina and surrounding regions,” event organiser Dr Jan Lievaart said.

### Networking opportunities

A total of 120 people attended the Beef field day and 135 people attended the Sheep field day. The Graham Centre field days provide an opportunity for producers to meet and network with industry experts to further build and expand their knowledge base. This was reinforced in positive feedback received from producers who attended. The majority of people indicated the topics discussed were very relevant to their livestock business and the industry. Producers also rated highly the morning presentations and afternoon hands-on workshops.

### Industry support

The field day is run in conjunction with the Hume Livestock Health and Pest Authority, with sponsorship also contributed from Meat and Livestock Australia, Novartis Animal Health, Pfizer Animal Health and Ancare.



**Beef and Sheep Field Day organisers:** Dr Jan Lievaart and Toni Nugent. Photo courtesy of *The Rural*.



“This key support from industry highlights the importance of events such as these in showcasing research that is topical and relevant to producers, advisors and other stakeholders in the livestock industry,” Dr Lievaart explained.

Presentations from the field days can be downloaded from the Graham Centre website [www.grahamcentre.net](http://www.grahamcentre.net)

## Science investigation awards give students first hand experience

The next generation of science students got first hand experience at the Science Investigation Awards held on 16 September. The Science Investigation Awards were held by the Primary Industry Centre for Science Education, in partnership with Charles Sturt University.

There were 42 projects entered from 81 students (Years 6 and 10) across the Riverina, with students travelling from as far as Barellan and Narrandera region to participate in the awards.

A total of 15 judges from CSU, Gateway Bookshop, Department of Primary Industries and other organisations assessed the projects on the day. Four Graham Centre members - John Harper, Ed Clayton, Andrew Peters and Toni Nugent were on the judging panel.

“We were looking for original ideas, whether the project hypothesis could be tested and how the students tested their hypothesis, presentation of results and project conclusions. It was a great experience to be involved in and fantastic to see so many young people interested and enthusiastic about science,” Ms Nugent said.

The major prize, the Graham Centre Agricultural Innovation Science Investigation award, was won by Jasmine Garland a Year 10 student from Mount Austin High School for her project looking at plant tolerance to acid, salt and grey water.

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**Next generation of science students:** Major prize winner of the Graham Centre Agricultural Innovation Science Investigation Award, Jasmine Garland, a Year 10 Mount Austin High School student. Photo: Kay Lembo.

## 5<sup>th</sup> World Congress on conservation agriculture

The Graham Centre was well represented at the 5th World Congress on Conservation Agriculture held in Brisbane 26-29 September. Professor Len Wade, Professor Jim Pratley, Dr Iain Hume, postgraduate scholars Joe Moore and Clive Kirkby and former Graham Centre scholar David Gale attended.

The theme of the Congress was “Resilient Food Systems for a Changing World”. Nearly 500 delegates from over 70 countries were in attendance. Our region was also well represented by farmers with Peter Campbell, Henty, Adrian Roles, Young and Cameron Swan, Urana making contributions.

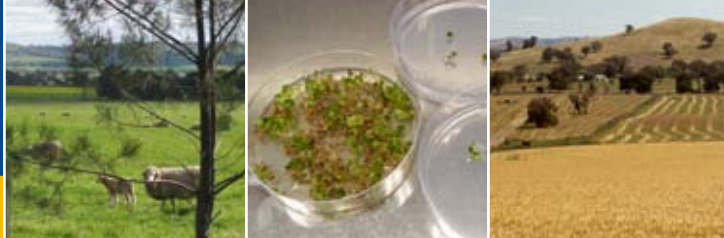


**Resilient food systems for a changing world:** Dr Iain Hume, Prof Jim Pratley, Joe Moore and David Gale recently attended the 5th World Congress on Conservation Agriculture.

The Congress was arranged around four themes: More efficient management practices for conservation agriculture; Designing productive farming systems; Impact through consultation, participation and knowledge sharing; and Policy development for market effectiveness. Len Wade gave an excellent overview of the issue of stubble management, Iain Hume spoke on the bio-economic optimisation of land-use to manage natural resources, and David Gale presented his work on increasing phosphorus efficiency through co-application of organic amendments with MAP. Joe Moore also attended the student workshop.

There was much discussion of the development and adoption of conservation agriculture in Australia, machinery advances, controlled traffic, soil carbon and greenhouse gas emissions and the role of modelling in supporting the technology. Discussion ensued on workforce capacity and on environmental services.

Further information: <http://www.wcca2011.org/>



## RESEARCH ACTIVITIES

### Molecular techniques for the rapid identification of opiine braconid parasitoids of the Queensland fruit fly

The Queensland fruit fly, *Bactrocera tryoni* (Froggatt) (Diptera: Tephritidae) is a serious pest of most edible commercial fruit and many vegetables in Australia. A non-chemical approach to control this pest involves biological control using parasitoid wasps. The four species of parasitoid wasps, (Hymenoptera: Braconidae), the introduced species, *Fopius arisanus* (Sonan), and the native *Diachasmimorpha longicaudata* (Ashmead), *D. kraussii* (Fullaway) and *D. tryoni* (Cameron), are known to parasitise the Queensland fruit fly. The latter two species persist in the dry, hot inland areas of Australia, where our major horticultural production areas exist.

Differentiation of these parasitoid species is necessary so that we may better understand and utilise these beneficial insects. Distinguishing between parasitoid species currently relies on phenotypic comparison of the adult forms and involves tedious and lengthy dissection and rearing methods, requiring a minimum of 5-6 weeks.

Molecular-based techniques have recently been used to identify and characterise fruit fly parasitoids that exist outside Australia. Polymerase chain reaction (PCR) and DNA sequencing has been used to generate sequence data that for the first time could identify and characterise these fruit fly parasitoids at a molecular level. Nonetheless, to date, these techniques have only been applied to adult fruit fly parasitoids, limiting the application to epidemiological studies. Molecular techniques have yet to be applied to endemic fruit fly parasitoids and have not been applied to the egg/larval stages of development of any parasitoid species.



Differentiating between parasitoid species: Female *Diachasmimorpha* species persist in the dry, hot inland areas of Australia where our major horticultural production areas exist. Photo: John Weiss.

### New research initiatives

In this study, Dr Reynolds and her team sequenced and analysed three molecular markers from four species of parasitoids (*D. tryoni*, *D. kraussii*, *D. longicaudata* and *F. arisanus*) known to parasitise the Queensland fruit fly in Australia. This provided an outline for the development of molecular techniques for the detection of these parasitoid species.

A phylogenetic analysis confirmed that the *Diachasmimorpha* spp in this study form a monophyletic group (i.e. a group of organisms that share a recent common ancestor), which is in agreement with taxonomical (morphological) identification. Similarly, *Fopius arisanus*, which is morphologically distinct from *Diachasmimorpha* spp, formed a separate group to that of the *Diachasmimorpha* spp.

This study is the first to describe a molecular test for the detection of parasitised fruit fly larvae to species level. In order to develop a molecular test for species discrimination the project team identified that the PCR assays targeting the COI gene regions were the most effective, as this gene has sufficient variability to enable downstream differentiation of the differing species parasitising the Queensland fruit fly.

This is very encouraging and suggests that this test could be successfully applied to field surveys comprising a range of Queensland fruit fly parasitoid species. Indeed, COI may be the preferred molecular marker for discriminating parasitoids at the species level generally, due largely to its emerging status as a 'universal DNA barcode' for animals, including insect species.

Using cultured Queensland fruit fly larvae that had been presented to *D. tryoni* parasitoids, the project team were able to establish a 'proof of concept' that parasitoid DNA could be readily detected within total DNA extracted from Queensland fruit fly larvae. The rate of parasitism of fruit fly larvae by *D. tryoni*, was greater than the emergence rate determined using conventional rearing methods and reflects that not all adult parasitoids will eclose successfully. However, a parasitised larvae, whether the adult emerges successfully or not, is one less pest fruit fly in the environment.

There are several uses for the development of such a molecular-based technique. A biological control strategy could employ these methods to estimate parasitism rates and to determine how seasonal and other factors affect parasitism. Ultimately, by utilising molecular techniques, this data can be generated much faster than the conventional method of rearing the insects through to the adult stage and subsequent morphological identification would permit.



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### Further research

A PhD candidate, Ms Jessica Smart (University of Sydney) will be looking at further developing this molecular technique. As part of her recently awarded Graham Centre CSU PhD Scholarship, Jessica, under the supervision of Dr Olivia Reynolds, Dr Cheryl Jenkins and Professor Geoff Gurr, will seek to further the development of a rapid molecular diagnostic using real-time assays to identify Australian fruit fly parasitoids in field collected larval samples.

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### Diet may affect sex of lambs

Research at Wagga Wagga revealed that diet may affect the sex ratio of lambs by up to 15 per cent leading to a breakthrough in sheep reproduction.

"The results are the exciting culmination of a number of years work and have the potential to change the way producers manage reproduction in ewe flocks," Dr Clayton, Graham Centre member and Department of Primary Industries (DPI) research leader said.

The research is being carried out through the Graham Centre and recently received a funding boost of \$310,000 from Meat and Livestock Australia across a two-and-a-half year period.

The research is being undertaken by CSU PhD student Catherine Gulliver and involves the study of the ratio of omega-3 and omega-6 fatty acids in the diet of ewes and the effect it has on the sex ratio of lambs.

Ms Gulliver is the recipient of a scholarship from the Australian Postgraduate Award scheme and the Future Farm Industries Cooperative Research Centre.



Diet may affect the sex of lambs: Miss Catherine Gulliver, Dr John Wilkins and Dr Ed Clayton determining the pregnancy status of ewes by ultrasound. Photo: Toni Nugent.

Dr Clayton said the research was conducted in open-air pens at the Wagga Wagga Agricultural Institute and involved 300 first-cross ewes split into two groups.

"The first group was fed omega-6 sourced from oat grain (now fondly referred to as "grain for girls"), while the second group was fed omega-3 sourced from a diet of pea silage," Dr Clayton said.

"Ewes were fed the two diets for six weeks prior to joining to Dorset rams and three weeks after joining."

After lambing, the lambs were tagged, and a 15 per cent increase in the number of female lambs from sheep fed high omega-6 (grain) compared with those fed high omega-3 (pea silage) diets was observed.

### Benefits for producers

"We were very surprised that the different diets could have such a profound influence on the sex of lambs," Dr Clayton said.

For a self-replacing ewe flock or for first-cross ewe breeders, to increase the number of female lambs relative to the number of male lambs, a diet high in omega-6 could be fed at joining. Alternatively, if producers wanted more male lambs for prime lamb production systems, they might consider feeding a diet high in omega-3 at joining.

A further trial now underway, involving 300 first-cross ewes and 320 Merinos, focuses on whether the skewing effect was pre or post-conception and if the effect is similar in first-cross ewes and Merinos. Results from this trial will be available in mid 2013.

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### NSW global leader in perennial wheat research

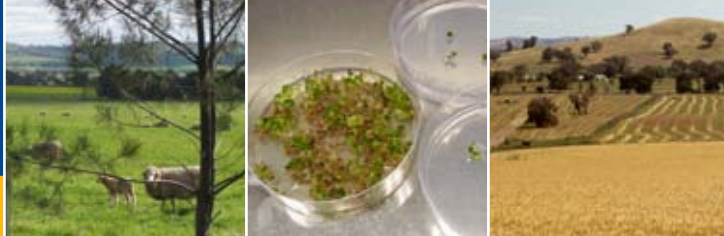
Field trials in Cowra and Woodstock have found that USA-developed germplasm could survive and successfully yield grain for three consecutive years.

Seed from the Cowra Agricultural Research and Advisory Station is destined for the USA, Canada, South Africa, Nepal and the United Kingdom as the quest to produce the first commercial perennial wheat intensifies.

Department of Primary Industries (DPI) scientist and Graham Centre member, Richard Hayes, said there was a lot of excitement over the results from the NSW field trials.

"The varieties we had success with had survived no more than two years in the USA where the plants originated," Mr Hayes said.

"We are now collaborating with plant breeders across the world on a study to help understand the key environmental



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factors enabling perennial crops to survive and find out what has inhibited their survival.

The use of perennial grain crops that do not require annual sowing would minimise inputs and offer environmental benefits that could benefit farming systems in many countries.

### International linkages

DPI perennial wheat research trials were part of a collaborative project with Professor Len Wade, Charles Sturt University and Dr Phil Larkin at CSIRO, which was funded by the Future Farm Industries Cooperative Research Centre.

The project, which is due to wind-up this year, has allowed Australian researchers to forge strong relationships with international research institutions including Washington and Michigan State Universities and The Land Institute in Kansas.

“Ongoing perennial wheat research will be able to build on our results,” Mr Hayes said.

“Already economists from the University of Michigan are keen to use Australian agronomic data to underpin the economic models for these potential new crops.

“Up until now they had no real agronomic data on perennial wheat crops and we are able to provide that.”

The seed for the Australian research came from plant breeders at Washington State University and The Land Institute, Kansas and was mainly derived from crossing annual wheat with perennial intermediate and crested wheatgrass.

Mr Hayes said the most successful perennial wheats have a full extra genome from the perennial parent.

“That means they have 56 chromosomes compared with the 42 chromosomes of conventional annual wheat. However, our study showed that having 56 chromosomes provided no



Perennial wheat research: Richard Hayes inspecting a perennial wheat hybrid line grown in the field at Woodstock, prior to harvest 2010. Photo: Bernadette York.

guarantee that the germplasm would create a perennial plant.”

### More options for growers

Perennial crops offer options for farming widely variable landscapes and environments and have the potential to address climate variability by putting extra flexibility into farming systems.

Mr Hayes said depending on the season a perennial crop could be grazed or harvested for grain.

“In lower rainfall areas, particularly in drought years, perennial cereals may allow farmers to vary their inputs, reduce costs and deliver environmental benefits,” he said.

“Crops that are in the ground for several years can take advantage of every drop of rain that falls, which will also help increase soil moisture use, reduce soil acidification and salinisation with the potential to reduce erosion.”

The NSW trials also found that most of the successful lines were highly resistant to leaf rust, stripe rust, stem rust and wheat streak mosaic virus.

“That’s good news, not just for the productivity and survival of perennial wheat, but in ensuring there are no negative disease impacts on conventional cereal crops,” Mr Hayes said.

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**Editor’s note:** The October edition of DPI’s *Agriculture Today* was the original source of this article.

### Plant pathology workshop

The climatic conditions in 2010 created a platform and level of inoculum for a range of diseases that many early career advisers may not have previously encountered. Added to this, the possibility of average to above average rainfall over the 2011 winter/spring favouring significant fungal disease levels, prompted the Graham Centre to host a plant pathology workshop on 9 August at the Wagga Wagga Agricultural Institute. The workshop was coordinated by Helen Burns, Graham Centre Research Liaison Officer-Industry Links, with sessions delivered by Graham Centre plant pathologists Drs Andrew Milgate and Ben Stodart and Kurt Lindbeck.

The hands-on workshop targeted early career advisers and those wanting to refresh their skills on the recognition and strategic management of key fungal disease of canola, wheat and barley crops and served as a pilot to gauge demand and scope for future workshops. The number of participants was limited, with lead agronomists from the main regional commercial agribusiness firms and consultancy firms invited to nominate staff. A total



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of 27 advisers from across southern NSW attended the workshop.

### On to a good thing

The focussed half-day format was supported by workshop attendees, who are reluctant to spend time 'out of the paddock' in demand periods.

Feedback from participants highlighted the benefit of the workshop in improving understanding of disease epidemiology and the importance of a systematic approach to disease identification. Comments reflected the increased confidence levels of the attendees and greater awareness of the support offered by researchers following the workshop.

Attendees expressed interest in future pathology workshops. Although they would have liked more diseases to have been covered, the preference for half-day workshops suggests separate focussed workshops are the preferred option.

From a biosecurity and disease management perspective the pathology workshop increased skills and the capacity of early career advisers, while lifting the profile of Graham Centre research and researchers.

The workshop also provided an opportunity to develop a network of advisers to aid in a disease alert mechanism and to track disease distribution and severity.

Advisors indicated the key sources of information they currently use for plant diseases diagnosis are GRDC factsheets, the internet and DPI pathologists, while the key sources of information on plant disease management strategies are GRDC factsheets, in-house training, GRDC workshops and the internet.

This reliance of the private sector on information provided by the public sector highlights the importance of topical, timely and regionally relevant workshops and updates to build the skills and capacity of private sector advisers.

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This workshop was supported by GRDC through project DAN 147: Integrated disease management for cereal and broad leaf crops in southern NSW and northern Victoria.

## Publications

Visit the [Graham Centre website](#) to view published papers by Centre members. These papers demonstrate the broad research capacity of the Centre.



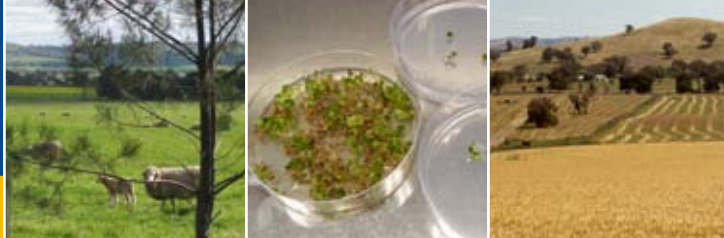
**International linkages.** During September an Indian delegation from the Ministry of Finance, accompanied by AusAid staff, visited the Graham Centre. Building these international links contributes to the reputation of the Centre and increases the impact of research findings. Photo: Toni Nugent.



**Building industry links.** A recent meeting between Graham Centre members, FarmLink, Holbrook Landcare Network and MLA highlighted the Centre's research capacity and close links to farmer groups. Farmer links are essential in providing input to develop research for our diverse mixed farming systems.



**Wetlands are progressing.** The wetlands are being developed with local community groups to demonstrate the 'green' aspects of agriculture and links with native ecosystems and biodiversity. The surrounding area was planted with native shrubs and grasses, in partnership with local aboriginal groups. Photo: Patricia Murray.



## TRAVEL & CONFERENCE REPORTS

### Attainment of board certification in the American College of Theriogenologists

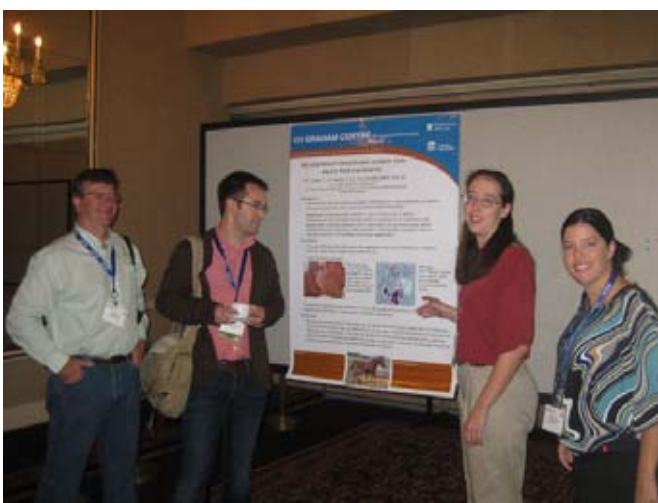
The conference support scheme provided by the Graham Centre facilitated the attendance of Dr Tonya Collop to an international meeting of the veterinary reproduction community. While attending the Society for Theriogenology Annual Conference and Symposia Tonya presented a poster, networked with international colleagues, and attained specialist credentialing as a diplomate in the American College of Theriogenologists. The benefit of diplomate status is more evident as the number of veterinarians within Australia who have this qualification is less than 10.

Dr Collop's poster presentation was titled "*Mycobacterium intracellulare* isolation from equine fetal membranes".

"My poster presentation, although on equine subject matter, had relevance to all people associated with animal husbandry, due to the risks of zoonotic illness. The concern of appropriate biosecurity protocols being used, as a research priority of the Graham Centre cannot be over-emphasised", stated Tonya.

At the conference Tonya received certification by the examination route for specialist qualification as the first person to sit through a residency program in Australia.

The conference provided a day-long session on small ruminant reproduction, as well as bovine, equine and small animal reproductive seminars over the course of the conference. One seminar addressed trichomoniasis in bulls.



**High achiever:** Tonya Collop is the first person to sit for specialist qualification for certification of the American College of Theriogenologists through the residency program in Australia. Photo: Isabel Velez.

Trichomoniasis, a venereal disease of cattle, has worldwide distribution and unfortunately cannot be treated in bulls, causing considerable economic loss in cattle operations. The lack of treatment options, increased embryonic loss rates and the necessity for infection control make the inclusion of this particular disease an important example of the timely seminar topics presented.

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### International experience lifts profile and assists in identifying gaps in Australian research

Bree Wilson, a post-doctoral research fellow at Charles Sturt University recently attended the 2011 International Congress on Invertebrate Pathology and Microbial Control and 44<sup>th</sup> Annual Meeting of the Society for Invertebrate Pathology in Halifax, Canada. The meeting coincided with the Organisation for Economic Cooperation and Development (OECD) Symposium on Disease in Aquatic Crustaceans, with about 250 people (70 of which were students) making the journey across the globe to Halifax.

The conference showcased work from all invertebrate pathology divisions including fungi, bacteria, microsporidia, nematodes and viruses, as well as diseases of beneficials. Bree presented a poster titled '*The effect of aphid cuticular waxes and pigment on the infection process of Metarhizium anisopliae*'. The poster showed the infection process of *Metarhizium anisopliae* on several aphid species using light and scanning electron microscopy (SEM), with the recently acquired benchtop SEM "Neoscope". Future work will examine the infection process of *M. anisopliae* in different spray formulations in species such as the waxy cabbage aphid (*Brevicoryne brassicae*). The results gained from this study, together with information from complementary *M. anisopliae* pathogenicity trials, will yield important information about the surface chemistry of aphids and how this may influence adhesion of conidia and the ultimate effectiveness of fungal-based biopesticides.

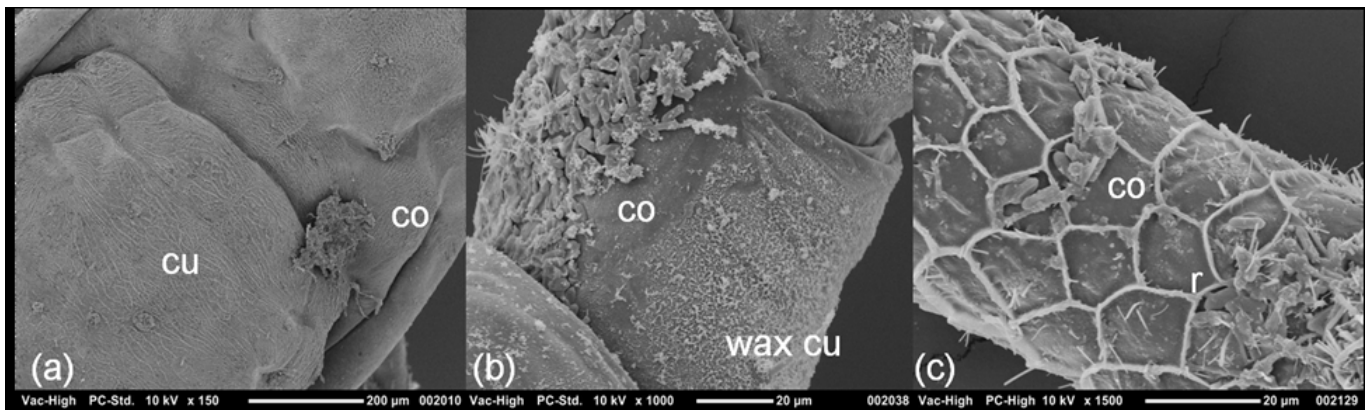
There were few attendees from Australia highlighting that Australia is a small player in this research, but has great capacity to grow. Bree's poster presentation attracted a lot of attention and highlighted the local team (Professor Gavin Ash and Dr Ben Stodart, CSU and Dr Caroline Hauxwell, QUT) and Wagga Wagga Plant and Insect Pathology Group's capacity to conduct high quality research in the area of biosecurity and pest management. This in turn will enable profitable and sustainable farming through integrated pest management. While in Halifax, Bree also contacted two industry groups, which was an important step for the



commercialisation and registration steps of her project. Attendance at conference sessions outside of her direct area (fungi), enabled Bree to begin identifying gaps in research pertaining to biosecurity and pest management in Australia.

“The lack of Australian researchers at the conference also highlights the need for more work to be done in Australia and puts our local team on the map,” Bree said.

Contact: Bree Wilson, T: 02 6933 4419; E: brwilson@csu.edu.au



**SEM micrographs of the rose-grain aphid 24 h post-inoculation** (a) aggregates of conidia (co) on cuticle (cu), (b) aggregates of conidia (co) on waxy cuticle (wax cu) and (c) conidia (co) within reticulations (r) on a siphunculi. Photo: B Wilson.

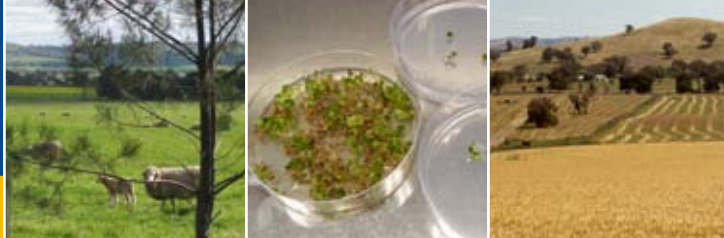
## Project summary

### The effect of aphid cuticular waxes and pigment on the infection process of *Metarhizium anisopliae*

Sucking insects such as aphids can cause significant yield losses in agriculture due to the direct effects of feeding and the indirect effects associated with the spread of viruses. In this project, *Metarhizium anisopliae* isolate EFD 251 (Australia) has been shown to have insecticidal activity against a range of crop pests including aphids, mirids, green vegetable bug, thrips, Rutherglen bug and Helicoverpa. Several species of aphid transmit viruses in grain crops in Australia and include the waxy cabbage aphid (*Brevicoryne brassicae*), the dark pigmented oat/wheat aphid (*Rhopalosiphum padi*) and the light pigmented rose-grain aphid (*Metopolophium dirhodum*).

In this project, a time-course of the infection process and blastospore formation by *M. anisopliae* on several aphid species is presented. Using light, scanning and transmission microscopy we investigated the role of the wax layer and the colour of the cuticle on 1) the adhesion and germination of conidia, 2) mycelium production and 3) penetration of germ tubes through the aphid cuticle.

The results gained from this study, together with information obtained from complementary *M. anisopliae* pathogenicity trials, will yield important information about the surface chemistry of aphids and how this may influence adhesion of conidia and the ultimate effectiveness of fungal-based biopesticides.



## TRAVEL & CONFERENCE REPORTS

### Tackling tomorrow today

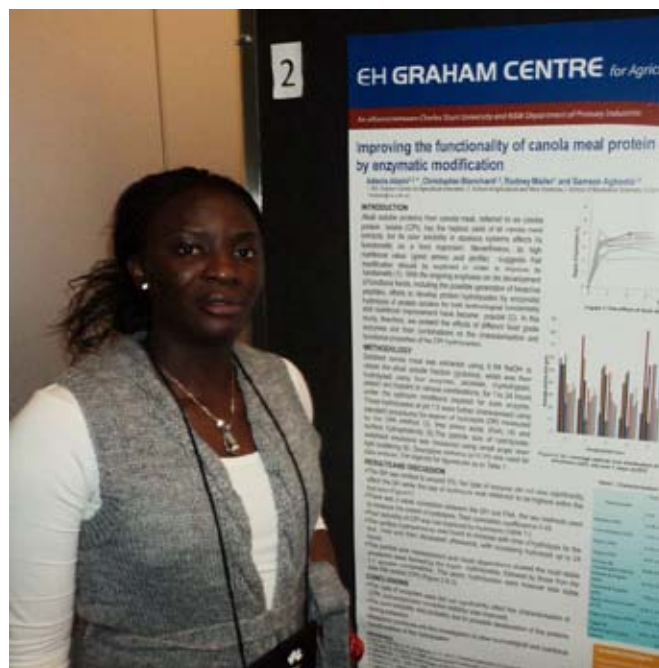
The theme for the 44<sup>th</sup> Annual Convention of the Australian Institute of Food Science and Technology, “Tackling Tomorrow Today”, addressed issues concerning the environment and sustainability, health, safety and risk, food choices, nutrition and food fashion. A number of international speakers presented their views on diverse critical issues affecting food production such as food production and security, water management, dairy, business, food choices and nutrition. Issues affecting today’s food system such as urbanisation, water shortage, food safety and food policies were also addressed. People from all walks of life were in attendance, including academics, industry representatives and the business world, as well as researchers from diverse fields encompassing the food chain.

The conference sought to address the need to face up to the challenges of the present and future food environment. Thanks to the support offered through the Graham Centre’s Conference Support Scheme, PhD students Randy Adjonu, Siong Tan and Adeola Alashi attended the conference and had the privilege of meeting people in both industry and academia, playing diverse roles in the aforementioned areas. Through activities undertaken at the conference, the students have been challenged to play their part in tackling the present and future food environment issues facing the world at large and the need for more research to be undertaken to build a solid foundation for tomorrow’s food system.

The students presented posters on their research projects; Siong Tan “*Extraction and residual anti-nutritional components in canola and mustard protein extracts*”, Adeola Alashi “*Improving the functionality of canola meal protein isolate by enzymatic modification*” and Randy Adjonu “*Influence of pre-heat treatment and enzyme specificity on the antioxidant properties of whey protein isolate (WPI) hydrolysates*”.



Facing challenges of the food environment now and into the future: PhD students Randy Adjonu, Adeola Alashi and Siong Tan attended the 44<sup>th</sup> Annual Convention of the AIFST conference.



Relevant research: Adeola Alashi presented a poster “Improving the functionality of canola meal protein isolate by enzymatic modification” at the 44<sup>th</sup> Annual Convention of the AIFST conference.

### Collaboration and capacity building

The conference provided a platform to showcase the Graham Centre to researchers, the industry and other Universities for possible future research collaboration.

“As part of the Graham Centre’s vision of collaborative research, conversations at the conference have established certain profound contacts for current and possible future collaborative research works in the diverse areas of the food landscape,” Randy explained.

“Furthermore, new technologies being employed to best sustain the global food demand due to population growth as well as urbanisation, which is consuming the available lands for farming, were also highlighted.”

“Attending the conference was a good boost for me because I was able to understand exactly how relevant my research is to the projected rise in population and the consequential food shortage - one of the major issues of concern in the food and agricultural world today,” said Adeola.

“I was exposed to the impact of food shortage on the global economy and the urgent need for improving and sustaining food production, and improving the available but under-utilised nutritional sources by adding value for example, through enzymatic modification, so that they can be readily available for consumption as food, if we are to combat malnutrition,” Adeola explained.

“Comments and suggestions from industry experts were very



## TRAVEL & CONFERENCE REPORTS

helpful in improving my on-going research. The meetings and discussions with other researchers and the exchange of ideas were also valuable, with the knowledge acquired of great importance as part of the development in my graduate research experience,” Siong said.

“Attending the conference has also developed my confidence as a centre member in the area of research, which falls in line with the Graham Centre’s vision to undertake world class collaborative research and graduate training with key partners,” said Randy.

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### Mineral supplementation increases twin-lamb growth rate when grazing dual-purpose wheat

In September Shawn McGrath, Graham Centre PhD student, attended the 8<sup>th</sup> International Symposium on the Nutrition of Herbivores in Aberystwyth, Wales. The conference focussed on the challenges faced by animal agriculture, including competing pressures for land with alternative forms of land use, the need to both mitigate against and adapt to the effects of climate change combined with the need to meet society’s demand for safe nutritious food produced at low cost.

Shawn gave an oral presentation on the results of some of his research as part of his PhD studies.

“I reported on the results of a field trial conducted at Balldale in southern NSW, which looked at the effect of

supplying a basic mineral supplement to lambing ewes that were grazing a crop of dual-purpose wheat,” said Shawn.

A significant part of the conference focussed on research that is aimed at better understanding the role of rumen microbes in greenhouse gas production, and mitigation strategies to reduce the impact of ruminant production in terms of greenhouse gas production. There is much research being conducted in this area around the world in response to the global focus on climate change.

“The presentations demonstrated that there is still much to learn, for example the role of different microbes, but also suggested some interesting abatement strategies being tested,” he said.

The conference included a technical tour to a local dairy farm to look at their systems and pasture management. The dryland system is based on perennial ryegrass, with an aim to maintain quality at 12 MJ ME/kg DM year round. Thirty percent of the sward is sown to clover, however persistence is low due to broadleaf control. Silage is made from excess pasture, averaging 11.5 MJ ME/kg DM, which is fed to cattle when they were shedded - cows are housed in barns for about five months of the year. The herd is predominantly Holstein Friesian with some Jersey cows. The farm is investing heavily in infrastructure to increase the use of slurrage and minimise the cost of nitrogen application. In terms of expense, the cost of grass is half that of silage to produce, and was 25% the cost of concentrate per unit. So the focus was on fully utilising grass and minimising the use of concentrate.

“I would like to thank the Graham Centre and NSW Rural Assistance Authority for funding my travel and attendance at this conference,” Shawn said.

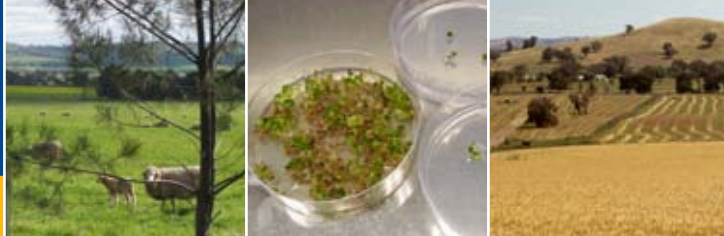
Contact: Shawn McGrath; T: 02 6933 454;  
E: shmcgrath@csu.edu.au



PhD studies: Shawn McGrath reported on the results of a field trial conducted at Balldale, NSW.



Farming systems and pasture management: A technical tour to a local dairy farm was an interesting part of the 8<sup>th</sup> International Symposium on the Nutrition of Herbivores in Aberystwyth, Wales. Photo: Shawn McGrath.



## IN THE LIMELIGHT

### Dr Ben Stodart

**Position:** Research Fellow

**Organisation:** Charles Sturt University

#### Career Brief

- 1995 - Completion of BSc (Hons) at Flinders University, South Australia. Major area of study was molecular biology and microbiology.
- 2001 - Completion of PhD - "Molecular characterisation of Rhizoctonia solani anastomosis group 2", The University of Adelaide.
- 2001-2002 - Various positions at CSIRO and SARDI.
- 2002-2006 - Technical officer, molecular biology, NSW DPI. Spent examining landrace accessions of wheat held within the Australian Winter Cereals Collection.
- 2006 - present - Post doc conducting research and capacity building projects in Cambodia, CSU.

#### Research and Teaching Activities and Interests

##### Research activities

My major research activities are centred around the assessment of vegetable pathogens collected in Cambodia. Mostly this involves identification from DNA samples collected during survey work. This can lead to the discovery of novel species or sub-species, which is always good for the publications! Associated with this work is the development of protocols suited to poorly resourced laboratories, training materials and resource documents for researchers and extension workers in Cambodia.

I also have a role in a GRDC funded project looking to develop biocontrol agents for insect pests. Mainly I conduct genetic analysis of isolates, but I also like to annoy Dr Bree Wilson as much as possible.

For something completely different I have been involved in the analysis of a fungal pathogen occurring on the platypus, and more recently, genotyping platypus from the Murrumbidgee catchment, both in collaboration with Dr Joanne Connolly.

##### Teaching activities

Along with the co-supervision of three PhD students, I have taught Agricultural Genetics and Plant Pathology.

#### Professional Links

- ACIAR
- GRDC
- CRC for National Plant Biosecurity

**A typical day for me includes ...** Rushing around to get my son out the door, arriving at work late because I did

not achieve that and then - answering emails from my Cambodian counterparts; getting in the lab to try and do some experiments, which vary greatly in success and dealing with all the issues I failed to deal with adequately the day before.

**My main project at the moment is ...** Strengthening the Cambodian and Australian vegetable industries, through the adoption of improved production and post-harvest practices - conducting the plant pathology research and capacity building aspects of this whole of system program.

**My favourite part of my job is ...** The travel, the people I work with (both Australian and Cambodian), going home to play with my kids!

**When I am not in the office I like ...** Spending time with my family and trying to get the garden in to some semblance of order.

**When I am driving I like to listen to ...** Whatever happens to be on Triple J at the time! Tool, A Perfect Circle, and The Dirty three are all tumbling around the floor of my car at the moment.



Ben Stodart Conducting field surveys in Cambodia.  
Photo: Gavin Ash.



## Dr Julie Pattemore

**Position:** Research Associate

**Organisation:** Charles Sturt University

### Career Brief

I have evolved from field-based plant pathology into a genomics geek! I began my research career in sugarcane nematology with Queensland DPI, followed by a brief return to The University of Queensland to get out of the dirt and into molecular biology. From there I worked for seven years for the CRC for Tropical Plant Protection in DNA-based disease diagnostics of banana. The highlight of this was giving a keynote at an international conference describing how we scientists, government and the banana industry collaborated to eradicate black Sigatoka from a commercial banana production area - a world first. Eventually I came round to doing a PhD - which introduced me to the world of next generation sequencing.

### Research and Teaching Activities and Interests

#### Research activities

Whole genome sequencing of economically important fungal pathogens of plants and insects. Getting my teeth into the bioinformatics of genome assembly and comparative genomics.

#### Teaching activities

I'm not allowed near students yet!

### Professional Links

- Australasian Plant Pathology Society

**A typical day for me includes ...** ACGTCCTGAACC! I trawl through a lot of sequence data looking for the cool, interesting stuff. At the moment I'm looking at genes involved in fungicide resistance in *Mycosphaerella graminicola*, causing the wheat disease Septoria tritici blotch. While fungicide resistance is a growing problem in Europe, it has not been identified in Australia. We now have the genomic resources to rapidly identify new cases of fungicide resistance in Australia if it emerges.

**My main project at the moment is ...** Whole genome sequencing of economically important fungal pathogens of plants and insects. Whole genome sequencing gives you the genetic blueprint of an organism. From here, the genomic resource allows you to start answering more questions about the fungus: which genes are involved in what process; how is it different to other strains of the same fungus, or closely related species; what makes it more pathogenic; what controls its host range. Then there is the more applied applications like the generation of molecular marker data sets for genotyping, molecular identification of strains, environmental tracking and more.

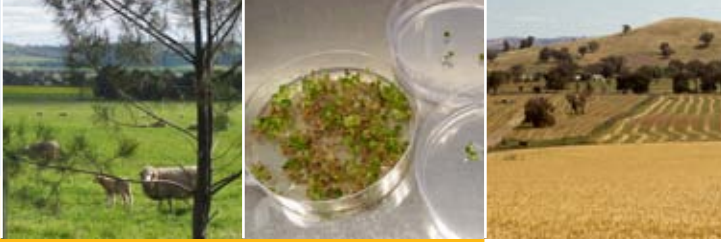
**My favourite part of my job is ...** My job involves staying up-to-date with the sequencing and molecular technologies as they arise. I like talking to other researchers about the biologically challenging questions they face and how we can match the most appropriate technology to the problem. Not every problem requires a big budget sledge hammer, sometimes a ladies claw hammer will do!

**When I am not in the office I like ...** To head out into the hills on my Honda CB900. Since moving down south I've discovered the Snowy Mountains and Victorian Alps offer some of the best riding I've ever done and the most beautiful scenery.

**When I am driving I like to listen to ...** The voices in my head - I get some good project ideas when I'm out on the road!



Julie Pattemore travelled to Mexico in September to present a paper at the 8th International Symposium on *Mycosphaerella* and *Stagonospora* Diseases of Cereals. Photo: Andrew Milgate.



## EVENTS CALENDAR 2011

Date	What	Where	More information
27 October	Seminar 'Endophyte alkaloid expression – how do we measure & what does it mean? Dr Wade Mace, AgResearch NZ.	DPI Conference Room, Wagga	E: <a href="mailto:leweston@csu.edu.au">leweston@csu.edu.au</a>
15 December	Graham Centre End of Year Function (4:00 - 7:00pm)	CSU Convention Centre, Wagga Wagga	Maree Crowley, T: 02 6938 1681
28-29 Feb 2012	GRDC Adviser Update	Narrandera, NSW	<a href="http://www.orm.com.au">www.orm.com.au</a>



## Science or Art?

Thank you to Dr Geoff Burrows for this interesting photograph – what is it?

It's a longitudinal section of a snail medic pod, taken from the Graham Centre field site!

*Do you have an interesting research-based photograph that we could include in future editions of the Innovator? If so, please send to Toni or Sharon.*

## Summer Edition of *the Innovator*

The Summer Edition of *the Innovator* will be available mid January 2012. Submission of articles for this edition closes on **Friday, 16 December 2011**. Please email articles to Toni Nugent or Sharon Kiss.

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