Scientists ‘fast-forward’ plant breeding

A team of international researchers, including a PhD student from The University of Western Australia, have fine-tuned an in-vitro method that can shorten the plant breeding cycle by up to 70%.

“This represents a key milestone in the quest to increase world cereal production,” explains team member Associate Professor Guijun Yan, from UWA’s School of Plant Biology and the UWA Institute of Agriculture, “because breeding new plant varieties suited to cope with drought, salinity and diseases is at the heart of many plant breeding programs aimed at improving crop yields and quality. Traditionally, this has been a time-consuming activity: it involves identifying suitable lines from hundreds of crosses, followed by developing ‘pure lines’ of the plants, which takes at least eight generations. Pure lines are essential for commercial seed production, and until recently, the fastest way to obtain pure lines was the so-called ‘shuttle breeding’ technique developed by the ‘Father of the Green Revolution’, Nobel Laureate late Dr Norman Borlaug. This technique involves growing plants at different places, to exploit differences in latitude or altitude. However, even this technique can achieve only two or three generations a year.

This may soon be history as a team of international researchers has developed a new technique that enables up to eight generations of wheat and nine generations of barley a year. The team – involving researchers from UWA, China and CSIRO – has perfected a method involving in-vitro germination of 10-15 day-old embryos and culture of plantlets under extended light, high temperature and water and nutrient stress conditions to achieve each generation within 40-45 days. The method has been used to generate many mapping and fine mapping populations for genetic research and breeding purposes.

While embryo culture has been used before, this team introduced a difference which delivered stunning results:

“We combined this technique with specially modified water, light, temperature, humidity and potting-mix management, and a skilled technician in the team was able to dissect 60 plant embryos per hour from the developing grains,” says Yan. “By dramatically shortening times required to obtain pure-line genotypes, our method could have wide applications in breeding and biological studies.”

Their study has just been published in the international journal *Euphytica.*
Climate-smart crop research bags Science and Innovation award for young UWA scientist

A young research associate at the Centre for Legumes in Mediterranean Agriculture (CLIMA) has been recognised with a Science and Innovation Award for Young People in Agriculture, Fisheries and Forestry for her research that aims to help plant breeders identify environmentally-friendly subterranean clover, a key pasture species in Australia.

Dr Parwinder Kaur conducts research with a multi-disciplinary team that will aid in identifying genes which control vital traits in this species, by sequencing the complete genome. “This research is a world-first effort and will change the way grazing is practiced,” says Kaur. “Once we determine the genes that control such traits as methane release potential, the results could help address a range of emerging issues for ruminant health in a changing climate and make climate-smart crops a reality in the near future.”

As the winner of the Meat and Livestock Science and Innovation Australia Award, she will initiate a collaborative research program with Japan.

Kaur is passionate about communicating her work to the scientific community and the wider public:

She regularly talks about her research on radio and plans to publish her work in scientific journals and present at key conferences.

The Science and Innovation Awards for Young People in Agriculture, Fisheries and Forestry are coordinated by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), and each category is supported generously by primary industries, to provide winners with grants of up to $22,000 each to undertake a project exploring an emerging scientific issue or innovation over a 12-month period.

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What’s new at the UWA Future Farm 2050

Ms Christine Shervington
Email: christine.shervington@uwa.edu.au

Filmed November 2012 for viewing February 2013

As part of ABC Catalyst’s ‘On the Road’ six-week Cross-Australia tour in November 2012, the Catalyst team, including reporters Anja Taylor, Derek Muller and Simon Pampena, visited the UWA Future Farm 2050 project at Ridgefield.

Their report was aired on 7 February 2013 and covered an overview of the vision for the Future Farm project. The Catalyst team also examined the research on methane abatement that is being done in the UWA-CSIRO Alliance for Versatile Livestock Systems. Professor Phil Vercoe (IOA) and Dr Dean Revell (CSIRO) are collaborating to address the challenge of reducing the greenhouse gas footprint of extensive grazing systems for livestock without adversely affecting productivity and profitability.

One strategy is to develop grazing systems that are based on mixtures of plants that offer good nutritive value whilst also reducing methane emissions. There is also the possibility that ‘anti-methanogenic’ plants could become a methodology for the Carbon Farming Initiative but, for this to occur, the researchers need to quantify the impact of the novel forage systems on livestock productivity and GHG emissions, and there needs to be certainty that new systems persist to provide long-term benefits.

The Catalyst crew assisted in inflating a ‘poly tunnel’, CSIRO’s plastic tent in which groups of sheep can be kept for 24 hours while their methane emissions are measured. In this endeavour, the Catalyst crew was aided by Nathan Philips and Andrew Toovey (CSIRO). Dr Samantha Bickell (IOA) then gave instruction on low-stress stock handling as the test animals were brought into the ‘poly-tunnel’ for measurements. Extra interest was added when a ‘sheep cam’ was used to observe flock behaviour from the perspective of an individual sheep.


Another exciting development relates to a new project ‘Ensuring sustainable and responsible production of healthy food from healthy animals’, awarded to the University of Bristol and UWA and supported by the Worldwide Universities Network’s (WUN) Development Fund. The UWA Future Farm is also a key resource in this project which addresses the WUN Global Challenge: Adapting to Climate Change with the immediate strategic objective of safeguarding food security for the growing human population.

IOA Deputy Director Winthrop Professor Graeme Martin emphasises the significance of these developments: “The UWA Future Farm joins two other unique and visionary research farms – one in England and one in southern India – and this will allow us to compile a global assemblage of data and ideas that will help ensure sustainable and responsible production of healthy food from healthy animals.”

Agriculture on Youtube

youtube.com

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<tr>
<td>Catalyst interview about UWA Future Farm, 7 Feb 2013 (with Prof Phil Vercoe and W/Prof Graeme Martin)</td>
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<td>Extended Catalyst interview, discussing the use of native shrubs to reduce methane emissions (with Prof Phil Vercoe)</td>
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<td>Extended Catalyst interview about the broad scope of research being conducted at Future Farm 2050 (with W/Prof Graeme Martin)</td>
<td><a href="http://www.abc.net.au/catalyst/stories/3685256.htm">www.abc.net.au/catalyst/stories/3685256.htm</a></td>
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Three ‘legal eagles’ at UWA are doing their bit to improve the sustainable use of Western Australia’s limited water resources which are essential to safeguard our future food security and quality of life.

As the WA government drafts new water resource management legislation to implement WA’s commitments under the National Water Initiative (NWI) (www.nwc.gov.au/nwi), Associate Professor Alex Gardner (Faculty of Law and IOA), PhD student Madeleine Hartley and honours graduate Sarah Robertson have identified serious deficiencies with the state’s water access rights legislation and regulatory compliance system, and have developed proposals to address these issues.

Problem areas include lack of rigour and transparency in the metering, recording and reporting of water extraction and use (i.e. water accounting), which makes it difficult to monitor and enforce water access rights in Western Australia. “Much of the data necessary to ensure compliance with water licences and access entitlements is not publicly available in Australia,” says Gardner. “This means, water licence and entitlement holders are not kept accountable for the amounts of water they extract, trade and use.” In Gardner’s view, deficiencies in the statutory frameworks together with current privacy and confidentiality legislation are to blame for this situation. In an article co-authored with Bachelor of Laws honours graduate, Clare McKay, he calls for legislative and policy reforms to create a presumption that water accounting data will be publicly available and only withheld from publication if the case for privacy or confidentiality is made specifically in relation to the particular data.

“Transparency in water accounting is essential to secure environmental and other public benefit outcomes and to meet the NWI objectives for water accounting reform, namely to support public and investor confidence in the amount of water being traded, extracted for consumptive use, and recovered and managed for environmental and other public benefit outcomes.”

Sarah Robertson’s work highlights the importance of extending the NWI reforms to the compliance and enforcement system. Her research into the monitoring and enforcement of water access rights in the South-West of WA found problems with the State’s compliance monitoring system, departmental continued on page 13
IOA scientist cruises to plant breeding improvements

Winthrop Professor Wallace Cowling
Email: wallace.cowling@uwa.edu.au

Winthrop Professor Wallace Cowling was on long service leave in early 2012 when he was fortunate to “hitch a ride” with wife Kellie on the newly launched “Disney Fantasy” ship from Germany to New York. This provided an opportunity for Cowling to read numerous text books in quantitative genetics and its application to plant breeding, and he was inspired to write the recently published review article titled “Sustainable plant breeding” for the international journal Plant Breeding. He was invited speaker on this subject at the German Plant Breeding Society in Giessen in early March 2012.

As Cowling now remarks, “The 2-week sail from Bremerhaven to New York City provided the time to think about issues that affect plant breeders during their careers. We spend most of our professional careers “keeping busy”, but we often fail to critically review the best way to breed plants. As a result of this paper, I have now changed the way I breed canola in our company Canola Breeders. The goal is to avoid the “yield plateau” that sometimes limits what breeders can achieve in their careers due to diminishing genetic diversity. After making a few small changes to my breeding program, I am confident that Canola Breeders can release superior commercial varieties into the long term, and maintain or increase genetic diversity in the program. In the past, breeders have made improvements in the short term, at the cost of genetic diversity. By increasing migration into the program, and expanding the population base through a greater number of parents (chosen on the basis of superior estimated breeding value), breeders can accelerate their genetic progress and improve breeding efficiency. Modern biometrical and molecular techniques can help us achieve these goals, but the primary changes need to be made by the breeder at the coal face of selection and crossing.”

Honey week highlights ‘More than Honey’

Dr Barbara Baer-Imhoof
Email: barbara.baer@uwa.edu.au  Webpage: www.ciber.science.uwa.edu.au

Western Australia is about to celebrate Honey Week (29 April – 5 May) and this year’s highlights include the award-winning documentary ‘More than Honey’, made by Oscar-nominated movie director Markus Imhoof, with scientific assistance from researchers at UWA’s Centre for Integrative Bee Research (CIBER).

About a third of what we eat, including most fruit and vegetables, requires pollination by honeybees. Einstein once predicted that if bees were to die out, mankind would follow four years later.

Scarily, this scenario is not as far-fetched as it might sound: Millions of bees are dying worldwide. ‘More than Honey’ explores the reasons for this global catastrophe in a theatrical, internationally acclaimed documentary: we come eye-to-eye with bees in a hive; we follow one beekeeper who transports 15,000 hives on the back of his trucks all over the United States to pollinate endless monocultures of almond trees, where many of his “ladies” die of pesticides and parasites; we visit the idyllic Swiss Alps where a traditional beekeeper loses his hives to foulbrood, while in Southern China the bees have vanished completely and farmers hand-pollinate their apple trees.

But there is hope as well: we accompany the film crew on their visit to researchers at CIBER in Western Australia, where the bees are still healthy and scientists closely collaborate with local beekeepers in the search for solutions to safeguard honeybees.

CIBER, together with the Goethe Institute and the Swiss Embassy, will bring ‘More than Honey’ to an Australian audience at the Audi Festival of German Films 2 May, Cinema Paradiso, Perth. To view the trailer, visit: www.ciber.science.uwa.edu.au/blog/?page_id=121.

Other events for Honey Week 2013 include a bee exhibition at Scitech with daily visits (11am-2pm) by beekeepers and scientists and, on the last day (5 May, 11am – 4pm), a big Festival at the House of Honey in the Swan Valley. For further details visit: Honey Week on facebook www.facebook.com/HoneyWeek
Workshop kickstarts ‘Environmental Research Prioritisation Framework’

Ms Ully Fritsch Email: ully.fritsch@uwa.edu.au

The need for environmental research is widely accepted, since our finite natural environment and resources have come under increasing pressure from man’s efforts to meet the demands of a growing population in a changing climate.

This is where Winthrop Professor David Pannell, from UWA’s Centre for Economic and Environmental Policy comes in: “To date there has been surprisingly little information available to help assess environmental research proposals, and what literature does exist, has largely focused on ad-hoc identification of gaps and shortcomings in completed projects,” explains Pannell. “I decided to do something about this and secured the collaboration of eminent scientists from UWA, interstate and overseas with the aim to develop a framework that could be used by research organisations and funding bodies to examine and evaluate environmental research proposals.”

At the end of February 2013, ten scientists and economists met in Brisbane for a one-week workshop on environmental research evaluation, including Professor Julian Alston (University of California-Davis) who is widely regarded as a world-leader on the topic of ‘priorities of agricultural research’.

Participants identified key factors to take into consideration, including a proposed project’s benefit for the community as a whole; feasibility of completing the environmental research; scale of the problem and of its effects; time lags until benefits would be generated; and the likelihood that research results will be adopted by decision makers or other users. There are plans for a joint publication on the outcomes of workshop, which could qualify as a milestone in the development of a scientific framework for the evaluation of environmental research proposals.

Given that some of the benefits of environmental research are intangible and therefore difficult to evaluate systematically, this is an ambitious quest, but if successful, a systematic framework for evaluation is likely to produce significant benefits. “One aim is to help environmental research funding organisations to select research that is ultimately likely to deliver the most valuable environmental benefits,” Professor Pannell said.

The workshop was conducted as part of the ARC Centre of Excellence for Environmental Decisions and the National Environmental Research Park(NERP)-Environmental Decisions hub, funded by the Australian Government.

For further information email david.pannell@uwa.edu.au

Anti-cancer drug discovery in sunflowers brings new focus to research at UWA

Ms Alice Trent Email: alice.trent@uwa.edu.au

Meet new Perth resident and winner of Australia’s highest award for young plant scientists (the Peter Goldacre Award), Dr Josh Mylne. Dr Mylne has recently arrived from Brisbane to further his research on drug discovery in plants. His research follows on from his 2011 finding of how a cancer treatment drug-like protein called SFTI-1 could be made in sunflower seeds.

Besides earning him the Peter Goldacre award in 2012, this discovery represents a big step forward in the quest to manufacture cheap and effective cancer drugs in plants – a process called “pharming”.

The drug potential of the SFTI-1 protein comes from its ability to block a digestive enzyme that breast cancer cells use to destroy healthy tissue nearby, allowing the breast cancers to grow. If cancers can’t multiply – they eventually die. Typically, cancer treatment involves an arsenal of drugs designed to target various weaknesses of the cancer cell and usually include an enzyme blocker such as this.

Mylne’s further experiments showed something even more interesting; SFTI-1 is cut out of a larger protein segment and locks onto itself to form a tight protein ‘ring’. This makes SFTI-1 ultra-stable and very difficult for any enzyme to attack it.

“This structural information on how ultra-stable molecules form could open the doors to creating a host of ultra-stable enzyme blockers,” explains Mylne. “On top of this, further research has shown that SFTI-1 can be modified to block a variety of cancer proteins.”

An ARC Future Fellowship has allowed Mylne to pursue this research in his own, new laboratory at UWA in collaboration with the ARC Centre for Excellence in Plant Energy Biology and the School of Chemistry and Biochemistry, and he is excited about the prospect of unlocking further benefits over the next five years.
Ms Ully Fritsch Email: ully.fritsch@uwa.edu.au

In December 2012, UWA hosted the fourth Australia-China Joint Symposium on Science, Technology and Education – the first time the event has been held in Western Australia.

The four day symposium attracted more than 40 delegates from renowned Chinese institutions, including North China University of Electric Power (NCUEP), Chinese Academy of Sciences (CAS), Tsinghua University, and China University of Petroleum.

They were joined by representatives from Australian universities and government, as well as by top Chinese dignitaries, including Madam Wang Yin’er, Consul General of the People’s Republic of China in Perth.

Among the plenary speakers were CAS Vice President, Professor Jinghai Li, UWA Nobel Laureate Professor Barry Marshall, UWA Vice Chancellor Professor Paul Johnson and NCUEP Vice President Professor Yongping Yang.

Food security, water, medicine, energy, culture and commerce were some of the agenda topics and the conference was a big success on all fronts: “UWA and NCUEP signed a research collaboration agreement, and many other research collaborations were initiated, with two of them already active,” says Professor Dongke Zhang, Director of UWA’s Centre for Energy and IOA and (then) President of the Federation of Chinese Scholars in Australia (FOCSA). “The program also included a postgraduate workshop for the first time which was well received by the participants.”

The symposium was hosted by the Federation of Chinese Scholars in Australia, a consortium of 13 Chinese professional associations in Australia whose aim is to promote links and cooperation between the two nations sponsored by UWA, the Chinese Consulate General in Perth, NCUEP, BHP, CAS, Griffith University and the University of New South Wales.

The next symposium will be held in Wollongong in June 2014.
An Open Day at the UWA Turf Research Facility drew a crowd of local government and industry representatives, keen to see how turfgrass can be managed most effectively on a water allocation.

During the Open Day at UWA’s Shenton Park Field Station, a series of trial plots demonstrated how different water allocations, in combination with a wetting-agent, have influenced turfgrass quality and development of soil water repellence, or “dry-patch”.

The Water Allocation Project is supported by Horticulture Australia Ltd in collaboration with government agencies.

Inaugural Alan Robson Medal awarded to UWA Plant Biologist

Late last year, UWA plant biologist Associate Professor Michael Renton became the winner of the inaugural ‘Robson Medal for Research Excellence in Agriculture and Related Areas’. With the retirement of UWA’s former Vice Chancellor, Emeritus Professor Alan Robson, in 2012, the Science Faculty established this new annual award to acknowledge Robson’s significant contributions over the decades during his time within the Faculty and the University at large.

Staff and PhD students from UWA, DAFWA and CSIRO, were invited to submit peer reviewed papers for assessment for this award. Only papers whose first or last authors had completed their PhD within the past ten years were included. The call attracted 27 applicants competing for the call.

Runners up were UWA scientists Dr Imran Malik (Centre for Legumes in Mediterranean Agriculture) and Dr Roberto Busi (Australian Herbicide Resistance Initiative).

Robson praised the high standard of entries and commended the multi-disciplinary approach used to synthesise different types of knowledge in Renton’s paper. Since winning the award, Renton has given a plenary presentation on the topic at the Global Herbicide Resistance Challenge conference held in Fremantle in February, and been invited to give a similar presentation at the European Weeds Conference to be held in Samsun, Turkey, in June this year.

French intern impresses growers and scientists alike

Assistant Professor Michael Considine
Email: michael.considine@uwa.edu.au

In Late 2012, French Masters student Isabelle “Izzy” Desmons spent a three month internship at IOA and made a great contribution in an ARC-Linkage Project that investigates grapevine bud necrosis and flower abortion.

The focus of Desmons’ visit year was a research project to survey the incidence and severity of bud necrosis and flowering disorders in Carnarvon and the Swan Valley, across several properties. She spent six weeks in Perth honing her skills and knowledge of vine physiology, followed by five weeks in Carnarvon and a final week in Perth.

“Izzy gained a great rapport with the grape growers and impressed everyone with how quickly she took not only to the dissecting microscope, but also to gumboots, secateurs and the art of table pruning,” says Assistant Professor Mick Considine, Desmons’ mentor on the project.

Desmons was the second student from the French institution ‘l’Ecole d’Ingénieurs de Purpan’ in Toulouse, to do an internship with the UWA/DAFWA project team. Each year, students enrolled in a 5-year Master of Agriculture course in France spend an internship with an academic or industry partner, including two international visits to English-language countries.

If you are interested in hosting a student between July and September please contact Michel de Rancourt via email (michel.derancourt@purpan.fr).
PhD project sets new direction for sheep breeding research

Winthrop Professor Graeme Martin  Email: graeme.martin@uwa.edu.au

Cesar Rosales Nieto presenting his research on the maternal efficiency of meat sheep.

A project by PhD student Cesar Rosales Nieto is exploring ways to breed sheep at one year of age and challenging a five-decade old dogma in the process.

If successful this would address the two most urgent needs of the Australian sheep-meat industry: to reduce its carbon footprint, and to increase the size of the sheep flock. Winthrop Professor Graeme Martin, Deputy Director of IOA, explains: “These two goals are most readily achieved if we can breed sheep at a younger age – obviously, reproduction is fundamental to increasing flock size but, equally important, meat sheep that are not reproducing are only producing greenhouse gas, thus increasing *emissions intensity (the amount of greenhouse gas emitted per kilogram of product).”

Delayed breeding represents a major inefficiency in reproduction – traditionally, farmers do not breed their female sheep until they are two years old, wasting a year of productivity and also adding a year of greenhouse gas production; delayed breeding also lengthens the generation interval and thus slows down genetic progress.

In his project, UWA PhD student, Cesar Rosales Nieto, is working towards practical ways to breed sheep at one year of age. “I am focusing on the genetics of body composition, particularly muscle development, and was able to show that in ewe lambs, genetic improvement for rapid muscle development can advance puberty and increase the reproductive efficiency of the ewe lambs.”

As Martin points out, this is a whole new direction in reproductive physiology and poses the question how muscle can affect the onset of puberty and fertility.

“Nieto has evidence that a muscle protein, follistatin, might trigger this onset and he presented his findings to the annual conference of the European Association of Animal Production in Bratislava, Slovakia (27-31 August 2012). After the conference, he visited laboratories in Austria, France and Spain to discuss his work and potential collaboration with UWA. His travel was funded by a Postgraduate Research Travel Award from Convocation, the UWA Graduates Association.”

UWA students recognised for successes in agriculture and related disciplines

Students in agriculture and related areas at UWA have been on a roll, claiming several prestigious prizes and awards for their outstanding achievements (cf page 10).

IOA congratulates the following students:

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<tr>
<th>NAME</th>
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<tr>
<td>Ms Louise Fisk</td>
<td>Best presentation by a scientist under 35 years, at the Joint Australian and New Zealand Soil Science Conference in December 2012. Title of her presentation: Soil solutions for diverse landscapes. The effect of temperature and organic carbon availability on the relative rates of microbial nitrogen immobilisation and nitrification in a semiarid soil.</td>
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<tr>
<td>Ms Karlia Meitha</td>
<td>Winner of a Grape and Wine Research and Development Council travel award for her project Investigation of respiratory control in dormant grapevine bud.</td>
</tr>
<tr>
<td>Mr Bidhyut Banik</td>
<td>Winner of the CSIRO Sustainable Agriculture Flagship 2013 Postgraduate Scholarship within the theme of Plants, ruminants and methane: it’s pure chemistry.</td>
</tr>
<tr>
<td>Ms Genevieve Massam</td>
<td>Winner of the Undergraduate Prize for the WA branch of the Australian Agricultural and Resource Economics Society (AARES) for her thesis: Community Values for the Benefits of Carbon Farming; a Choice Experiment Study. Presented at the 57th AARES conference in Sydney in December 2012.</td>
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Careers Night for Agriculture students: Wed 22 May

www.facebook.com/events/426578277422539/?ref=14

The Ag Institute of Australia (WA Division) presents its annual Careers Night on Wednesday 22 May at Curtin University, Chemistry Building.

The event is open to all university students in WA enrolled in Agriculture and related disciplines. Students will have the opportunity to engage with a wide range of employers across the industry, including agribusiness, agronomy and animal science.

The event will commence at 6pm. For further information visit the Ag students’ facebook page at www.facebook.com/events/426578277422539/?ref=14

The UWA Institute of Agriculture

April 2013

9

Sustaining productive agriculture for a growing world
Two UWA Ag Science graduates claim top awards at Young Professionals in Agriculture Forum

Ms Uly Fritsch
Email: ully.fritsch@uwa.edu.au

UWA Agricultural science graduate Emma Downsborough has taken out the highest award at the Young Professionals in Agriculture Forum, followed by Caris Jones, another UWA Ag Science graduate who claimed second prize and was also recognised for delivering the best presentation.

The annual Young Professionals in Agriculture Forum is hosted by the Department of Agriculture and Food, WA (DAFWA) and Ag Institute Australia (WA Division), and recognises the work of tertiary students who have completed an undergraduate degree and are studying agriculture-related subjects at Western Australian universities. Finalists are required to submit a research paper and deliver a presentation.

Emma Downsborough who is from a farm at Burracoppin and moved to Perth to study Agricultural Science and Commerce at UWA, achieved the top award for her work on consumer preferences and willingness to pay for local food products.

Before graduating with first class honours from her double degree, she had already worked two years part-time as a Marketing Officer for agricultural business ‘Grain Assist’. “I am really interested in becoming more involved in local food marketing if the opportunity arises,” says Downsborough.

“My honours studies at UWA have prepared me well and they were really exciting. I owe a big thank you to my supervisors Professor Michael Burton and Assistant Professor Amin Mugera (both from the School of Agricultural & Resource Economics and IOA) for their fantastic support throughout my honours year.”

Caris Jones, from a wheat and sheep farm near Dowerin, took out second prize for her work on feed-use efficiency and its impact on the fertility of Merino ewe lambs, and her presentation was judged second to none. Her honours project supervisors were Professor Phil Vercoe, School of Animal Biology and IOA, Associate Professor Andrew Thompson, Murdoch University and DAFWA, and Ms Beth Paganoni, DAFWA.

Department Director General, Mr Rob Delane, said the outstanding work carried out by the six finalists indicated the high standard of young professionals entering the agriculture and natural resources sectors.

“I have really loved my time at UWA,” says Jones, “especially the hands-on approach and the opportunities to visit the UWA Future Farm and see first-hand what’s going on in terms of the latest research.”

Since graduating, Jones has returned home to put the knowledge she developed at UWA to the test on the family farm for a while. After that, she plans to look further afield and pursue a professional career related to agriculture, which should not pose too much of a problem, according to Mr Delane: “The diverse range of careers in the agriculture and food sector provides exciting opportunities for such talented and motivated graduates and the range is expected to increase further with the ever-growing global demand for food.”

In 2012, the International Centre for Plant Breeding Education and Research (ICPBER) at UWA shared its expertise and state-of-the-art facilities with three diverse training groups who had come to learn new skills and methods related to plant breeding.

The Microspore Culture and Flow Cytometry Short Course was held 9 – 13 July 2012 and attracted researchers from the public and private sector in Indonesia, Bangladesh and India, keen to learn this technique that can shorten the plant breeding cycle from nine years down to one year. Participants developed practical skills in flow cytometry and learned the theory behind successful microspore culture and doubled haploidy.

Presenters included Dr Janine Croser (CLIMA) and Dr Kathy Heel (CMCA). The course was supported by the Crawford Fund WA.

The Workshop Experimental Design and Application of Linear Mixed Models in Plant Research was held 5 and 12 of October for PhD students from WA universities and for scientists working in the industry. The aim of the course was to introduce more advanced experimental designs and the latest statistical techniques (such as linear mixed models) for the analysis of field and glasshouse experiments.
Lessons from aphid-study for oil exploration, agriculture and virology

Associate Professor Christian Nansen
Email: christian.nansen@uwa.edu.au

A novel procedure which allows observation of aphid-feeding has revealed lessons for oil exploration, and introduced a new direction for research in virology, applied entomology and agriculture.

As part of a GRDC-funded project ‘Detection and epidemiology of spring aphids and redlegged earth mites’, UWA Entomologist Associate Professor Christian Nansen (IOA and Animal Biology) and colleagues used a simple chemical staining procedure and succeeded in observing the ‘leaf-drilling’ by aphids, that is, aphids in the process of feeding.

In Western Australia (and many other parts of the world) aphids are economically important pests on crops like wheat and canola. Their feeding stresses crops and stunts growth, resulting in lower yield and less profit.

“Often, crop loss due to aphid feeding is attributed mainly to disease-transmitting (plant pathogenic) viruses, which are transferred by aphids to the crop plant in the feeding process,” explains Nansen.

“Management of aphid pests has traditionally focused on killing them, because ‘a dead aphid doesn’t feed’, but killing the aphids should actually be considered secondary to suppressing its feeding.”

“Aphids are fluid feeders (like other piercing sucking insects) and don’t have mandibles for chewing. Instead, they feed by inserting their complex mouthparts (stylets) into the living tissue that carries organic nutrients (phloem) in the vascular system of plants.”

Phloem-feeding, however, is a risky business, as the vascular system in plants is under a very high positive pressure (approximately 500 times higher than the blood pressure in humans). “Aphids face a challenge which is quite similar to explorers drilling for oil or gas,” explains Nansen. “When their mouth parts reach the phloem – the target resource – in the vascular system, they must control the pressure to avoid an explosion.”

Aphids have solved this challenge by secreting a cement-like material (a stylet sheath) around their mouth parts, and it immediately hardens and works like a catheter or pressure valve, protecting the aphid from blowing up.

Using a simple chemical staining procedure, Nansen and colleagues were able to observe and visually record the stylet sheath being secreted (as indicated on the photo by the arrow), i.e. the moment of ‘leaf-drilling’/ feeding.

Arguably the most significant benefit of this staining/visualisation procedure (of ‘leaf-drilling’) is that it allows quantification of how many times crop leaves are being fed on by aphids. “We are now able to count the number of stylet sheaths and determine to what extent different agro-chemicals (including pesticides) affect the risk of virus transfer to crops and how aphid feeding varies among crop varieties,” explains Nansen, “and this represents a big step towards effective control of aphids and improved profitability of crop production.”

An aphid feeding on a canola leaf. Chemical staining of the stylet sheath secreted around the mouth parts can be used to quantify the number of feeding events and possible risk of virus transfer.
Chickpea improvement for a changing world: collaboration with India on abiotic stress tolerance

Winthrop Professors Tim Colmer and Neil Turner
Email: timothy.colmer@uwa.edu.au

UWA Plant and Agricultural Scientists visited India during February 2013 for chickpea project discussions and participation in a Consultative Group in Agricultural Research (CGIAR) planning meeting on grain legumes.

UWA and International Crops Research Institute for Semi-Arid Tropics (ICRISAT) have collaborated for several years on disease resistance and abiotic stress tolerance pre-breeding in chickpea. Recently, the collaboration has been expanded by an ACPFG-led Australian consortium as part of an Australia-India Strategic Research Fund (AISRF) Grand Challenge Project with ICRISAT as the lead organisation in India. The project interacts closely with the Pulse Breeding Australia chickpea program.

Winthrop Professors Neil Turner, Tim Colmer and Kadambot Siddique visited India for discussions on a project finishing in 2013 on salinity and drought tolerance, while the activities in the new AISRF Grand Challenge Project gathered momentum.

“This was the final meeting scheduled for our current project on salinity and drought stress, for which the focus at UWA has been on salt tolerance,” said Colmer. “Although chickpea is a salt-sensitive species, we have identified useful variation in tolerance in partnership with our colleagues at ICRISAT and made progress on understanding the impact of salinity on reproductive success. We still have a way to go to fully understand the mechanisms of tolerance and to improve knowledge on the genetics. We have a launching pad to enable these further discoveries in collaboration with the expanded partnerships available via the AISRF Grand Challenge Project.

Presentations by members of the project team highlighted the substantial progress made during the previous six months. In particular, discussions focused on a large joint data set obtained in collaborative experiments which involved research officer John Quealy sampling tissues at ICRISAT with chemical analyses conducted at UWA and experimental work by ICRISAT PhD student Pushpavalli. Pushpavalli had visited UWA on a Crawford Fund award. Turner summarised the success of the project meeting: “It was very pleasing to see how this team work involving short exchange visits between UWA and ICRISAT has enabled joint data sets. We now plan to write up this work for a joint publication.”

The visit to ICRISAT also enabled the UWA team to participate in a CGIAR workshop Global Research Program on Grain Legumes. The Grain Legumes Program is a partnership between four CGIAR Centres: ICRISAT as lead Centre, Centro Internacional de Agricultura Tropical (CIAT), International Center for Agricultural Research In the Dry Areas (ICARDA) and International Institute of Tropical Agriculture (IITA), along with a number of representatives from various national programs and selected university collaborators. The Grain Legume Program will focus on increasing productivity, both via breeding and improved management practices, of: chickpea, groundnut, faba bean, lentil, pigeon pea, common bean and soybean. The priority pulse crops vary for the target regions in Asia, Africa and Latin America.

“We had two days of intensive small group discussions on specific issues. The workshop provided an opportunity to learn about the CGIAR Grain Legume Program and its directions for the next 3 to 10 years. There are plenty of opportunities for collaboration with the program on areas of mutual interest. The meeting involved about 100 legume scientists, so it was good to catch up with old friends and to meet new colleagues,” said Siddique.

This is an exciting time for chickpea research in Australia and more widely, with the recent completion of the draft genome (see also www. news.uwa.edu.au/201301295388/business- and-industry/chickpea-breakthrough-aims- feed-millions), the new Grand Challenge Project commencing in 2012 in Australia (Australian Centre for Plant Functional Genomics, UWA, University of Queensland, Royal Melbourne Institute of Technology, University of Melbourne), several PhD research student projects underway, international collaborations, and the planned interactions of molecular geneticists, physiologists, crop scientists, and breeders focused on chickpea.

From ICRISAT in Hyderabad, Turner and Siddique went to Panjab University in Chandigarh to visit Professor Harsh Nayar who is a collaborator on the AISRF project on abiotic stress tolerance in chickpea. Nayar and his students have been studying the effects of heat and salinity on the biochemical and hormonal balance of chickpea. In an interactive session at the university, the visiting scientists were impressed by the quality of the research being conducted by the students. Joint papers between ICRISAT, Panjab University and UWA are underway.

Siddique and Turner then travelled to Punjab Agricultural University (PAU) in Ludhiana which has been involved in previous collaborations with UWA and ICRISAT on ascochyta tolerance and salinity in chickpea and canola. After visiting the field at PAU where extensive agronomic, breeding and pathology evaluation of chickpea is being conducted and lupins from WA are being trialled, Siddique and Turner each gave a public lecture in the university and discussed future collaboration with Professor B.S. Dhillon, Vice-Chancellor of PAU. “These visits are important in both continuing collaboration and attracting students to UWA,” concluded Siddique at the end of the visit.
Promising field pea and lentil innovations in Bangladesh

Professor William Erskine
Email: william.erskine@uwa.edu.au

UWA ‘Legal Eagles’ keen to improve water use compliance continued from page 4

madeleine hartley’s research underscores the deficiencies in the RIWI act, which also provides the regulatory framework for water extracted from Perth’s principle underground water supply: the Gnangara groundwater system. Besides compliance issues (at the Department of Water and the stakeholder level), she blames negligent governance for the present scenario: “Limited stakeholder engagement is undermining the legal and policy measures designed to ensure that water is used efficiently and sustainably.” She believes that reform of the RIWI Act could provide the foundations for more stringent enforcement of the policy framework: “Tighter legal mechanisms which enhance prescribed methods of WUE in law and policy are required to ensure WA’s long-term water security under a drying climate and decline in groundwater availability.”

All of this work has been funded by the National Centre for Groundwater Research and Training: www.groundwater.com.au/

enforcement policy, administrative measures and criminal enforcement provisions. She discovered that, although non-compliance with water restrictions has been wide-spread, little use is made of the current enforcement mechanisms in the Rights in Water and Irrigation Act 1914 (WA) (RIWI Act).

Key reforms proposed by Robertson to address these issues include more extensive metering and auditing of water entitlements; strengthening of the criminal enforcement law by closing gaps in the offence provisions; increasing penalties and introducing provisions that make it easier to prosecute offenders.

As WA faces increasingly drier climatic conditions and moves to implement the NWI regime, Sarah believes the timing is right: “The drafting of the new water resources management legislation presents a good opportunity to reform the enforcement system, and it is important that Government have the ability to enforce the law when it is appropriate.”

Madeleine Hartley’s research underscores the deficiencies in the RIWI Act, which also provides the regulatory framework for water extracted from Perth’s principle underground water supply: the Gnangara groundwater system. Besides compliance issues (at the Department of Water and the stakeholder level), she blames negligent governance for the present scenario: “Limited stakeholder engagement is undermining the legal and policy measures designed to ensure that water is used efficiently and sustainably.” She believes that reform of the RIWI Act could provide the foundations for more stringent enforcement of the policy framework: “Tighter legal mechanisms which enhance prescribed methods of WUE in law and policy are required to ensure WA’s long-term water security under a drying climate and decline in groundwater availability.”

All of this work has been funded by the National Centre for Groundwater Research and Training: www.groundwater.com.au/
Harnessing microbes to release the P ‘bank’ in soil

Associate Professor Deirdre Gleeson  Email: deirdre.gleeson@uwa.edu.au

Researchers at UWA are working to provide grain growers with practical management options that harness soil micro-organisms to unlock part of the fixed phosphorus bank in Australian arable soils.

Australian grain producers apply $1 billion worth of phosphorus (P) fertilisers each year, but only 50% is taken up by plants. Much of the remaining fertiliser P becomes fixed in soil and the P ‘bank’ in Australian arable soils is estimated to be worth $10 billion.

Gleeson, from the UWA’s Institute of Agriculture (IOA) and School of Earth and Environment says, “We are aiming to identify management practices that farmers can use to make soil micro-organisms release phosphorus from the bank in soil so that it is available for their crops to take up.”

The research is being funded by GRDC, as part of its second Soil Biology Initiative, and ARC.

“Soil micro-organisms have a range of processes to release phosphorus from the bank in soil,” explains Gleeson. “We’re investigating whether manipulating organic matter inputs can cause soil micro-organisms to make phosphorus stored in the soil bank available for crops to take up. In our research we are assessing two ways in which the amount of carbon and nitrogen in the organic matter – known as the carbon to nitrogen ratio – could cause soil micro-organisms to release phosphorus from the bank in soil.”

Firstly, the researchers are determining whether applying organic matter with a low carbon to nitrogen ratio causes soil micro-organisms to release phosphorus from the bank in soil.

Gleeson explains, “Applying organic residues with low carbon-to-nitrogen ratios to soil may cause soil micro-organisms to become starved of phosphorus. This may cause the micro-organisms to release phosphorus from the bank of fixed phosphorus in soil, which will later become available for plants to take up.”

The second way in which applying organic matter to soil may cause soil micro-organisms to release phosphorus from the bank of fixed phosphorus in soil, is by applying organic materials with a high carbon-to-nitrogen ratio.

Gleeson says, “Applying organic materials with high carbon-to-nitrogen ratios may result in a microbial community in soil that is smaller, but more diverse -- and a more diverse microbial community may have more ways to release phosphorus from the bank in soil.”

The project combines cutting edge technology -- such as the use of a CT scanner and UWA’s powerful NanoSIMs microscope – with glasshouse experiments.

Researchers are currently analysing the data from the first experiment of ryegrass grown in a glasshouse and treated with different carbon-to-nitrogen ratios and Gleeson says, “There have been promising results from the first sixteen weeks of the experiment and they will help us determine how influential the carbon to nitrogen ratio is in terms of releasing fixed phosphorus from soil.”

Distinguished Professor from Lanzhou University visits UWA

UWA’s thriving collaboration with Lanzhou University, China, received another boost last November when Professor Feng-Min Li, Changjiang Scholar and Director of LZU’s Institute of Arid AgroEcology, paid a one-week visit to UWA.

During his visit Li held discussions with Winthrop Professor Kadambot Siddique, IOA Director, and Winthrop Professor Neil Turner, on a proposed joint workshop to be held in Beijing later this year.

He also visited the UWA Future Farm 2050 in Pingelly, and the CSIRO facilities in Floreat, where he met with senior scientists from the joint UWA-CSIRO Animal Production Research Unit and from the UWA-CSIRO Plant Genome Initiative.

He deepened his understanding about the way UWA steers and supports its research and Postgraduate Programs during meetings with Winthrop Professor Robyn Owens, Deputy Vice-Chancellor (Research).

“Professor Li’s visit was very productive and generated ideas for new initiatives that will strengthen our collaboration further for the benefit of dryland agricultural systems in China and Australia.”

**New staff**

**Kathleen DeBoer**

Email: Kathleen.Deboer@csiro.au

The Joint UWA-CSIRO Molecular Plant Pathology and Crop Genomics Group led by Winthrop Professor Karam Singh (IOA and CSIRO) has appointed new Research Associate Dr Kathleen DeBoer, to help deliver novel strategies for enhanced resistance to diseases in Australian agriculture.

Dr Kathleen DeBoer completed a PhD in molecular genetics at Monash University, where she examined the genetic regulation of pyridine alkaloid metabolism in *Nicotiana* plants. For the past three years she has held a post-doctoral research position in Professor Moira O’Bryan’s laboratory, Monash University, where she used mouse models to understand the genetics of male infertility in humans.

In her new role Kathleen will work on a GRDC-funded project ‘Strategies to Provide Resistance to the Economically Important Fungal Pathogen, *Rhizoctonia solani*, a pathogen common in most soils and able to cause disease in a large number of cultivated plants.

She will apply molecular biology and genomics to investigate the plant side of the interaction with the pathogen; in addition, she will use comparative genomic and transcriptomic analysis to explore the fungal side of the interaction.

“This is a fantastic opportunity for me,” says Kathleen, “and I am excited to be working with world-class scientists on this cutting-edge research to help combat the large economic impacts of *R. solani* in Australian agriculture.”

**Cara Allan**

Email: cara.allan@uwa.edu.au

In March this year, the UWA Institute of Agriculture welcomed Cara Allan in her role as Graduate Research Assistant, a newly created position within IOA, working with Dr Ken Flower and Winthrop Professor Kadambot Siddique on an ACIAR/AusAID funded conservation agriculture project between Australia, ICARDA and Iraq.

Cara completed a Bachelor of Animal Science degree with Honours at Murdoch University in 2012.

Her interest in agricultural research was sparked during a stint of compulsory on-farm industry experience, undertaken as part of her degree.

“I really look forward to finally being able to apply the years of university education I have received and to work within the UWA Institute of Agriculture,” says Cara.

She will also be involved with a joint long term no-till project between UWA and the WA No-Tillage Farmers Association (WANTFA) to measure the insects and diseases and a CSIRO led crop stubble cover project. Both form part of the above ACIAR project.

**Matthias Leopold**

Email: matthias.leopold@uwa.edu.au

Assistant Professor Matthias Leopold has recently arrived from Germany to join the Soil Science team within School of Earth Science and Environment. Matthias came from the Science Centre of Weihenstephan at the Technical University of Munich.

As a highly qualified soil-geomorphologist he focuses on different aspects of soil development and soils as archives of the landscape history. Thus, he integrates knowledge from the study of soils in their natural environment (pedology) and geoscience to research and understand near-surface processes at various scales and environments.

Matthias is involved in the new ‘CRC for Polymer’ program where he intends to focus on the spatial distribution of soil water using shallow, high-resolution geophysical techniques. He developed expertise in these methods during previous projects such as monitoring the spatial water infiltration of artificially created soils during mine site rehabilitation and estimating potential depth of root penetration in agricultural duplex soils.

Matthias has also worked on projects related to radionuclide contamination (Cs-137) in forest soils. He was part of a team developing monitoring concepts with respect to regional changes in clay mineralogy, organic matter and texture composition.

Matthias is a member of the Critical Zone Observatory at the University of Colorado at Boulder USA, where he studies the complexity and connectivity of soils with the underlying subsurface, recently known in science as the “critical zone”.

“With the excellent facilities and support at UWA, I am keen to establish new connections between Soil Science and Geoscience as well as Archaeology and to make a meaningful contribution within established collaborations with Agriculture and Plant Science,” says Matthias.

**Caris Allen, BSc, Grad Dip**

In 2010, Caris Allen completed a Bachelor of Science with a double degree in Environmental Science and Land & Water Management, followed by a Graduate Diploma in Science Communication at the University of Western Australia. She is currently Research Account Manager at the WA-office of Kalyx.

Following her graduation, she found employment with national contract research company Kalyx.

Her initial role was to administer the field trials provided to clients, ranging from the University of Adelaide to international companies like Monsanto. It tested her insight knowledge of research design and data handling as much as her ability to communicate project progress and outcomes to clients within the breeding portfolio of Kalyx.

With Australia currently being the market place for research on genetically modified (GM) crops, Caris was recently given a new challenge. She now oversees the compliance to protocol in GM-trials conducted by Kalyx in this heavily regulated sector of agriculture.

Caris thrives at Kalyx and is set for a career in modern agriculture, which she attributes to her high-quality education in a multi-disciplinary degree at UWA, accompanied by an exceptional work ethic fostered throughout her studies at UWA.
Robert Haddrill, BSc (Hon)

In 2007, Rob Haddrill completed a Bachelor of Science (Agriculture) with Honours (Science Communication) at UWA. He is currently State Manager for Glencore Grain Australia in Western Australia.

Better known to the average Western Australian as number 42, a full-back AFL player for the Fremantle Dockers, he retired from national football around the time he finished his degree.

His sporting career may have stretched his time at university but combined with his rural background, it also provided the ideal opportunity to engage in a fourth year research project concerned with the social capital of sporting clubs in country towns.

A blend of science communication and agriculture allowed Rob to develop networking skills, which he admits have become essential to his successful way of doing business with farmers for Glencore Grain.

The challenge that internationalisation of agricultural products brings to farmers feeds Rob’s passion for communicating with them about what happens with grain beyond their farm gate.

A recent field trip to Europe has strengthened his understanding of the new face of agriculture: quality assurance of sustainably grown grain.

Rob sees a bright future for himself in the free trade of agriculture between farmers and market and enjoys the opportunities that Glencore Grain can offer him.

In November last year, a Reunion Dinner was held to bring together students who began their course in the then Faculty of Agricultural Science in 1962. Around 46 Agricultural Science students started that year with around 15-16 students graduating in 1965-66. Since then, all had headed off in a variety of directions, and in a large number of cases lost contact with each other.

The University’s Office of Development assisted with names and contact information, and from the list provided, fourteen former students were tracked down, of whom ten were able to attend with their partners, while apologies were received from another four. Winthrop Professor Kadambot Siddique (Director IOA) and his wife Almaz joined them as their guests, to reminisce about the past, and what they had done over the intervening years.

Among the academic staff fondly remembered were Professors Underwood, Reg Moir, Lex Parker, Henry Schapper, Roger Mauldon, Jack Longergan and Jim Quirk, all of whom had a significant influence on students and development of the State’s agriculture.

After the dinner, Siddique provided an overview of the existing agriculture courses and research activities and the changes and challenges facing the future.

Most of the attendees had spent their working life with the Department of Agriculture (David Highman, Mike Page, John Morrissey, Graham Walton), while others had ventured into areas such as philosophy (Dr David Biggins), teaching (Ian Alexander), business and IT (David Cannon), public service (Jim Malcolm) and consulting (Peter Eckersley, Dr Wally Cox). Clearly, a course in Agriculture at UWA provided excellent foundation for careers in a variety of disciplines!

All enjoyed the catch-up after so many years, and resolved to have another reunion dinner in four years’ time to celebrate 50 years since graduation.

### New postgraduate students

<table>
<thead>
<tr>
<th>STUDENT NAME</th>
<th>TOPIC</th>
<th>SCHOOL</th>
<th>SUPERVISOR(S)</th>
<th>FUNDING BODY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr Bidhyut Banik</td>
<td>The mechanism of antimethanogenic potential in <em>Biserrula pelecinus</em></td>
<td>Animal Biology Plant Biology and IOA</td>
<td>Prof William Erskine; Res/Asst/Prof Zoey Durmici; Dr Clinton Revell (DAFWA)</td>
<td>University Postgraduate Award</td>
</tr>
<tr>
<td>Ms Rasika Kankanamalage</td>
<td>Racial status of <em>Pseudocercospora capsellae</em> in Western Australia, the identity and mechanisms of host resistance in oilseed Brassica</td>
<td>Plant Biology and IOA</td>
<td>W/Prof Martin Barbeti; Dr Mingpei You</td>
<td>UWA SIRF</td>
</tr>
<tr>
<td>Ms Yupin Li</td>
<td>Pythium root rot of <em>Phaseolus</em> bean – interactions of host resistance with water availability</td>
<td>Plant Biology and IOA</td>
<td>W/Prof Martin Barbeti; Dr Mingpei You; W/Prof Tim Colmer</td>
<td>IPRS</td>
</tr>
<tr>
<td>Mr Hieu Sy Tran</td>
<td>Black spot disease complex in field pea – pathogens involved and interactions with host resistance</td>
<td>Plant Biology and IOA</td>
<td>W/Prof Martin Barbeti; Dr Mingpei You; Prof Tanveer Khan</td>
<td>AusAID</td>
</tr>
<tr>
<td>Ms Louise Fisk</td>
<td>The balance between microbial nitrification and nitrogen immobilisation rates and variation in a Western Australian semiarid soil</td>
<td>Earth and Environment and IOA</td>
<td>Prof Dan Murphy; Assoc/Prof Louise Barton</td>
<td>Australian Postgraduate Award; UWA Establishment/Relocation Award; UWA Safety-Net Top-Up Scholarship</td>
</tr>
<tr>
<td>Mr Habtamu Ayalew Tamir</td>
<td>TBA</td>
<td>Plant Biology and IOA</td>
<td>Assoc/Prof Guijun Yan; Dr Xuani Ma</td>
<td>AusAID</td>
</tr>
</tbody>
</table>
## New research funded projects

<table>
<thead>
<tr>
<th>TITLE</th>
<th>FUNDING PERIOD</th>
<th>FUNDING BODY</th>
<th>SUPERVISORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia- India Grand Challenge genomic approaches for stress tolerant chickpea'</td>
<td>2012 – 2015</td>
<td>Australian Centre for Plant Functional Genomics (ex DIISR Australia India Strategic Research Fund)</td>
<td>W/Prof Timothy Colmer; W/Prof Kadambot Siddique</td>
</tr>
<tr>
<td>Maintenance of soil organic carbon levels supporting grain production systems the influence of management and environment on Carbon and Nitrogen turnover</td>
<td>2012 – 2014</td>
<td>DAFWA Ex DAFF Carbon Farming Futures ‘Filling the Research Gap’</td>
<td>Prof Daniel Murphy</td>
</tr>
<tr>
<td>Economic analysis of gene deployment strategies for high priority exotic pests and chemical supply to manage pest incursions</td>
<td>2012 – 2014</td>
<td>CRC Plant Biosecurity</td>
<td>Prof Benedict White</td>
</tr>
<tr>
<td>Enhancing WA’s chickpea industry through targeted demonstration and extension of new aschocyta-resistant improved varieties and lines in partnership with grower groups</td>
<td>2013 – 2014</td>
<td>Council of Grain Growers Organisation (COGGO)</td>
<td>W/Prof Kadambot Siddique; Prof Tanveer Khan</td>
</tr>
<tr>
<td>Polymers for improving soil moisture management and cropping productivity</td>
<td>2012 – 2014</td>
<td>CRC for Polymers</td>
<td>Prof Daniel Murphy; W/Prof Anthony O’Donnell; Assoc/Prof Louise Barton; Asst/Prof Deirdre Gleeson</td>
</tr>
<tr>
<td>Valuation of economic, social and ecological costs and benefits</td>
<td>2012 – 2015</td>
<td>CRC for Water-Sensitive Cities</td>
<td>Asst/Prof James Fogarty; W/Prof David Pannell</td>
</tr>
<tr>
<td>Better regulatory frameworks for water-sensitive cities</td>
<td>2012 – 2016</td>
<td>CRC Plant Biosecurity</td>
<td>Assoc/Prof Alex Gardner</td>
</tr>
<tr>
<td>Research and technical support for the project empowering farmers to adopt behavior change in a carbon economy</td>
<td>2012 – 2014</td>
<td>South Coast Natural Resource Management Inc (NHT)</td>
<td>Assoc/Prof Barbara Cook</td>
</tr>
<tr>
<td>New technologies and enhanced techniques for water resource assessment in a changing climate</td>
<td>2013</td>
<td>Worldwide Universities Network (WUN)</td>
<td>Prof Neil Coles; Prof Mark Rivers</td>
</tr>
<tr>
<td>The value of carbon and biodiversity services provided by native shrubs on farmland</td>
<td>2013</td>
<td>UWA-UQ bilateral Collaboration Award</td>
<td>Asst/Prof Marit Kragt</td>
</tr>
<tr>
<td>Development of a web-based tool to interpret and quantify spray coverage obtained from commercial pesticide applications</td>
<td>2013 – 2014</td>
<td>COGGO</td>
<td>Assoc/Prof Christian Nansen</td>
</tr>
<tr>
<td>Facilitating NRM planning for climate change - baseline climate change knowledge for the southern and southwestern flatlands</td>
<td>2013 – 2015</td>
<td>Department of Climate Change &amp; Energy Efficiency NRM Impacts &amp; Adaptation Program</td>
<td>Assoc/Prof Barbara Cook; Asst/Prof Peter Speldewinde; Mr Benjamin Ford; Mr Simon Neville; Miss Rebecca Davies</td>
</tr>
<tr>
<td>Investigation of respiratory control in dormant grapevine bud</td>
<td>2013</td>
<td>Grape and Wine Research Development Corporation</td>
<td>Asst/Prof Michael Considine</td>
</tr>
<tr>
<td>Identifying the biochemical and molecular bases of 2,4D herbicide resistance in the economically important weed Raphanus raphanistrum (wild radish)</td>
<td>2013 – 2015</td>
<td>Nufarm</td>
<td>W/Prof Stephen Powles</td>
</tr>
</tbody>
</table>

## Current and upcoming visitors to IOA

<table>
<thead>
<tr>
<th>VISITOR</th>
<th>VISITORS’ ORGANISATION, COUNTRY</th>
<th>HOST DETAILS/PURPOSE</th>
<th>DATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof Scott Nissen</td>
<td>Colorado State University</td>
<td>W/Prof Stephen Powles</td>
<td>Jan – Aug 2013</td>
</tr>
<tr>
<td>Miss Haiyan Kong</td>
<td>MOE Key Laboratory of Arid and Grassland Ecology, Lanzhou University, China</td>
<td>W/Prof Kadambot Siddique; W/Prof Neil Turner</td>
<td>Mar 2014 – Feb 2014</td>
</tr>
<tr>
<td>Ms Jocelyne Christelle</td>
<td>Director of Studies and Research, Rural Development National Organization, Gabon</td>
<td>W/Prof Kadambot Siddique</td>
<td>13 – 20 April 2013</td>
</tr>
<tr>
<td>Prof Ron Madl</td>
<td>Department of Grain Science &amp; Industry, Kansas University</td>
<td>W/Prof Kadambot Siddique</td>
<td>July 2013</td>
</tr>
</tbody>
</table>
UWA IOA Publications 2012 (November – December)

Referred journals


NAME | AWARD
--- | ---
Prof Michael Burton and Ad/Assoc/Professor Dan Rigby | Won the ‘Quality of Research Discovery award’ for their paper: Supply Uncertainty and the Economic Value of Irrigation Water. Presented at the 57th annual Australian Agricultural and Resource Economics Society (AARES) Conference in December 2012
Prof Ben White, Ad/Senior Lecturer Rohan Sadler | AARES-Wiley Blackwell Australian Journal of Agricultural and Resource Economics Best Paper Award for their article. Optimal Conservation Investment for a Biodiversity-rich Agricultural Landscape
Dr Muhammad Farooq Ad/Lecturer | Top cited paper award for 2012, from the University of Agriculture, Faisalabad, Pakistan


**Book Chapters**


**UWA IOA Publications 2013 (January – March)**

**Referred journals**


Leptosphaeria maculans: 595-605.


Book Chapters

UPCOMING MEETINGS AND EVENTS
Local events
The Ag Institute of Australia Careers Night 22 May, 6pm Curtin University, Chemistry Building www.facebook.com/events/426578277422539/?ref=14
International event
InterDrought-IV Conference 2–6 September Perth, Australia www.interdrought4.com

UWA IOA MISSION
To advance research, education, training and communication in agriculture and resource management, for the benefit of mankind.

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THE UWA INSTITUTE OF AGRICULTURE April 2013 Sustaining productive agriculture for a growing world

UPCOMING EVENTS

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Local events
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