The launch of the agricultural strategic plan is timely, and new strategies to tackle the national and international challenges have been identified.

Guest speaker, former Agriculture and Food Minister Ken Baston said agriculture in WA has a lot to offer the global food market and that the scientific community, including IOA play a vital role in advancing agriculture.

“We have set an ambitious goal to double the value of agricultural production in this state between 2013 and 2025,” Minister Baston said.

“Your strategic plan provides an important framework and creates the appropriate direction to achieve this goal.”

IOA Director Professor Kadambot Siddique gave a 30 minute presentation in which he stressed the increasing opportunity for Western Australia to lead the way in agriculture.”

“The launch of the agricultural strategic plan is timely, and new strategies to tackle the national and international challenges have been identified.”

Our mission is to enhance UWA’s contribution to the advancement of agriculture and natural resource management in selected international, national and regional settings.”

“For Western Australia, the Institute works with the agriculture industry to create knowledge, and improve workforce skills, to contribute to local and regional prosperity.”

A video overview of IOA’s new research themes; Crops, Roots and Rhizosphere, Sustainable Grazing Systems, Water for Food Production, Food Quality and Human Health, and Agribusiness ecosystems was played and is available online ioa.uwa.edu.au/publications/videos.

Prof Robyn Owens, Deputy Vice Chancellor Research summed up the event and reflected on the changes in modern farming and the critical role IOA plays in bridging the gap between the University and industry.
In this issue of the newsletter, I have chosen to highlight some of the achievements our students studying agriculture and related areas have made (see pages 3, 5, 6, 10 and 12). Students make strong contributions to research and are an important part of UWA’s research culture.

Capacity building is an incredibly important for sustainable agriculture and food production. Through capacity building, we can take steps to close the gaps in agricultural development and productivity in developing countries. Offer letters are being sent to fifteen Pakistani students to undertake PhD research training in agriculture at UWA (joint project with University of Agriculture Faisalabad (UAF), Pakistan). Upon completion, these students will return to their home country with a wealth of knowledge, and the tools to improve food production with better management practices. Previously we have trained 12 PhD students from UAF in agriculture at UWA.

Some of our top PhD students will present their research in agriculture and related areas at UWA on Wednesday, 8 June 2016 at the annual Postgraduate Showcase: Frontiers in Agriculture. All are welcome so please do mark your calendars and register online at ioa.uwa.edu.au/events/register.

Recently UWA has had six subjects ranked in the top 50 in the QS World University Rankings by Subject (www.qs.com). In particular, Agriculture and Forestry category UWA continued the upward trend and jumped three places to 38 in the world. Congratulations to all involved.

In March, we released IOA’s Strategic Plan 2015-2019 at an event attended by approximately 80 members of the agriculture industry and scientific community (see cover story). A video describing IOA’s five cross-disciplinary research themes was aired, and it can be viewed on our homepage ioa.uwa.edu.au.

The annual IOA Industry Forum will be held on Thursday, 7 July 2016 at UWA. The Industry Forum is one of the key events in our calendar, and is driven by our Industry Advisory Board who choose a topic that is pertinent to the agriculture industry in WA and nationally. The topic for this year’s event is Australia’s Free Trade Agreement with China and its impact on the agriculture industry. All are welcome to participate in the lively discussion on how Australia’s agriculture sector can leverage from the agreement to meet China’s demand for the high quality, safe foods we produce. Register online at ioa.uwa.edu.au/events/register-industry-forum.

Our Industry Advisory Board is a particularly well-functioning group. It comprises of representatives from the agriculture industry, who provide strategic advice to IOA to work towards our common goal of advancing agriculture. We held our first meeting for 2016 in March and welcomed Mr Tym Duncanson from the Department of Water, and Mr Rob Dickie from CBH Group. Tym and Rob have replaced Ms Verity Klemm and Dr Richard Williams respectively who have completed their terms. They were both excellent contributors and served the board well. Ms Tress Walmsley, CEO, InterGrain has accepted the Vice Chancellor’s invitation to join the board, and will attend her first meeting later this year.

The United Nations Food and Agriculture Organisation (UNFAO) has designated 2016 as the International Year of Pulses (the hashtag is #IYP2016 for the social media experts amongst us). Pulses play an important role in farming systems for crop diversification, nitrogen fixation and availability of other nutrients in the system. They also have beneficial effect for human health, including reduction in cardiovascular disease, diabetes, obesity and neuro-degenerative diseases. I am humbled and honoured to have been designated a Special Ambassador for Pulses, to support the UNFAO in raising public awareness on the important contribution of pulses to sustainable cropping system, food and nutritional security especially in developing countries. I will be reporting more about pulses in the August issue.

Finally, I’d like to thank Prof Daniel Murphy for his excellent support as IOA Associate Director throughout 2015. Prof Wallace Cowling has been appointed as the new IOA Associate Director and Prof Phil Vercoe will continue in his current role as IOA Associate Director.
French Interns Make Ridgefield Home for Six Months

Debra Mullan, FF2050 Project Officer
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UWA Farm Ridgefield hosted four French interns from September 2015 to March 2016. The interns came from France’s top agricultural colleges: Sébastien Abric from AgroParistech, Margaux Weyer from Agrocampus Ouest, Julien Bajard from Montpellier Supagro and Camille Petit from ENSAT Toulouse, and stayed at the Old Farmhouse for the duration of their internship.

The aim of the internship was to work on a project within the Future Farm 2050 Project and gain experience in Australian broadacre agricultural systems.

Much of the research conducted through the Future Farm 2050 Project pursues a visions of ‘clean green and ethical’ systems for livestock management. The students worked with Prof Phil Vercoe on his research which aims to minimise the environmental footprint, especially greenhouse gas emissions.

They also had the opportunity to work on other research farms such as the Department of Agriculture and Food WA’s (DAFWA) Mt Barker Research Station and Medina Research Station. This included working with DAFWA researcher on the Merino Lifetime Productivity Project, a joint project led by Prof Graeme Martin with the Australian Wool Innovation, Australian Merino Sire Evaluation Association, DAFWA and Murdoch University.

In addition to the project work, the interns provided support in the day-to-day workings of an operational farm and assisted with harvest, farm mechanics, building fences and working with animals including sheep, goats and dogs.

Camille Petit said she especially enjoyed working with animals and learning about sheep and farming in drier climates than what she is used to. In addition to the agricultural experience, she loved improving her English and getting an insight into Australian culture.

UWA Involved in Specialist Agriculture Program at Kelmscott Senior High School

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Prof Graeme Martin and E/Prof Lyn Abbott have been engaging with students at Kelmscott Senior High School’s Specialist Agriculture Program.

The Specialist Agriculture Program is aimed at academically capable students with a keen interest in agriculture and the biological sciences. Students follow an accelerated agricultural curriculum from Years 7 – 10, and develop practical skills that extend their understanding of food and fibre production in modern Australia.

Prof Martin visited the school in October 2015 and gave Year 7 and 8 students an overview of sustainability, the importance of agriculture, why a ‘business as usual’ approach is no longer good enough and the different career opportunities within the agricultural sector. He also explained how the Future Farm 2050 Project at UWA Farm Ridgefield addresses the many challenges facing agriculture in the future.

E/Prof Lyn Abbott followed up with a visit to the school in November 2015 and facilitated a ‘Living Soils activity’. She introduced students to the importance of soils and undertook an activity to understand the variety of living animals in different soils types.

These students will visit UWA Farm Ridgefield later this year to see first-hand the many exciting projects at the farm.
A delegation of agribusiness experts from IOA led a workshop on Facilitating Agribusiness Development in Brunei Darussalam in April. The event was funded by the Australia-ASEAN Council and supported by the Australian high Commission in Brunei Darussalam. A total of 52 government officials and private sector stakeholders participated in the workshop.

Adjunct Professor Peter Batt, Dr Nazrul Islam and Agribusiness ecosystems Theme Leader Dr Amin Mugera worked closely with Brunei Darussalam’s Department of Agriculture and Agribusiness (DOAA) to develop the workshop, and ensure it was responsive and sensitive to the needs and strengths of Brunei. Topics included improving productivity, adding value by understanding your customers and adoption of agricultural technology.

The workshop outcomes are expected to contribute to the development of a holistic, systems-based framework to support agribusiness development in Brunei, directly supporting the Brunei Government’s economic diversification agenda.

During the visit, the UWA team visited major agribusinesses and farms to see Brunei agricultural practices and processes first hand. They also delivered a lecture at Universiti Brunei Darussalam on food security and the challenges faced by governments worldwide in ensuring that there is sufficient food for a growing population in a time of diminishing resources and a variable, changing climate.
Mike Carroll’s fellowship to benefit sheep production

The Mike Carroll Travelling Fellowship is a memorial to the late Dr Mike Carroll, who was associated with the WA Department of Agriculture for over 20 years, serving as Director-General from 1990 to 1994.

Mr Joseph Steer and Ms Anna Aryani Amir, both from UWA’s School of Animal Biology and Institute of Agriculture received the 2014 and 2015 fellowship respectively at a ceremony on 25 February 2016. The fellowship gave them the funds to visit and learn new techniques from national and international research centres to advance their studies.

Joseph Steer, whose research is funded by the Australian Wool Innovation and Department of Agriculture and Food WA, spent five weeks at Rothamsted Research in England studying methods to identify which odours attract blowflies to sheep.

“Understanding how these odours influence blowflies provides sheep breeders with an opportunity to selectively breed sheep for resistance to flystrike, a disease that costs the Australian sheep industry around $280 million dollars a year,” Joseph said.

“The 2015 fellowship recipient, Anna Aryani Amir used the Mike Carroll Travelling Fellowship to collaborate with the Turretfield Research Centre in South Australia, a world leader in vitro fertilisation studies in sheep. Anna is researching the effect of plant extracts and plant secondary compounds from grazing new legume pasture Biserrula pelecinus on reproduction of sheep.

“We learnt from clover disease outbreak in the 1950s that plant secondary compounds from pastures sheep graze on can affect fertility in sheep,” Anna said.

“At the Turretfield Research Centre, I learned how to manage and process eggs sourced from ovaries at random stages in the reproductive cycle to analyse the effect plant extracts have on sheep fertility.”

Mrs Helen Carroll, who presented the awards with her son, Mr Andrew Carroll, at a ceremony at UWA’s Faculty of Science said the Fellowship honours her deceased husband’s devotion to agriculture, and his tireless efforts to give back to the agricultural community.

“Recipients of the fellowship are chosen not just on academic ability, but their potential to benefit from the experience, and their enthusiasm to impart the findings of their travels to the scientific, farming and wider community on their return to WA,” Mrs Carroll said.
Dr Michel Meuret, Director of research at the National Institute for Agricultural Research in France delivered an IOA Public Lecture titled Pastoral livestock systems in France: managing productivity, landscapes and communities during his visit to Australia in March 2016.

Dr Meuret has been working with French herders for over 25 years, and shared some fascinating insights about the French systems of grazing and herding techniques.

“As we have come to rely on experimental science to understand principles, we place less emphasis on the hands-on experience in understanding and implementing practices,” Dr Meuret said.

“Through experience, herders have learnt a ‘know-how’ of the processes involved in food and habitat selection.”

In the lecture, Dr Meuret described the interrelated relationship between the herder, the herd and the available fodder. He said the herders teach the herd to respect the grazing boundaries and to forage on the full range available in the grazing areas. They use a ‘temporary palatability scoring’ of forages to ensure the herd consume a wide variety, and even establish daily grazing circuits that are designed to stimulate appetite and intake.

He concluded by stressing the importance of more dialogue between scientists and herders so both farmers' objectives and the environmental objectives are met.

Iraqi Masters student Doraid Amanoel in the School of Animal Biology and CSIRO has been awarded the CSIRO Agriculture Director Award for Outstanding Publication, for his paper on Vitamin E deficiency in sheep.

He found that Vitamin E deficient sheep are able to detect and consume more of a Vitamin E enriched feed - a discovery that has the potential to provide low-cost management solutions for the livestock industry.

The award, which is typically awarded for outstanding publications from students at the PhD level, was jointly awarded to Doraid and Deakin University PhD student Michael Salini.

Doraid is a Livestock Industry Officer and has been working with the Ministry of Agriculture and Water Resources, General Directorate of Agriculture, in Dohuk, Iraq since 2006. He said his rural background requires high quality knowledge and skills in agriculture to boost the economy.

“My education in Australia is helping me to build an agricultural link between Australia and Iraq based on modern scientific

Doraid Amanoel wins award for his research into Vitamin E deficiency in sheep

Daily grazing circuits are designed to stimulate appetite
innovation which will help me to contribute to a positive change in both countries,” Doraid said.

“The findings of this study have the potential to provide low-cost management opportunities in areas where the incidence of Vitamin E deficiencies and the associated nutritional myopathy are high due to a lack of green pastures during dry seasons.”

UWA supervisor Assoc/Prof Dominique Blache said the achievement of high impact science from a student project was achieved due to a number of factors, the least of which being Doraid’s exceptional talent and hard work.

“Doraid’s Masters project required a wide range of skills in its design and execution. The expertise and advice needed was available to Doraid because of the collaborative partnership between UWA Animal Biology and CSIRO Mixed Livestock Systems groups,” Assoc/Prof Blache said.

“Doraid engaged with CSIRO after introducing himself at the end of lecture at UWA. He has developed an excellent collaborative work ethic, and these interactions are highlighted by the number and diversity of CSIRO and UWA staff involved as co-authors or acknowledged in Doraid’s research paper.”

Doraid’s research was supported with funding from the CSIRO Agriculture Flagship, AusAID Australian awards and the Australia-Iraq Agricultural Scholarship. IOA was responsible bringing Doraid and several other Masters students from Iraq to UWA as part of the above scholarship program.

Industry careers night for ag students

Approximately 60 students studying agriculture and related disciplines across WA attended the annual Agricultural Careers Night, on 6 April 2016.

The event, organised by the Agriculture Institute Australia WA Division, was held at the Royal Agriculture Society Showgrounds in Claremont. Groups of students rotated through the 15 industry representatives in ten-minute round-robin intervals.

IOA was once again a major sponsor of the event and was represented by IOA Director, Hackett Professor Kadambot Siddique, Associate Professor Megan Ryan and Communications Officer Diana Boykett.

IOA Director, Prof Kadambot Siddique encouraged undergraduate students to consider pursuing an Honours or Master’s degree in agricultural science.

“The fourth year of study is the icing on the cake. Besides focusing their agricultural knowledge, students learn important skills like science writing, communications and project management, which employers’ value highly,” Prof Siddique said.

“The degree structure at UWA is flexible. Students can complete a three-year Bachelor’s degree, a two-year Master’s degree, a fourth-year Honour’s research project, and if they want to, they can come back to do a final year of coursework to be awarded with an internationally recognised Master’s degree.”
International Conference on Pulses for Health, Nutrition and Sustainable Agriculture in Drylands

Under the United Nation’s 2016 International Year of Pulses (IYP2016), the International Conference on Pulses for Health, Nutrition and Sustainable Agriculture in Drylands was held in Marrakech, Morocco from 18 to 20 April 2016.

The conference was organised by the International Center for Agricultural Research in the Dry Areas (ICARDA), Institut National Recherche Agronomique (INRA)-Morocco, OCP-Foundation, IFAD, UNFAO and CRP-GL and brought together world experts to find a path forward to boost pulse production in developing countries using science, development investments and policy.

In attendance were 250 participants from 32 countries, which notably included 95 students. UWA was well represented through two keynote presentations in sessions on Innovations in Pulse Breeding, by Prof William Erskine, and Innovations in Productivity Management delivered by Prof Kadambot Siddique.

During the meeting the United Nations Food and Agriculture Organization (UNFAO) designated Prof Siddique the Special Ambassador for Pulses 2016.

As Special Ambassador, Professor Siddique will raise awareness on the important contribution of pulses to food security and nutrition, including the positive impact of pulses to climate change, human health and environmental sustainability.

At the close of the conference the participants made a Morocco Pulses Declaration.

Vale Dr Andrew David Halsted Stewart

(5 June 1942 – 7 December 2015)

Dr Andrew David Stewart passed away peacefully at home on 7 December 2015. He was 73 years old.

Dr Stewart and family have a long association with The University of Western Australia. He was a medical graduate of UWA, specialising in ophthalmology and was a former President of the Royal Australian and New Zealand College of Ophthalmologists.

The Hector and Andrew Stewart Memorial Lectureship is in memory of Dr Stewart’s grandfather, the late Mr Hector J Stewart, MLC, and his father, the late Mr Andrew Malcolm Stewart, who was a member of UWA’s teaching staff in agriculture from 1937 to 1959, and Assistant Director of The UWA Institute of Agriculture. His uncle, Sir Hector Stewart was a former Pro-Chancellor of UWA.

Dr Stewart continued his family’s devotion to agricultural education through his strong support of the Memorial Lectureship. Dr Stewart was well-known in WA for his hobby, buffalo breeding and was one of the first breeders to import buffalo from the Northern Territory in the 1980s.

Dr Stewart will be sadly missed by members of The UWA Institute of Agriculture.
The 2nd Asia Australia Food Innovations Conference (AAFIC) was held on 17-18 March 2016 in Perth and brought together over 200 delegates across both days.

Res/Prof Jonathan Hodgson from the Faculty of Medicine, Dentistry and Health Sciences and IOA who helped organise the event, said the conference focused on assisting players in the Australian food industry to capitalise on insights and emerging trends in Asia, and boost the information flow through all aspects of the supply chain.

"Technological advances within the food industry, and in the wider scientific community, have redefined the way we produce value-added foods," Prof Hodgson said.

"While these developments have delivered a more efficient food production system, a greater variety and larger export quotas of processed foods, they have also raised a number of challenges which need to be addressed."

Mr Peter Schutz, Chair of Food Innovation Australia Limited gave the keynote address and discussed strategies to grow Australia’s food and agribusiness sector.

A wide range of topics were discussed including agri-food security, functional food and health, value adding for export and grains innovation.

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Strong UWA presence at GRDC Grains Research Update

UWA was well represented by staff and students from IOA at the annual Grains Research and Development Council’s (GRDC) Grains Research Update in Perth.

The event, facilitated by Grains Industry Association of WA (GIWA) was held on 29 February and 1 March at the Perth Exhibition and Convention Centre, and attracted approximately 600 grains industry personnel, growers and researchers.

Dr Louise Barton from IOA and the School of Earth and Environment presented findings from a review assessing nitrogen loss and supply from the Western Australian cropping systems done in partnership with the Department of Agriculture and Food WA.

Field-based studies using granular urea, demonstrated loss of nitrogen fertiliser to the atmosphere via ammonia volatilisation can be as high as 29% from WA cropping soils, and that soil a significant source of plant-available nitrogen.

“Further research is needed to quantify soil nitrogen mineralisation and ammonia volatilisation rates under current WA farming practises,” Dr Barton said.

“Importantly, the findings need to be incorporated into decision support tools for farmers.”

Dr Ken Flower from IOA and the School of Plant Biology updated attendees on the long-term effects of crop rotation and residue retention on wheat crop performance.

“Over the nine years of the trial, continuous cereal had the highest mean gross margin, followed by monoculture wheat,” Dr Flower said.

“Heavy canola residues had no effect on wheat yield, whereas heavy cereal residues reduced yields in some years, especially when the harvester did not spread the material uniformly.”

UWA’s IOA and School of Plant Biology had joint boot at the conference venue.

A copy of all presentations can be downloaded at www.giwa.org.au/2016researchupdates
INTERNATIONAL EXPERIENCE IN AGRICULTURE AND ENVIRONMENTAL SCIENCE FOR UWA STUDENTS

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In December 2015, ten UWA students from UWA’s Faculty of Science visited Naresuan University near Phitsanulok in Thailand on a two-week international field course in agriculture and environmental science.

This short-term visit was a collaborative learning program where UWA students were matched with Thai students from the Faculty of Agriculture, Natural Resources and Environment at Naresuan University. Funding was provided through the Study Abroad program.

UWA students visited Nam Nao National Park as well as a rubber plantation where Dr Wanwisa Pansak from the Department of Agricultural Science at Naresuan University is investigating planting of crops under rubber trees to quantify water use efficiency.

The Thai postgraduate students demonstrated the use of field equipment and helped UWA students participate in soil monitoring activities. UWA students prepared literature reviews and research proposals on environmental issues in Thailand with the support of lectures from academic staff at Naresuan University.

Students gained insight into international agricultural and environmental issues and found similarities as well as differences in how these issues are dealt with in Australia and Thailand. Experience of different cultural practices and development of communication skills were important benefits from the visit. Students found the visit to Sukhothai Historical Park was particularly interesting and which gave them insight into a very significant 700 year old Province in Thailand.

UWA’s collaboration with Naresuan University has been developed over several years and it strengthens cultural understanding and broadens knowledge of agriculture in an environment. UWA students maintain contact with Thai students through social media, and this prolongs the benefit of the international field course.

Joint UWA-Tottori University Symposium on Dryland Research

A delegation from Tottori University, Japan visited UWA in March to discuss the challenges in understanding and managing drylands.

Dryland systems are sensitive to changes in water use and extraction yet at the same time provide options for food production and other economic activity. They are also some of the areas expected to be most severely impacted under projected climate change scenarios.

Dr Matt Hipsey from the School of Earth and Environment and IOA Research Theme Leader organised a half day symposium to share knowledge between colleagues from UWA and Tottori University. Recent advances across a broad spectrum of research areas were highlighted including catchment systems and dryland ecohydrology, dryland agriculture, conservation and viable living in a dry land.

Professor Dai Nagamatsu delivered a keynote address on the International Platform for Dryland Research and Education at Tottori University.

The participants agreed to collaborate on dryland research and capacity building between the two universities.
Unlocking miRNA-mediated regulatory mechanisms underlying plant response to chromium stress

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Chromium (Cr) is one of the most widely distributed environmental contaminants, with its hexavalent form (Cr6+) being an extremely toxic carcinogen.

Phytotoxicity caused by chromium contamination can result in inhibition of seed germination, nutrient balance and enzymatic activities, reduction of root growth and crop yield. Hexavalent Cr contaminated food poses potential health hazards to humans and animals.

Dr Yinglong Chen from UWA’s Institute of Agriculture and School of Earth and Environment in collaboration with Nanjing Agricultural University, China and North Dakota State University, USA used advanced next-generation sequencing (NGS) technology, to understand the regulatory roles of miRNAs in response to Cr stress in radish, a root vegetable crop with economic and dietary importance to China.

The study found that several target genes for Cr-responsive miRNAs encoding different transcription factor families might regulate corresponding HM-related transcriptional processes in plants.

The researchers also found that a few key responsive enzymes or proteins (HMA, YSL1 and ABC transporter protein) were involved in Cr uptake and homeostasis process.

A schematic model of tolerance mechanism and regulatory networks in response to Cr stress was proposed based on the identification of Cr-responsive miRNAs and analysis of their corresponding target genes.

The findings of this study were published in Nature’s prestigious journal Scientific Reports and could provide novel insights into miRNA-mediated regulatory mechanisms underlying plant response to Cr stress in root vegetable crops.

Harvest of edible radish crops in an experimental trial in China
BIOTECHNOLOGIES VINE PERSPECTIVE

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The ‘biotechnologies vine perspective’ workshop held in January 2016 in Margaret River was a great opportunity to communicate progress on two ARC research grants in wine grapes.

Teams from UWA, DAFWA, Yalumba, the Australian Wine Research Institute (AWRI) and overseas had the opportunity to conceptualise the underlying genetic distinctions between clones of Cabernet Sauvignon, as the stage was set to taste several experimental wines from the DAFWA and Yalumba trials of Cabernet Sauvignon clones.

The clonal wines have certainly captured increasing attention as a means to accentuate regional identity, particularly of ‘regional heroes’, as Cabernet is for both Margaret River and Coonawarra.

DAFWA winemaker Richard Fennessey led a tasting panel by introducing his base wine. It invited differing opinions of what terms such as ‘spice’ and ‘vegetal’ mean in the context of Cabernet. Richard instructed the panel on the framework of the tasting, and scoring protocol, before introducing the experimental wines he’d made from both the 2014 and 2015 vintages.

The wines were assessed ‘blind’ and the 21 tasters (made up of professional viticulturists and winemakers) were asked to rank the intensity of 20 predetermined aroma and flavour attributes. The data from this sensory exercise is currently being statistically analysed in the aim to determine wine characteristics unique to each of the clones. This information will be used to compliment the genomic work on these clones and potentially link genomic and sensory differences between the clones.

Senior red winemaker at Yalumba, Peter Gambetta then presented six clones of Cabernet Sauvignon produced from the Coonawarra wine region in South Australia, which are less readily available in WA, to compare the performance between the six clones. Most commented on how vastly different the styles of these wines differed from the Margaret River clones from the first session.

Dr Mick Considine delivered one of four short seminars to conclude the event, continuing the topic of clonal variation with some insights to the progress of the ARC grant ‘Genomic basis of clonal variation in Cabernet Sauvignon wine grapes’.

Honours degree gives ag students a head start

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Since completing my Honours in Agricultural Science in 2015 at UWA I have started working at Agribusiness Research and Management (ARM) in Busselton as a Horticultural Business Graduate.

ARM provides project management services for horticultural projects including avocado and vineyard operations. ARM aims to maximise efficiency of operations in terms of improving production whilst remaining cost effective. I am involved in the technical and operational side of the business which includes researching best practice farming, deciding upon its effectiveness and practicality, implementing and monitoring practices and deciding upon usefulness for future years.

Completing my Honours degree at UWA gave me the skill set and networking opportunities to successfully gain graduate employment. Managing and being responsible for my own research project gave me the opportunity to enhance my problem solving skills, communication skills and independent learning and research skills.

Honours also gave me a more in-depth understanding of farming systems so I now have the ability to make better informed insights and decisions about actual farming operations. The learning experience during Honours made it a very rewarding year as I can now take the skills and discipline I have acquired into the workplace.
The 3 Ps of Reproduction: Photons, Pheromones and Phood

Prof Graeme Martin
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Prof Graeme Martin from UWA’s School of Animal Biology and Institute of Agriculture was recently delivered the 2016 ‘Sex in Three Cities’ lectures for The Society of Reproduction and Fertility (SRF), an initiative designed to promote awareness of SRF and of reproductive biology research.

Each year, the SRF invites a renowned scientist to present lectures to a broad audience including academics, students and the general public, in Edinburgh, Nottingham and London. The lecturer also interacts informally with staff and students at each location. Previous lecturers include Professor Lord Robert Winston in 2013.

For about 40 years, Prof Martin and his colleagues have been trying to understand how environmental factors affect the reproductive system. Most of their basic research has been on animals but is also relevant to human fertility because it is difficult to ask fundamental questions with experiments on people. Prof Martin thus focused his lecture on the humble sheep: its reproductive physiology is similar to that of humans but is also an important industrial animal.

The sheep brain takes in information about night length (photons), the odours of its flock mates (pheromones), and the availability of food (by measuring the metabolic status of the body), and integrates this information with information about reproductive status (puberty, pregnancy, lactation). It then enacts a strategy that has been fine-tuned over evolutionary timescales to maximise reproductive success.

“As with most scientific journeys”, Prof Martin said, “unexpected discoveries about reproduction in sheep have presented us with new perspectives about mammalian biology. For example, we used to think that brain cells could not divide, but now we know that they can do so in response to photons and pheromones from the outside world.”

“We also used to view reproduction as a simple process in which the brain produces a hormone that stimulates the ovaries and testes, but now we know that brain-gonad communication is an intricate two-way exchange.”

“Even within the gonad there’s a whole extra suite of communication channels, perhaps the most astonishing of which involves a massive group of molecules called ‘small RNAs’ that are produced by DNA and interfere with the control of the cells by the genes,” Prof Martin said.

“Gone is the simple traditional view that a gene produces RNA that produces a protein.”

According to Prof Martin, these discoveries have three major implications. First, because we now know that brain cells can divide, we are increasingly optimistic about the possibility of regenerating and repairing brain tissue. Second, ‘small RNAs’ offer a whole new suite of possibilities for dealing with problems in malfunctioning tissues. Third, photons, pheromones and food have led to ‘clean, green and ethical’ options for managing livestock.

More information about previous lectures can be found at www.srf-reproduction.org/educationandengagement/sexin3CitiesLectureSeries.aspx
PART 1: REFLECTIONS ON BEING TAUGHT RESEARCH AT THE UWA INSTITUTE OF AGRICULTURE, 1957-1965

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IOA Director, Prof Kadambot Siddique, asked me to reflect on my education at UWA half a century ago.

I graduated in the 5-year degree BSc(Agric)(Hons) in February 1962, then with a 3-year PhD before setting off in June 1965 for the United Kingdom. I boarded the Fairstar from Fremantle, later flying Pan-American to the USA, on CSIRO and Fulbright fellowships. How well did this education fit me for my future intellectual tasks?

Let me take you back to 1957, when Professor Eric Underwood, world renowned for trace element nutrition in humans and animals, was the sole professor and director of Agriculture. He was well supported by young members of staff such as RJ Millington, John Gladstones, Reg Moir, Lex Parker, Don Drover, Max Parker, Henry Schapper, Hadyn Lloyd-Davies (CSIRO), and later Bruce Davidson, public debater of Sir Charles Court. It was also said that Vice-Chancellor Prescott knew by sight almost every student on campus (less than 1500) or sought to do so.

I recall being told by the Registrar in Orientation Week 1957 that only one of either me or my neighbour seated in Winthrop Hall could expect to survive to second year. This prediction was realised as our first year group of 27 in Agriculture was reduced to 14 in second year (i.e. 13 men and Elizabeth Banks), but all of whom eventually graduated.

First year students were often given lectures by the subject professors. So we benefited from intriguing sessions with Harry Waring (Zoology 1 – anecdotes in reproductive biology sufficiently dramatic to attract engineers to Saturday lectures and a huge subject in which one final rat dissection counted for half the final marks), Don Prider (Geology – innumerable 35 mm slides on geomorphology and a prediction oil would be found under Perth), Andrew Cole (Chemistry in action) and Brian Grieve (Botany and Blackall’s keys to wildflower taxonomy) with Charles Gardner lecturing us Botany 2 the very day Mario Lanza died.

A feature of our undergraduate course was flexibility of choice in optional units of study from the basic curriculum, with the Dean’s approval. Thus some of our group chose Biochemistry 2 instead of Botany 3 in fourth year, or in my case Chemistry 2, following up with a major in the honours year in Biochemistry 3 or even later in the PhD (Maths 2 and Chemistry 3).

Ivan Oliver, later Professor, gave "no-holds barred" lectures with his focus on neo-natal rat biochemistry. I recall too the mind-expanding tutorials in thermodynamics run by Noel Bayliss in an upstairs room in the old Chemistry building in 1963. Bayliss had a direct connection with IOA having a research interest in the thermodynamics of nitrogen fixation, publishing with Lex Parker, my eventual choice as PhD supervisor.

With Lex on sabbatical, our microbiology in third year was delivered by Reg Moir, president of the rumen liquor tasters club. I always recall Reg’s concluding statement in his lectures in Agricultural Microbiology that “It ain’t necessarily so”.

Lex Parker was remarkable for his imaginative approach to research, the variety of topics he entertained, always prepared for endless discussion – definitely one of Nature’s gentlemen. The Department of Soil Science and Plant Nutrition was established with some friction by Jim Quirk and Alan Posner around 1962, with Jack Loneragan appointed soon after.

Critical attitudes were reinforced at IOA in Biometrics taught by statisticians such as Norm Sternhill (who I recall discussing the statistics of whether lawyers are just procrastinators or liars as well) and Clive Boundy (I recall my brilliant colleague Mike Dilworth was in dispute with), both statisticians from CSIRO at the rear of the IOA building. Of course this approach is all based on Fisher’s analyses of population variance and tests for treatment significance he developed for agricultural researchers.

There is a second connection with Rothamsted in that two of my books published by Wiley were edited by Phillip Nutman, head of microbiology there in the 1960s.

So we emerged from the IOA nearly all preferentially different. Add to that my post-doc period working with pioneers in molecular biology such as HL Kornberg (later Sir Hans as Professor of Biochemistry at Cambridge University),
anaerobic biochemistry (Gareth Morris later at Aberystwyth) and nitrogenase purification (with Len Mortenson at Purdue).

So when I arrived at the University of Sydney in February 1968 I felt equipped to tackle almost anything. Some of this future license is summarised in the four books below, written as answers to questions posed by students and colleagues. If you don’t know something, just write a book on the topic!

My opus magnum is clearly Action in Ecosystems (2001) though this conclusion has yet to show in citations. The most frequently cited book is Acid Soil and Acid Rain (1992), one that seems to be in every university library in northern America, even with multiple copies in the New York City Library. It simply writes down all the chemical and biochemical reactions for acidifying and alkaline processes in ecosystems and suggests how to manage them. So those long discussions with Lex late in the week have paid as games for formulating null hypotheses and testing to see if they stand or fail.

Even my PhD project with Lex on primary products of symbiotic nitrogen fixation resulted in me rejecting a hypothesis advanced (admittedly on flimsy evidence) that AMP-NH2 was such a primary product, given the need for ATP. But it concluded that modelling data using from exposures of serradella nodules to heavy nitrogen (15N2) ruled this out. Instead, they were consistent with ammonia being the primary product, then forming glutamine and glutamic acid. This is all strictly Karl Popper philosophically and similar falsification of hypotheses has figured strongly in our work ever since. Proving your hypotheses wrong is far more compelling and honest for advancing truth than any amount of data just in confirmation.

To be continued in the next issue.

### Study leave to study beans

**Assoc/Prof Erik Veneklaas**  
**erik.veneklaas@uwa.edu.au**

**Associate Professor Erik Veneklaas from UWA’s School of Plant Biology and Institute of Agriculture has spent five months of study leave investigating the physiology of common bean (Phaseolus vulgaris) at the International Centre for Tropical Agriculture (CIAT).**

Located in Colombia, CIAT is one of the largest CGIAR centres, and is a former workplace of Assoc/Prof Veneklaas who was employed there from 1996 to 1998 as a Tropical Ecologist. This visit, he was hosted by global leaders in the breeding and physiology of bean, Dr Steve Beebe and Dr Idupulapati Rao, who have decades of experience.

Common beans are the most important grain legume for human consumption at a world scale. They are particularly important in Latin America and East and South Africa. While generally grown on small farms, there is potential for commercial agriculture. In Western Australia, there may be a niche for common bean in the northern grainbelt. Globally, drought and low soil fertility pose constraints on yield.

The research carried out by Assoc/Prof Veneklaas and collaborators, including researchers from UC Davis and University of Sydney, focussed on the impact of drought as well as low phosphorus availability on yield.

It involved field trials at two locations and a large pot trial under a rain-out shelter. The pot trial included detailed observations of the process of flowering, pod growth and grainfilling. An important aim was to improve understanding of the processes determining harvest index in this crop, particularly under abiotic stress. Research outcomes are likely to include new insights into how seed number, size and seed quality are influenced by when the pods grow and at which position in the plant.

Assoc/Prof Veneklaas also worked with CIAT colleagues in the cassava and tropical forages programs, and is planning to increase collaboration in the future. Collaboration with CIAT offers new opportunities for research funding, especially in East Africa and South East Asia, and also for postgraduate student exchange and recruitment.

Bean experiment in large pots under field conditions with a rain-out shelter.
New Appointments

Professor Wallace Cowling

wallace.cowling@uwa.edu.au

Professor Wallace Cowling has been appointed Associate Director of IOA. He will dedicate one day per week with Associate Director Professor Phil Vercoe to provide support to the Director on strategic and operational matters. The Associate Directors share responsibilities for initiatives with state and national funding bodies, international collaboration opportunities, and interaction and communication with relevant farmer groups.

Professor Cowling has been closely associated with IOA since 1999 when he accepted a position in Plant Breeding at UWA. It is an industry-funded position and is 70% involved in canola breeding in the company NPZ Australia Pty Ltd, and 30% involved in teaching and research. His research goal is to apply knowledge of evolutionary genetics, molecular genetics and biotechnology for efficient genetic improvement in plants.

Ms Tress Walmsley

Tress Walmsley, CEO, InterGrain has joined IOA’s Industry Advisory Board.

Tress has over 15 years of agribusiness experience, along the way gaining a wealth of knowledge in commercial plant breeding operations with a strong understanding of the technical drivers required for success in the grains industry. Tress represents InterGrain on the National End Point Royalty Steering Group and the Grains Industry Association WA wheat committee. She is the 2015 WA Winner of the RIRDC Rural Women’s Award.

Exclusive Alumni Agriculture Tour

UWA’s Development and Alumni Relations team invite UWA alumni to attend an exclusive agriculture tour on Wednesday, 8 June.

Take a behind-the-scenes tour of UWA’s glasshouses with Hackett Professor Kadambot Siddique, Agriculture Chair and Director of The UWA Institute of Agriculture, and uncover just what UWA’s researchers are doing to tackle agricultural challenges like climate variability, soil salinity and acidification, pests, diseases, weeds and more.

Places are limited and registration is essential at alumni.uwa.edu.au/events
AWARDS AND INDUSTRY RECOGNITION

<table>
<thead>
<tr>
<th>NAME</th>
<th>AWARD</th>
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<tbody>
<tr>
<td>Hackett Professor Kadambot Siddique</td>
<td>Foreign Fellow of the Indian Society for Plant Physiology</td>
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<tr>
<td>Hackett Professor Kadambot Siddique</td>
<td>United Nations Food and Agriculture Organization Special Ambassador for Pulses 2016</td>
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VISITORS TO IOA

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<thead>
<tr>
<th>NAME OF VISITOR</th>
<th>VISITOR’S ORGANISATION AND COUNTRY</th>
<th>HOST DETAILS</th>
<th>DATES OF VISIT</th>
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<tbody>
<tr>
<td>Mr Faisal Younus Khan</td>
<td>Pakistan</td>
<td>Prof Kadambot Siddique, Dr Ying Long Chen, Dr Jairo Palta (CSIRO)</td>
<td>02/03/16 – 10/08/16</td>
</tr>
<tr>
<td>Dr Ghulam Abbas</td>
<td>Pakistan</td>
<td>Prof Kadambot Siddique, Dr Ying Long Chen, Dr Jairo Palta (CSIRO)</td>
<td>22/03/16 – 22/08/16</td>
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<tr>
<td>Dr Bekka Brodie</td>
<td>USA</td>
<td>Prof Phil Vercoe</td>
<td>24/04/16 – 13/05/16</td>
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<tr>
<td>Dr Ruchi Bansal</td>
<td>National Bureau of Plant Genetics Resources (NBPRGR), India</td>
<td>Prof Kadambot Siddique, Prof Hans Lambers, Dr Jiayin Pang</td>
<td>16/05/16 – 15/11/16</td>
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NEW POSTGRADUATE RESEARCH 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>Enoch Wong</td>
<td>Development and regulation of soil water repellence in cropping soils</td>
<td>School of Earth and Environment and IOA</td>
<td>Dr Louise Barton; Dr Matthias Leopold; Dr Phil Ward (CSIRO) and Prof Daniel Murphy</td>
<td>CSIRO (ex GRDC)</td>
</tr>
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MEMORANDA OF UNDERSTANDING (MoU) WITH EXTERNAL ORGANISATIONS

<table>
<thead>
<tr>
<th>ORGANISATION</th>
<th>TITLE</th>
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<tbody>
<tr>
<td>Faculty of Veterinary Science, Yamaguchi University, Japan</td>
<td>MOU Signed October 2015</td>
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<tr>
<td>Gansu Academy of Agricultural Sciences, China</td>
<td>Letter of Extension MoU September 2015</td>
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<tr>
<td>Segou University, Mali</td>
<td>MoU Signed December 2015</td>
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<tr>
<td>The Regional Polytechnic Institute, Katibougou, Mali</td>
<td>MoU Signed December 2015</td>
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<tr>
<td>Jawaharlal Nehru University, New Delhi, India</td>
<td>MoU Signed February 2016</td>
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NEW RESEARCH GRANTS

<table>
<thead>
<tr>
<th>TITLE</th>
<th>FUNDING PERIOD</th>
<th>FUNDING BODY</th>
<th>SUPERVISORS</th>
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<tbody>
<tr>
<td>Towards genome methylation based crop improvement’</td>
<td>2015–2017</td>
<td>ARC Linkage</td>
<td>Prof David Edwards, Prof Jacqueline Batley, Mr David Pike, Mr Benjamin Laga</td>
</tr>
<tr>
<td>Establishing Novel Breeding Methods for Canola</td>
<td>2015</td>
<td>ARC Linkage</td>
<td>Prof Jacqueline Batley, Prof David Edwards, Mr David Pike, Dr Harsh Raman, Dr Stephen Rae</td>
</tr>
<tr>
<td>Project Title</td>
<td>Year(s)</td>
<td>Funding Body</td>
<td>Principal Investigators</td>
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<tr>
<td>Impact of Weeds on Australian Grain Production &amp; Adoption of No Till Cropping Practices’</td>
<td>2015</td>
<td>CSIRO Ex GRDC</td>
<td>Dr Michael Renton</td>
</tr>
<tr>
<td>Organic Matter and Nutrient Availability</td>
<td>2015</td>
<td>University Of Queensland Ex GRDC</td>
<td>Dr Louise Barton, Prof Daniel Murphy, Dr Fran Hoyle, Dr Craig Scanlan,</td>
</tr>
<tr>
<td>Innovative Approaches to Managing Subsoil Acidity in the Western Region</td>
<td>2015–2019</td>
<td>DAFWA Ex GRDC</td>
<td>Prof Zdenko Rengel, Mr Paul Damon</td>
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<tr>
<td>Novel use of antitranspirants to improve wheat yield in the grainbelt of Western Australia</td>
<td>2016</td>
<td>COGGO</td>
<td>Dr Ken Flower, Prof Kadambot Siddique</td>
</tr>
<tr>
<td>Interdisciplinary Wheatbelt Service Learning Unit</td>
<td>2015</td>
<td>Heartlands WA Ex Wheatbelt Development Commission</td>
<td>Prof Fiona Haslam-McKenzie, Prof Matthew Tonts, Prof Carolyn Oldham, Dr Antony Hughe-D’Aeth</td>
</tr>
<tr>
<td>Facilitating agribusiness development in Brunei</td>
<td>2016</td>
<td>Australian ASEAN Council, DFAT</td>
<td>Prof Kadambot Siddique, W/Prof Tim Mazzarol, Dr Peter Batt, Dr Amin Mugera, Dr Nazrul Islam</td>
</tr>
<tr>
<td>In touch with the environment: dissecting early tactile responses in plants</td>
<td>2016–2018</td>
<td>ARC Discovery Projects</td>
<td>Dr Olivier Van Aken, Prof Harvey Millar, Prof Karam Singh</td>
</tr>
<tr>
<td>RnD4Profit – 14-1-022- Waste to Revenue: Novel Fertilisers and Feeds</td>
<td>2015–2017</td>
<td>Australian Pork Limited</td>
<td>Dr Sasha Jenkins, E/Prof Lynette Abbott, Mr Ian Waite</td>
</tr>
<tr>
<td>Spatial Temperature Measurement and Mapping Tool to Assist Growers, Advisors and Extension Specialist Manage Frost Risk at a Farm Scale</td>
<td>2015–2017</td>
<td>CSIRO Ex GRDC</td>
<td>Dr Ken Flower, Mr John Callow, Dr Bryan Boruff</td>
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<tr>
<td>Impact of Compost Carbon on Lettuce Growth and Soil Fertility</td>
<td>2015</td>
<td>C-Wise</td>
<td>Dr Zakaria Solaiman</td>
</tr>
<tr>
<td>A Long-term Study to increase Water Use Efficiency, Grain Yield and the Profit of Growers in the Western Region in a no-till system</td>
<td>2016–2018</td>
<td>GRDC</td>
<td>Dr Ken Flower</td>
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<tr>
<td>Genetic Analysis of Seed Dormancy for Pre Harvest Sprouting Resistance in Wheat</td>
<td>2015</td>
<td>YITPI Foundation PTY Ltd</td>
<td>Prof Guijun Yan, Dr Hui Liu, Prof Kadambot Siddique</td>
</tr>
</tbody>
</table>
Sustaining productive agriculture for a growing world

IOA 2015 Publications
Not previously reported

Refereed journals


Book Chapters


IOA 2016 Publications
(January – April)

Refereed journals


Busi R and Powles SB (2016) Transgenic glyphosate-resistant canola (Brassica napus) can persist outside agricultural fields in Australia. Agriculture Ecosystems and Environment 220: 28-34


Guan YK, Turner NC, Song L, Gu YJ, Wang TC and Li FM (2016) Soil carbon sequestration by three perennial legume pastures is greater in deeper soil layers than in the soil surface. Biogesosciences 13: 527-534


Jones RAC (2016) Future scenarios for plant virus pathogens as climate change progresses. Advances in Virus Research dx.doi.org/10.1016/bs.avir.2016.02.004


Mugera A, Burton M and Downsborough E (2016) Consumer preference and willingness to pay for a local label attribute in Western Australian Fresh and Processed Food Products. *Journal of Food Products Marketing* .


**Book Chapters**


**UPCOMING EVENTS**

**IOA Postgraduate Showcase 2016**

Wednesday, 8 June 2016
Bayliss Building, UWA

**IOA Industry Forum 2016**

Thursday, 7 July 2016
UWA University Club, UWA

**Women in Agriculture breakfast**

Tuesday, 16 August 2016
UWA University Club, UWA

**Pingelly Astrofest**

Saturday, 17 September
UWA Farm Ridgefield, Pingelly

**IOA MISSION**

To provide research-based solutions to food and nutritional security, environmental sustainability and agribusiness.

**HELP US REDUCE WASTE**

To receive this newsletter in electronic format only, please send an email to ioa@uwa.edu.au

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