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# SQUARED² UP

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*Pioneering rainwater harvesting system (page 19)*

# UP a pioneer with the African Science Leadership Programme

A first for the developing world – The Africa Science Leadership Programme (ASLP), a new initiative of the University of Pretoria (UP) and the Global Young Academy (GYA), with the support of the Robert Bosch Stiftung was launched with twenty outstanding scientists from all major regions in Africa participating in the inaugural programme earlier this year.

The ASLP aims to grow mid-career African academics in the areas of thoughtful leadership, team management and research development, with the intention of enabling them to contribute to the development of a new paradigm for Science in Africa, focused on its contribution to solve the complex issues facing both Africa and the global community.

Prof Bernard Slippers from the Department of Genetics and the Forestry and Agricultural Biotechnology Institute (FABI), is the Programme Leader.

According to Prof Slippers, "only a handful of institutions in Canada and the United States offer useful advanced leadership training for researchers. The need for such programmes is more desperate in developing countries if they are to avoid falling further behind in an interconnected and competitive world."

The first group of scientists represented basic and applied sciences, and span a wide variety of disciplines, including the social sciences and humanities. The Programme started with a week-long workshop titled 'Leading: a new paradigm for African Science'. The researchers explored topics such as collective leadership, science communication, creative and strategic thinking, management of complex projects and many more. They also engaged with leaders in academia, science communication and the society to explore challenges and possible solutions to African Science, initiating projects to address them. The fellows now continue with a year of application and mentorship, and a follow-up workshop is planned for April 2016.

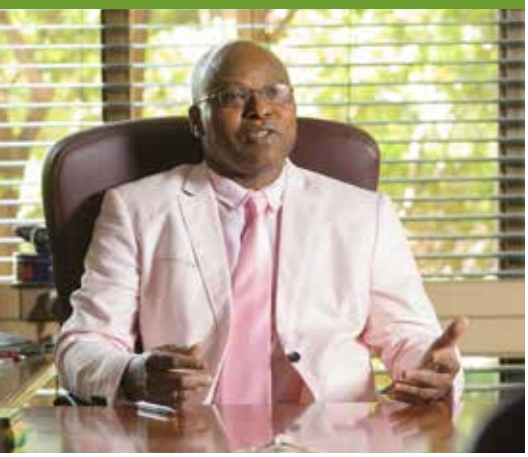
A researcher from the Faculty of Natural and Agricultural Sciences, Dr Eshchar Mizrachi, a Senior Lecturer at the Department of Genetics and FABI was also selected as one of the inaugural fellows.

"The ASLP will also serve as an independent voice for young scientists. To develop young scientists can have immense benefits

*Continued on page 3*

# Message from the Dean

## Strength in Diversity



As one of the most diverse science faculties in South Africa, we want to strengthen our position as a premier research faculty and ensure future success by making a positive contribution to the relief of local, national and international needs. The diversity strategy of the Faculty in terms of a wide range of aspects such as race, gender, age, different disciplines and multidisciplinary research has particularly paid off. A total of 12 more researchers in the Faculty that received National Research Foundation (NRF) ratings is yet another feather in the cap of the Faculty. Furthermore **Prof Nigel Bennett** maintained his A-rating while five emerging researchers received Y1 ratings: **Dr Babatunde Abidoye, Dr Danielle Bezuidenhout, Dr Michelle Greve, Dr Trevor McIntyre** and **Dr Cheryl Tosh.**

**The Africa Science Leadership Programme (ASLP),** a new initiative of the University of Pretoria (UP) and the Global Young Academy (GYA), with the support of the Robert Bosch Stiftung was launched with twenty outstanding scientists from all major regions in Africa participating in the inaugural programme earlier this year (page 1).

Three researchers from the Faculty, **Prof Mike Wingfield, Prof Brenda Wingfield** and **Prof Bernard Slippers** published an article in the prominent journal, *Science* where they asserted that an integrated global strategy is urgently needed to **protect our forests** (page 4).

The University was awarded four new research chairs under the South African Research Chairs Initiative, three of which are in the Faculty. The new research chairs were awarded to **Prof Brenda Wingfield** in Fungal Genomics, **Prof Wanda Markotter** in Animal Infectious Diseases and **Prof Namrita Lall** in Indigenous Knowledge Systems (page 6). The Department of Mathematics and Applied Mathematics recently made their presence felt at the 58th Annual Congress of the South African Mathematics Society where **Prof Kerstin Jordaan** was elected to serve as the new President and **Dr Gusti van Zyl** as the General Secretary (page 8).

One of the exciting research projects in the Faculty is by two chemists, **Dr Yvette Naudé** and **Prof Egmont Rohwer** who developed a cheap, disposable sampler to collect pollutants from surface water over time (page 37). In another study by **Prof Jaco Greeff** and a doctoral student, **Christoff Erasmus**, research was conducted on how faithful Afrikaner women have been to their husbands for the past 330 years - the results were published in the journal, *Heredity* (page 42). Furthermore **Prof Hettie Schönfeldt and Dr Beulah Pretorius** conducted research on how the food system impacts on the ability of consumers to choose healthy diets (page 43).

Being people centred, the Faculty continuously seeks for opportunities to recruit and appoint highly recognised researchers and academics. One of these new appointments was **Prof Nigel Barker** as the Head of the newly established Department of Integrated Plant and Soil Sciences who took up his new position on 1 October 2015 (page 45).

As always, we are very proud of the outstanding achievements of our staff. **Prof Bob Millar** is the winner of the 2016 John F W Herschel Medal in recognition of his highly distinguished multidisciplinary contributions to the furtherance of science (page 5). **Dr Fanie Terblanche** was instrumental in the process to ensure that it is a legal requirement for Agricultural Extensionists and Advisors to register with the South African Council for Natural Scientific Professions (page 38).

Many conferences, launches and high-profile events took place in the Faculty the past few months. During the Spring graduation ceremonies the University awarded an honorary doctoral degree in Science to **Dr Sergej Zilitinkevich** (page 13). Three heads of departments also delivered their inaugural addresses in the past few months. **Prof Alet Erasmus** (page 24), **Prof Andriëtte Bekker** (page 26) and **Prof Paul Sumner** (page 27).

The University and the **French Agricultural Research and International Cooperation organisation, working for the sustainable development in the South (CIRAD),** have signed a five-year agreement establishing the Centre for the Study of Governance Innovation (GovInn) at UP as a joint centre (page 51). The University and Prof Rosemary Gray also signed a Memorandum of Understanding as partners of the prestigious **University of Pretoria (UP) Derek Gray Award** (page 11).

JuniorTukkie and the **Sci-Enza Science Centre** hosted an exciting art competition to celebrate 2015 as the "International Year of Light", as declared by the United Nations (page 48). The Faculty and the Department for Education Innovation presented a symposium on the use of representations in **Science Education** with Prof Hsin-Kai Wu as the guest speaker (page 50).

As always, our students excelled. A PhD student in the Department of Animal and Wildlife Sciences, **Nadia Swanepoel**, was recently awarded two prestigious international scholarships (page 9). **Shehu S Awandu**, a PhD student at the University of Pretoria Centre for Sustainable Malaria Control (UP CSMC) won as first prize, the trophy as best presenter at the Limpopo Provincial Health Research day (page 63).

Many more outstanding achievements by our staff, students and affiliates, of which we are very proud, can be cited. With this newsletter we aim to showcase some of these achievements and we hope that you will enjoy this update on the latest developments in our Faculty.

*Prof Jean Lubuma*

Dean: Faculty of Natural and Agricultural Sciences

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for the University of Pretoria and the rest of Africa, especially with our vision of becoming a research intensive university," Prof Slippers explained.

"The speed and quality of the development of science capacity in Africa and the rest of the developing world depends not only on infrastructure and the technical training of people, but is intimately linked to the quality of leadership to lead change.

It is widely accepted that the future of scientific development lies in enabling interdisciplinary, interconnected and often large, international teams," he continued.

The Tuks Young Research Leader Programme (TYRLP) also emerged as an initiative of the ASLP. It serves early-career researchers in basic and applied science, engineering, social sciences, arts and the humanities, using a highly interactive approach to training, application of skills to leadership projects, peer support and mentorship. The TYRLP's inaugural workshop was presented in November 2015.

*Prof Bernard Slippers*

# One of SA's Top 200 young South Africans receives PhD in Biochemistry


*Dr Lungile Sithole*

Dr Lungile Sitole, one of the **Mail & Guardian* top 200 young South Africans in 2015 and a recipient of a 'Women in Science' (WISA) award from the Department of Science and Technology in 2014, received her PhD degree in Biochemistry at the University of Pretoria's recent Spring graduation ceremonies.

As the title of her PhD indicated, 'Spectroscopic evaluation of HIV positive sera reveals metabolic signatures of infection', Dr Sitole is involved in research to try and unlock new methods for monitoring HIV disease progression and individual responses to treatment. She is currently a Postdoctoral Fellow at the University of Johannesburg.

In 2009, Dr Sitole completed her MSc (cum laude) in organic chemistry at Jackson State University's School of Science, Engineering and Technology in Mississippi, USA. Before tackling her PhD she worked as a researcher for the Council of Scientific and Industrial Research.

Read more about her on the link http://200ysa.mg.co.za/blog/dr-lungile-sitole/

*Every year, the *Mail & Guardian* scours the country to find noteworthy and newsworthy young South Africans to profile in its *annual 200 Young South Africans* publication.

# Tree doctors from UP call for global strategy for forest health and biosecurity

Forests worldwide are continually under threat from introduced insects and pathogens despite the best biosecurity efforts. Without a concerted global effort to understand and control invasive pests the problem is expected to worsen as international trade increases.

In a review article, published in the prominent journal *Science*, Prof Mike Wingfield and his co-authors from the Forestry and Biodiversity Institute (FABI) at the University of Pretoria (UP) assert that an integrated global strategy is urgently needed to protect our forests.

Profs Wingfield, Bernard Slippers, Brenda Wingfield from FABI and Dr Eckehard Brockerhoff, Principal Scientist at Scion in New Zeeland, considers the urgent need for a global strategy to keep planted forests healthy. They reflect on the global value of plantation forests that are seriously threatened by invasive pathogens and insect pests. Globalisation is compounding this issue, and while there are solutions – including biosecurity, biological control, breeding, genetic engineering, environmentally safe chemical control and more – to protect forests, the lack of investment, capacity, and coordination of global efforts are barriers.

'More and more pests are emerging. Their impact is a growing concern as one in every six people rely on forests for food globally, and many more depend on them for climate regulation, carbon storage, health (through improved water and air quality) as well as the wood and wood-product industries,' explained Prof Wingfield. In South Africa, forestry contributes around R45 billion a year to the economy.

'Keeping invasive pests out of forests should be a top priority for all countries,' he said.

The authors added that global biosecurity is only as strong as the weakest link. 'Many countries don't have the resources to put biosecurity measures in place for plants and plant products. Once a pest becomes established it can be impossible to eradicate, and the pest can use the new country as a stepping stone for further invasions.'

The authors said that the only way to realistically deal with tree pests will be through global collaboration – sharing experience and research findings. While bodies like the International Union of Forest Research Organizations (IUFRO) help to facilitate collaboration, there is no single body or funding structure to support a global strategy for dealing with pests in planted forests.

According to the researchers, the perfect time to talk about this issue is now, as the World Forestry Congress of the Food and Agriculture Organisation (FAO) of the United Nations (UN) is focussing on forest health and sustainability when it meets in September in South Africa.

### Paper and other details

[1] Wingfield, M.J., Brockerhoff, E.G., Wingfield, B.D. & Slippers, B. (2015). Planted forest health: The need for a global strategy. Science (in press) DOI

[2] See Fig. 2 of the paper for the spread of pitch canker.

An introduction to the special issue of *Science* and the other review papers are available here or visit http://www.sciencemag.org/content/349/6250/800.full

*Prof Bernard Slippers*

*Prof Mike Wingfield*

*Prof Brenda Wingfield*

# Royal Society of South Africa honours Prof Bob Millar

*Prof Robert (Bob) Millar*

Prof Bob Millar, an internationally recognised scientist at the University of Pretoria (UP) is the winner of the 2016 **John F W Herschel Medal** in recognition of his highly distinguished multidisciplinary contributions to the furtherance of science.

Prof Millar is the Director of the Mammal Research Institute (MRI) and the Centre for Neuroendocrinology at UP, as well as Co-director of the University of Cape Town/Medical Research Council Receptor Biology Unit. He was recently appointed as the President of the International Neuroendocrinology Federation (INF). Prof Millar received this award for his exceptional contribution to science in South Africa, with a long career of world-class high-impact research across multiple fields, with a very strong interdisciplinary theme.

The John FW Herschel Medal is the senior medal of the Royal Society of South Africa and is awarded to those researchers who are outstanding in either a field of research that straddles disciplines or in more than one unrelated field.

Prof Millar has an impressive eclectic research record in diverse disciplines. He completed his BSc Hons in Zimbabwe, and undertook postgraduate research in Zambia where he identified phytoestrogens in grass species which were implicated in cattle infertility. Subsequently, for his MSc at London University, he conducted research in amino acid metabolism. This was followed by a PhD at the Liverpool University on photoperiodic regulation of seasonal reproduction in the hyrax.

Prof Millar then directed his endeavours to the development of novel assays for hormones for the diagnosis and treatment of hormone-dependent diseases as a Chemical Pathologist at Groote Schuur Hospital and the University of Cape Town (UCT). While at UCT he became fascinated with a new area of research, namely the regulation of growth, metabolism, reproduction and stress by small neuropeptides, produced in the brain. Together with his student he isolated and structurally characterised a novel peptide that regulates reproduction from 600 000 brains, which was the fourth structure identified. The Nobel Prize was awarded to Schally & Guillemin for isolating the first three. The receptors for these neuropeptides were unknown and Prof Millar took up a new challenge to develop molecular biology techniques. He was the first scientist, together with Dr Sealfon, to clone the receptor for Gonadotropin Releasing Hormone (GnRH) which regulates reproduction and participated in the development of analogues of GnRH which now constitute a billion dollar market as the primary treatment of prostatic cancer, precocious puberty (the sole treatment), hormone-dependent diseases in woman (e.g. endometriosis) and for in vitro fertilisation (IVF).

In 1998 Prof Millar was appointed as Director of the Medical Research Council (MRC) Human Reproductive Sciences Unit in Edinburgh. There he moved on to studies on the upstream brain regulation of GnRH and was the first to publish and patent Kisspeptin antagonists as potential new intervention drugs. He also participated in the development of a Neurokinin B antagonist which has entered the clinic for the treatment of polycystic ovarian syndrome (afflicts 10-30% of women).

This research continues in his present position as Director of the Mammal Research Institute at UP. Here he has again transmogrified his research to tackle diseases in wildlife. Prof Millar's diverse research contributions (infectious disease, chemistry, biochemistry, neuroscience, pathology, biology, physiology, drug development and clinical research) resonate with the remarkable diversity of John Herschel's scientific contributions and the society's desire to award the medal "to those who are outstanding in either a field of research that straddles disciplines or in more than one unrelated field".

Prof Millar has published over 400 articles in peer reviewed journals, including *Science, Nature, PNAS, Journal of Clinical Investigation, Journal of* Biological *Chemistry* and *New England Journal of Medicine* (IF 47) which have been cited over 17 000 times. He is an NRF A-rated scientist and has an H-index of over 70. He has filed 18 patents and established a successful Biotech company. He has received numerous international awards and laureates. He was inducted as a Fellow of the Royal Society of Pathologists (FRCP) for his publications in *Chemical Pathology*, a Fellow of the Royal Society (Edinburgh), a Fellow of the Royal Society of South Africa and member of the Academy of Science of South Africa. He has served on the editorial staff of many international journals and is Editor in Chief of *Neuroendocrinology* (IF 4.97). Over 50 postgraduate students graduated under his mentorship.

# Three new SARChI research chairs awarded to NAS

The University of Pretoria was awarded four new research chairs under the South African Research Chairs Initiative (SARChI), three of which are in the Faculty of Natural and Agricultural Sciences (NAS). At a function held in Cape Town in September the Minister of Science and Technology, Naledi Pandor, announced the establishment of 42 new research chairs to expand the South African Research Chairs Initiative. What makes this round of awards exceptional is that all 42 new research chairs were awarded to women scientists.

The new research chairs awarded to UP are:

### Prof Brenda Wingfield:
SARChI Chair in Fungal Genomics

Prof Wingfield is the Deputy Dean for Research and Postgraduate Studies in the Faculty of Natural and Agricultural Sciences. Her research focus is on fungal population genetics and genomics, which includes research on genetic variation within, as well as between species. She is a NRF A-rated scientist and one of the Research Leaders of the Department of Science and Technology (DST)/NRF Centre of Excellence in Tree Health Biotechnology.

*Prof Brenda Wingfield*

### Prof Wanda Markotter:
SARChI Chair in Animal Infectious Diseases (zoonoses)

Prof Markotter is an Associate Professor in the Department of Microbiology and Plant Pathology. Her research on the epidemiology and pathogenicity of rabies and rabies-related lyssa viruses, unique to the African continent, is well known and has contributed to the development of new diagnostic tools to make the diagnosis of rabies in developing countries more efficient.

*Prof Wanda Markotter*

### Prof Namrita Lall:
SARChI Chair in Indigenous Knowledge Systems

Prof Lall is an Associate Professor in the Department of Plant Science. She is an expert in Medicinal Plant Science and received the highest South African honour, the Order of Mapungubwe (Bronze), for her outstanding contribution to medical science. She has also been the recipient of various other prestigious awards for her outstanding scientific contributions to advancing science and building the knowledge base in the field of indigenous knowledge systems.

*Prof Namrita Lall*

The SARChI initiative was launched in 2006, as a strategic intervention of the South African government to increase research capacity in science, by developing human capacity and to stimulate the generation of new knowledge. The initiative is led by the Department of Science and Technology (DST) and the National Research Foundation (NRF).

**Prof Erika de Wet,** Co-director of the Institute for International and Comparative Law in Africa (ICLA) in the Faculty of Law was awarded the SARChI Chair in International Constitutional Law.

# NWU Alumni Award of Excellence for Prof Braam Van Wyk

Prof Braam Van Wyk, a world renowned botanist and plant taxonomist from the Department of Plant Science at the University of Pretoria, was recently honoured with an Alumni Award of Excellence by the North-West University (NWU).

Prof Van Wyk is a professor in the Department of Plant Science, incumbent of the Louis Botha Chair and curator of the HGWJ Schweickerdt Herbarium in the Faculty of Natural and Agricultural Sciences.

He was honoured by his alma mater, the former Potchefstroom University for Christian Higher Education, now the NWU, at a special awards ceremony. During this event the NWU Alumni Award of Excellence was bestowed on seven alumni for their professional accomplishments and service to the University and internationally. Prof Van Wyk received the award in the category for Research.

It was at his childhood home on a farm near Wolmaransstad that Prof Braam van Wyk discovered his love for natural science and plants. Today, as a world renowned botanist and plant taxonomist, he is an authority on the classification of Southern African trees and has a special interest in plant systematics, biogeography, plant anatomy and palynology.

Prof Van Wyk holds a master's degree in botany and a diploma in higher education from the former Potchefstroom University for Christian Higher Education. He also has a doctorate from the University of Pretoria.

He is one of the most productive plant taxonomists in South Africa and has authored or co-authored more than 390 publications on the botany of southern Africa, including several books.

Prof Van Wyk has also been responsible for the training of a significant percentage of the active plant taxonomists in South Africa, many of whom today occupy important positions at tertiary and other institutions. His popular scientific publications on wild flowers and trees have been valuable sources of reference for the general public. He has also produced the first electronic application (app) for the identification of trees in Southern Africa.


*Prof Braam Van Wyk*

# Prestigious Georg Forster Research Fellowship awarded to young entomologist

Dr Abdullahi Yusuf of the Social Insects Research Group (SIRG) in the Department of Zoology and Entomology was awarded a Georg Forster Research Fellowship by the Alexander von Humboldt Foundation of Germany.

These highly sought after fellowships allow young scientists the opportunity to develop their academic careers in partnership with leaders in their field of research. This fellowship will enable Dr Yusuf to pursue his research interests in honey bee behavioural ecology for a year in the Molecular Ecology Research Group (MERG) at Martin Luther University Halle-Wittenberg in Halle, Germany.

He will be working with Prof Robin Moritz, a leader in the field of honey bee behavioural ecology and genomics, who is the head of the MERG. Prof Moritz is also currently an Extraordinary Professor in the Department of Zoology and Entomology and this fellowship will provide Dr Yusuf with an opportunity to further strengthen the on-going collaboration between this research group and the SIRG.

*Dr Abdullahi Yusuf*

# Mathematicians excel at SAMS Congress

The Department of Mathematics and Applied Mathematics recently made their presence felt at the 58th Annual Congress of the South African Mathematics Society (SAMS). Two staff members were elected as council members and two PhD students received awards for their presentations.

Prof Kerstin Jordaan was elected to serve as the new President and Dr Gusti van Zyl as the General Secretary. Sesuai Madanha (supervised by Dr Hung Tong-Viet and Dr John van den Berg) and Tesfalem Abate Tegegn (supervised by Prof Mamadou Sango) were respectively awarded first and second prize for the best postgraduate student presentations at the congress.

A large number of researchers from the Department of Mathematics and Applied Mathematics participated in this year's conference which was hosted by the University of the Witwatersrand.

SAMS was established in Pretoria as a National Mathematical Association on 24 July 1957. The University of Pretoria has perpetually contributed to the outputs achieved by this Society.

*Sesuai Madanha and Tesfalem Abate Tegegn*

*Prof Kerstin Jordaan and Dr Gusti van Zyl*

# PhD student in Animal Science won two esteemed scholarships



A PhD student in the Department of Animal and Wildlife Sciences, Nadia Swanepoel, was recently awarded two prestigious international scholarships. She received the 2015 American Registry for Professional Animal Scientists (ARPAS) Alexander J Kutches, Sr. Memorial Scholarship Award, as well as the California Animal Nutrition Conference (CANC) scholarship this year.

Nadia started her PhD studies at the University of Pretoria (UP) in August 2011 under the supervision of Prof Lourens Erasmus. He organised a sandwich programme with Dr Peter Robinson at the Department of Animal Science at the University of California (UC), Davis, USA, to afford students from UP the opportunity to do the fieldwork part of their postgraduate studies abroad. Her research focusses on protein nutrition of dairy cattle, with specific emphasis on amino acid requirements during lactation.

As a result of her research in this area, Nadia was awarded the ARPAS Award at the Annual Continuing Education Conference of the California Chapter in Coalinga, California in October this year. As winner, Nadia was awarded the scholarship of $2 000, as well as the opportunity to present her research results in the form of a PowerPoint presentation at the meeting.

The purpose of the award is to recognise outstanding postgraduate students (students in a PhD degree programme) in dairy nutrition. The recipients are chosen from postgraduate students in California, Oregon, Nevada and Arizona who demonstrate a genuine interest in dairy nutrition and selection is based upon the individual's background, experience, research interests and activities with groups or organisations who are role-players in animal nutrition.

Nadia was also awarded the California Animal Nutrition Conference (CANC) scholarship earlier this year. She also won this scholarship in 2012. Students from across the United States were invited to present papers at this Annual Conference in Fresno, CA. Abstracts of the papers were sent to the CANC committee from across the state to enter the scholarship competition. The winner is selected based on the originality of his/her completed research with sound experimental design and interpretations. As winner, Nadia was awarded the scholarship of $1 500.


*Dr Marit Arana from A L Gilbert Feed Company presented the ARPAS scholarship awards. From left: Noe Gomez (Memorial Scholarship winner for MSc student), Dr Peter Robinson (Co-supervisor at UC, Davis), Nadia Swanepoel and Dr Marit Arana.*

# UP students compete in international synthetic biology competition



**2015 Pretoria_UP iGEM team.** ***From left:*** *Mr Gert Pietersen, Dr Eshchar Mizrachi, Ms Modjadji Makwela, Mr Axel Ind, Ms Thabang Msimango, Mr Vaughn Barendsen, Ms Nomakula Zim, Mr Ricu Claassens, Dr Steven Hussey, Prof Zander Myburg and Mr Brad Querl*

2015 marks the first year that a student team from the University of Pretoria (UP) participated in the International Genetically Engineered Machines (iGEM) competition and only the third time that an African team participated in this prestigious event.

The International Genetically Engineered Machines (iGEM) competition which started at the Massachusetts Institute of Technology (MIT) annually draws hundreds of high school and university teams from around the world to compete in what has become the premier international synthetic biology student competition. Synthetic biology is an emerging field that combines modern molecular biology and systems engineering concepts to develop innovative solutions, such as cancer-targeting viruses, novel biosensors, or even DIY biological 3D printers.

The Forest Molecular Genetics (FMG) Programme, with support from the Department of Science and Technology (DST), sponsored seven undergraduate and one BSc Honours student to participate in the iGEM 2015 competition. The team (Pretoria_UP) was mentored by Dr Steven Hussey and additionally advised by Prof Zander Myburg and Dr Eshchar Mizrachi from the Department of Genetics and Forestry and Agricultural Biotechnology Institute (FABI) at UP.

Pretoria_UP team representatives, Mr Gert Pietersen and Ms Nomakula Zim won a bronze medal at the 2015 iGEM Giant Jamboree in Boston, MA (24-28 September) where they presented their "Switch-coli" project to an international audience. They gained valuable insight into the iGEM organisation, which they will share with the rest of the team in preparation for the 2016 competition where the team aims to make their mark. The team used DNA BioBricks, the standard parts of synthetic biology, to design a genetic program controlling bacterial chemotaxis (movement in response to a chemical gradient). Their design improves a "bio-tweet" principle by the WITS-CSIR_SA team in 2011. This means that motile bacteria travel from a sender position to a recipient position, turn around synchronously only when most of them have arrived at the recipient, and then travel back to the sender, relaying information on the state of the recipient.

They registered seven new BioBricks in the Standard Registry of DNA parts, synthesized six and submitted three BioBrick DNA samples to the Registry. They also compiled a comprehensive wiki of their project, delivered an oral presentation, as well as a poster, to the iGEM community and judges. In addition, the team reached out to Grade 11 learners in the previously disadvantaged community of Mamelodi, educating them about synthetic biology and conducting a survey assessing differences in awareness, perception, attitude, and future projections of synthetic biology among learners from schools in previously disadvantaged and advantaged backgrounds. This work comprised the team's Human Practices portfolio and revealed striking socio-economic influences on synthetic biology acceptance and awareness.

The Pretoria_UP iGEM initiative is a community project within the FMG Programme, which aims to attract and develop scarce skills in synthetic biology innovation. The vision of this project is to participate in iGEM regularly and to encourage other South African institutions to form teams, and thereby stimulate a new generation of students who will develop synthetic biology solutions for the South African Bio- economy.

# UP Derek Gray Award rewards young scientists



The University of Pretoria and Prof Rosemary Gray recently signed a Memorandum of Understanding (MoU) as partners of the prestigious University of Pretoria (UP) Derek Gray Award.

This Award, incepted in 1999, was originally sponsored by the Derek Gray Memorial Fund, of which Prof Rosemary Gray is a trustee. This Award includes a full bursary to study at the University of Pretoria and a fully paid trip to Sweden and the Nobel awards ceremony in December. This prominent award also allows the winner to represent Africa at the International Youth Science Seminar to be held in Stockholm in December.

Established in 1980 by the late Dr Derek Gray, the Eskom Expo for Young Scientists has, since its inception, carried the humanist and non-racial message that science and technology are of vital interest and relevance for all South African school learners.

The winner of the first University of Pretoria Derek Gray Award in 2015 was Malan Steenkamp from Jeffreys Bay with his Wi-Fi-controlled robot, Lightning Storm 2.

Malan presented a Wi-Fi-controlled robot that was the result of a well thought-out development process, with three earlier models having been evaluated and refined. The project showed excellent use and integration of different technologies, including computers, communications, data and sensors.

The panel was impressed with Malan's excellent background knowledge of the underlying science and technology, as well as his ability to handle difficult questions. It was concluded that he will be an excellent ambassador to represent South Africa.

After two years of trial and error, the Daniel Pienaar High School matric pupil perfected the original robot – Lightning Storm – which he saw in his favourite magazine, *Popular Mechanics* in 2012.

Malan said the original robot simply 'bashed into walls and turned around, which was useless. "After fitting the original robot with sensors to avoid the bashing problem, I took it one step further with an IP address linked to an on board server. The robot is fitted with a light and camera and can send live video streaming to a phone. So the idea is to use it as a security surveillance device while you are away.

*Prof Rosemary Gray (Derek Gray Memorial Trust) and Prof Marietjie Potgieter (Deputy Dean: Teaching and Learning, Faculty of Natural and Agricultural Sciences) at the official signing of the MoU.*

*Malan Steenkamp*

# Mathematics and Applied Mathematics celebrating their growth

This year has seen the Department of Mathematics and Applied Mathematics celebrating a record in PhD graduates. The Autumn and Spring graduation ceremonies together delivered six PhD graduates (B Yizengaw, WS Lee, MAY Mohammed, YA Terefe, S Usaini and HZ Wiggins) and seven MSc graduates (B Stapelberg, S du Toit, A Ngugi, B Taljaard, K Bothma, A Billman, and L Mabitsela).

For the undergraduate programmes, Mathematics and Applied Mathematics saw a doubling in student numbers since 2011.

We all look forward to extended future growth, not only in numbers, but also in excellence. The Department of Mathematics and Applied Mathematics will continually strive to reach new heights in both its teaching and research activities as well in community based activities.



# University boosts Science with bursaries

The University of Pretoria (UP) has a long and proud tradition of being one of the main sponsors of the Eskom Expo for Young Scientists. At the Expo, the Faculty of Natural and Agricultural Sciences also awards annual bursaries to outstanding Grade 11 and Grade 12 candidates.

This year, bursaries were awarded to two Grade 11 learners, Lauren and Jacqui James, twin sisters from Victoria Girls' High School in Grahamstown.

Lauren was awarded a gold medal, judged overall category winner for Plant Sciences and received a first-year bursary to study at the University of Pretoria (UP). She was also selected as a finalist to represent South Africa at an international science fair in 2015/2016.

Lauren's project investigated whether Eucalyptus trees are allelopathic, or in laymen's terms, whether they produce a biochemical that may influence the growth, survival and reproduction of other plants. Eucalyptus trees are often used as wind breaks by farmers in South Africa. However, Lauren's research shows that these trees affect seed germination and crop growth, and therefore crop yield. This has implications for food security.

Her twin sister, Jacqui, was also awarded a gold medal, a bursary to study at UP and the Microscopy Society of South Africa Award for her project which investigated the effect of drought and flood conditions on plants.

The national finals of the Eskom Expo for Young Scientists provide a unique opportunity for young minds with bright ideas to showcase their research and innovation in Science, Technology, Engineering, Mathematics and Innovation (STEMI). This initiative is aimed at encouraging academic excellence in STEMI education. Each year, South Africa's brightest and most promising young scientists and engineers are brought together to recognise their achievements and to encourage them to pursue their interests in Science and Technology.

*Jacqui and Lauren James with their mother, Dr Helen James*

# Renowned scientist receives Honorary Doctorate

*Dr Sergej Zilitinkevich*



During the Spring graduation ceremonies in September 2015, the University of Pretoria awarded an honorary doctoral degree in Science to Dr Sergej Zilitinkevich. He is one of the world's leading scientists.

Sergej Zilitinkevich is a world leader in environmental turbulence and planetary boundary layers (PBLs). He deserves credit for the creation of the fundamental principles of the theory of stratified PBLs in the 60s and 70s. In particular, he deserves acclaim for his rotation-stratification depth-scale for stable PBLs, now referred to as the Zilitinkevich scale, and the PBL bulk resistance and heat-mass-transfer laws expressing the near-surface turbulent fluxes through external parameters: wind speed at the outer boundary of PBL and the temperature-humidity increments across a PBL. From 2005 to 2006 he extended these laws to extreme stratifications accounting for the newly recognised non-local features of stable PBLs and organised structures in convective PBLs. Another important contribution is the prognostic equation for the depth of evolving boundary layers, accounting for the turbulent energy spin-up. Many of Zilitinkevich's discoveries and laws are included in textbooks and cited as classical without references.

In the seventies, Zilitinkevich developed a novel method for analysing turbulent motions driven by inertia and buoyancy forces, and employed it to discover a puzzling 'sheared convection' regime involving two types of chaotic motions: usual shear-generated Kolmogorov turbulence and unusual convective turbulence consisting of merging plumes rather than breaking eddies. This theory has received undoubted experimental confirmation. However, it was way ahead of contemporary views and did not initially attract attention. In 2010, Zilitinkevich revealed that the merging-plume turbulence performs the inverse energy transfer (from smaller to larger scales), which is precisely the mechanism converting potential energy of unstable stratification into kinetic energy of large-scale convective structures.

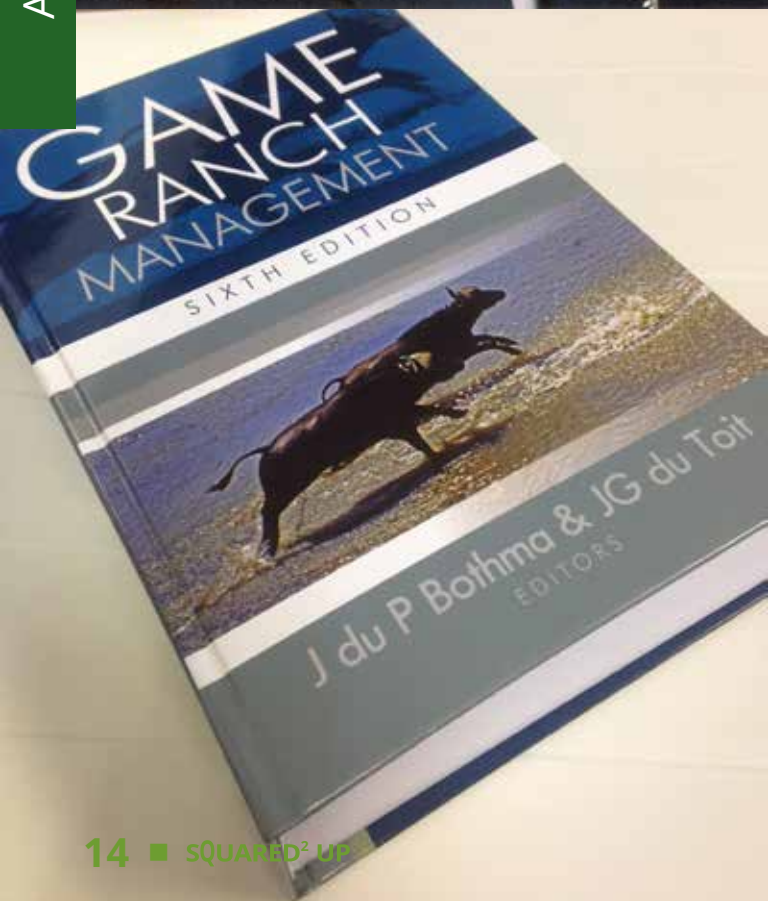
In the last decade, Zilitinkevich has been leading international efforts aimed at developing energetically consistent turbulence-closure theory applicable to the strongly stratified, very-high-Reynolds-number flows in the free atmosphere and hydrosphere. Zilitinkevich and collaborators have discovered the key mechanisms of the self-control of stably stratified turbulence and self-organisation of convective turbulence, obtaining ground-breaking results. Until now, super-critically stratified turbulence dominating the free atmosphere and hydrosphere has been parameterised only heuristically and very uncertainly, without serious theoretical and experimental bases. Convective PBLs are still parameterised only heuristically.

Practical applications of the work of Zilitinkevich include modelling and forecasting of climate, weather, wind-energy potential, and air and water quality. His basic results formulated in geophysical terms, are equally applicable to astrophysical problems, such as turbulence in accretion discs and convection in the sun.

# Emeritus professor editor of book on Game Ranch Management



*Prof Koos Bothma*




A former Director of the Centre for Wildlife Management and emeritus professor in the Department of Animal and Wildlife Sciences, Prof Koos Bothma is the editor and co-author of the recently published sixth edition of the book *Game ranch management,* which was first published in 1989 as the English version of his book, *Wildplaasbestuur.*

His co-editor and another co-author is Dr Kobus du Toit, one of his former students and currently an author in his own right, former President of the Onderstepoort Veterinary Student Council, former President of the Wildlife Group of the Veterinary Association of South Africa, co-owner of Big Five Pharmaceuticals (Pty) Ltd and a prominent wildlife consultant.

According to Prof Bothma, the growth of the wildlife industry in South Africa can be measured by the growth in the number of wildlife ranches. In 1965 there were only four wildlife-fenced properties in the former north-western Transvaal. By 2005, 40 years later, there were more than 10 000 properties with wildlife exemption permits in the nine provinces combined. As the wildlife industry continues to expand, so too does the need for scientific knowledge upon which it must be based.

This sixth edition of *Game ranch management* is written by 39 experts in various fields, including Prof Esté van Marle-Köster of the Department of Animal and Wildlife Sciences and other former staff members and students of the Centre for Wildlife Management, and is edited by two experienced wildlife ecologists and veterinarians. It is as complete a guide as possible for wildlife ranchers in South Africa. All the chapters have been revised and updated, with extensive new information on information systems and data management; economics of the wildlife industry in South Africa; bacterial, viral and protozoal diseases of wildlife; buying and selling wild animals; hunting, keeping and managing large terrestrial carnivores; trophy hunting; meat production; veld management; and habitat rehabilitation.

Completely new chapters or sub-chapters in the book include the following: marketing, genetic management, medical assistance in the field, ecto- and endo-parasites, the management of internal parasites, capturing wild animals chemically, falconry, as well as legislation and codes of conduct.

*Game ranch management* is designed for undergraduate and postgraduate students doing degrees or modules in wildlife management and ranching at training institutions across southern Africa. It is also a guide for current and future owners of extensive wildlife production units.

Prof Bothma was also awarded a Laureate Award in 2002. This the highest award an alumnus of the University of Pretoria or an outstanding achiever can receive from fellow alumni. This award has been presented to distinguished alumni since 1974.

# Potato researchers excel

Prof Martin Steyn from the Department of Plant Production and Soil Science was not only a keynote speaker at Potatoes South Africa's Research Symposium in July 2015, but was also invited to deliver a speech at the recent World Potato Congress (WPC) in Beijing, China. The topic of his speeches at both of these prestigious events was: 'The water footprint of potato production in South Africa and innovative tools to improve water use efficiency'.

The WPC brings together the broad potato industry represented by both developing and developed countries. They facilitate access to useful and applicable information. With this Congress, a network of common interests is built – 'a global potato family' with all the interests and practical concerns inherent in such a diverse group.

One of Prof Steyn's MSc students, Ms Chantel du Raan, also demonstrated the high standard of the work done in this programme when she was awarded the Potato Industry Development Trust Prize for the best student presentation at Potatoes South Africa's Research Symposium earlier this year. The title of her presentation was 'The Effect of nitrogen management on tuber initiation of selected cultivars'.

At this Symposium, Prof Jacquie van der Waals from the Department of Plant Science was awarded the BASF Trophy for the best presentation by a researcher for her speech titled 'Integrated Management: The Only Option with Powdery Scab'. Prof Van der Waals runs the Potato Pathology Programme at the University of Pretoria.

*From left: Prof Jacquie van der Waals, Dr Freddie Denner (AgChem) and Ms Rita van der Merwe (BASF).*

*From left: Ms Chantel du Raan, Dr Freek du Plooy (Agricultural Research Council) and Dr Fienie Niederwieser (Potatoes South Africa)*

## FABI student awarded prestigious BSPP/SASPP Grace Waterhouse fellowship

Ms Palesa Madupe, a MSc student in Prof Teresa Coutinho's research group in the Forestry and Agricultural Biotechnology Institute (FABI), was recently awarded the prestigious British Society of Plant Pathology (BSPP)/Southern African Society of Plant Pathology (SASPP) Grace Waterhouse Fellowship.

The Fellowship gave her an opportunity to spend four weeks in Prof David Studholme's laboratory at the University of Exeter in the UK. Ms Madupe's research focuses on a recent host jump of a bacterial pathogen of sugarcane to *Eucalyptus.*

The genome of this pathogen, *Xanthomonas vasicola*, was sequenced at the University of Pretoria and while she was in the UK, Ms Madupe improved the sequence, using various bio-informatic tools. She was also able to show, using a comparative genomic approach, that the *Eucalyptus* isolate had acquired a unique gene region not found in any other *X. vasicola* strains isolated from different hosts.

Ms Madupe will shortly be submitting her thesis and intends continuing this research for a PhD.

*Palesa Madupe with Prof David Studholme*

# Prof Serena Coetzee appointed to South African Geomatics Council

Prof Serena Coetzee, Director of the Centre for Geo-information Science and part of the Department of Geography, Geo-informatics and Meteorology was appointed to represent Higher Education on the South African Geomatics Council.

The announcement of the appointment of members to the Geomatics Council has been broadly welcomed by the geomatics community. A revisit to a paper by former PLATO president, Paul Marshall, titled "The way forward for PLATO as a statutory body in the transitionary period towards the new SA Geomatics Council" provides some answers as to what lies ahead.

The first meeting of the Geomatics Council was held within 30 days of the 22 May 2015 publication in the *Government Gazette.* This was the commencement date of the new Geomatics Profession Act. Members of the Geomatics Council were appointed for four years, as opposed to the previous council term of two years.

The main difference between the new Act and the 1984 Act is that the new Geomatics Council falls under the auspices of the Minister, while the PLATO Council was accountable to the Minister. The Geomatics Council is required to meet twice a year, as opposed to the previous arrangement of once a year, and it will be funded to a much larger extent by the department. The PLATO Council was self-funded and was therefore largely independent of state funding. The new Geomatics Council is obliged to honour all existing commitments made by the PLATO Council.

The current Education Advisory Committee is likely to remain in place until a suitable Education and Training Committee is established. In his paper Marshall advised that this committee will need suitable and sufficient permanent members, and will need the backing of the minister to properly carry out its functions, especially the biannual accreditation of qualifications at institutions offering surveying, mine surveying and geo-information science.

The establishment of a Continuing Professional Development (CPD) programme is a specified duty of the new Geomatics Council and as such it will have much more authority when enforcing participation in the CPD programme.

A major challenge for the new Geomatics Council is that the Geomatics Act provides for the publishing of a recommended tariff of fees. While this has generally been viewed as a positive development, the drafting of a "One Tariff Fits All" for the geomatics industry was identified by Marshall as being one of the more difficult tasks to be faced by the new Geomatics Council.

This article was published in *PositionIT* at http://www.ee.co.za/article/new-geomatics-council-implications.html



*Prof Serena Coetzee*

# UP dominates AEASA Conference 2015

The Department of Agricultural Economics, Extension and Rural Development once again showed that they are a force to be reckoned with at the 53rd Conference of the Agricultural Economics Association of South Africa (AEASA).

Tinashe Kapuya, a PhD student in the Department, received the award for the best paper submitted for oral presentation with her paper titled "Investment strategies and the (re)structure of agro-food supply chains in Africa." The award for the second best poster paper, titled "Setting an economic and institutional research agenda for food supply chain losses and waste" was received by Leanda Louw, currently pursuing a master's degree on this topic.

The Conference had 39 slots for oral presentations. Of the available slots, 18 were filled by students and staff members from the University of Pretoria (UP). The University was furthermore well represented with a total attendance of 22 delegates, of which 18 were PhD and master's students.

This annual event creates the ideal platform for agricultural economists to come together to network, share knowledge and collaborate on future research. It is also an arena in which postgraduate students have the opportunity to share their research results and to establish a network with current and future industry leaders.

When thinking about the University of Pretoria's success at the AEASA Conference the words of Liberian peace activist, Leymah Gbowee, comes to mind: *"I am what I am because of who we all are"*. The amount of submissions, good attendance and recognition by ways of awards was indeed a team effort from all those involved. And it was with pride that the University of Pretoria departed the AEASA Conference with a renewed feeling of – Tuks of Niks!



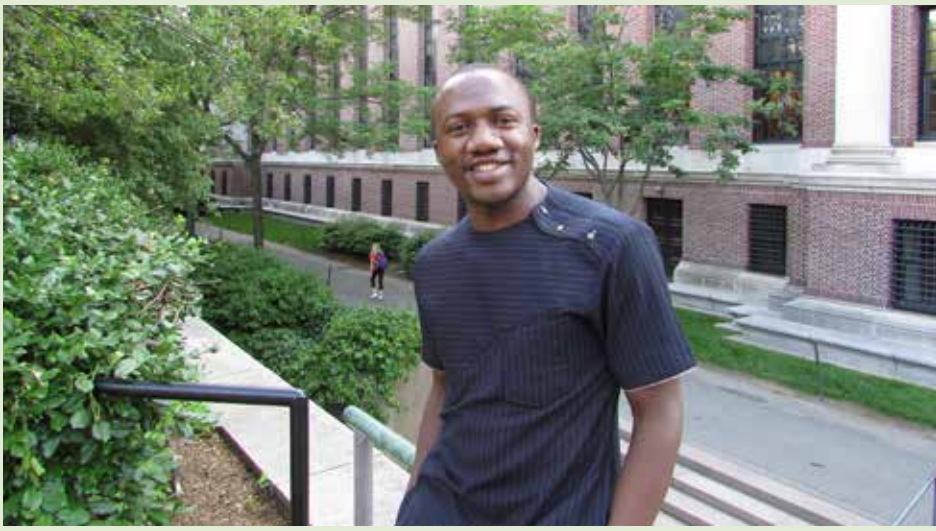
*Staff members and students of the Department of Agricultural Economics, Extension and Rural Development at the AEASA conference.*

# Plant Scientists won Phytologist Poster Prize

Dr Barnabas Daru from the Department of Plant Science recently won the New Phytologist Poster Prize at the 35th New Phytologist Symposium at Harvard University, USA.

He was awarded an amount of US$150 for his poster, 'The genomes of forest trees: new frontiers of forest biology'.

*Dr Barnabas Daru*



# Eight new Food Science doctors from UP in 2015

Five PhDs from the Department of Food Science were centre stage at the recent Spring graduation ceremony. This was the largest group of PhDs ever from this Department at a single graduation ceremony. During the Autumn ceremony, three more PhDs were conferred on food scientists. This brings the total for 2015 to four master's and eight doctorates for this relatively small Department.

The Department is extremely proud of the eight new Food Science doctorates, which is the largest number for a single year. Assuring food security for all and optimising the quality of the food supply, is embedded in the global millennium development goals. Food Science researchers like these could play an important role in the efforts to achieve these goals.

Topics of research included:

- Adediwura Falade: *Improving the quality of non-wheat bread from maize using sourdough fermentation*
- Twambo Hachibamba: *Phenolic compounds in gastrointestinal digests of cooked cowpeas: Their potential for preventing inflammation and cardiovascular disease*
- Doreen Hikeezi: *Sorghum grain: Development of methodologies for end-use quality evaluation.*
- Adeoluwa Adetunji: *Cell wall and tannin treatments for increased utilisation of cassava and sorghum in beverage and bioethanol production*.
- Franklin Apea Bah: *Bioactive phenolics in sorghum-cowpea composite porridge and their potential to alleviate radical-induced oxidative stress.*
- Melanie Dennill: *Sensory and enzymatic factors associated with defects in low fat UHT milk.*
- Bhekisisa Dlamini: *Yeast fermentation of sorghum worts: Influence of nitrogen sources*

*The new Food Science doctoral graduates from the Spring graduation are from left: Drs Bhekisisa Dlamini, Melanie Dennill, Fidelis Ocloo, Adeoluwa Adetunji and Franklin Apea Bah. (Photo: Joseph Kamdem)*

*In April this year Drs Adediwura Falade, Twambo Hachibamba and Doreen Hikeezi were awarded PhDs. Dr Doreen Hikeezi with Prof John Taylor (co-supervisor). Prof Gyebi Duodu (absent) was her supervisor.*

*From left: Prof John Taylor (supervisor), Dr Adediwura Faladi and Prof Naushad Emmambux (co-supervisor).*

# Pioneering rainwater harvesting system won two Corobrik-ILASA Awards

The Pioneering rainwater harvesting system developed in the Botanical Garden does not only have a soothing and calming effect on everybody in the vicinity, but also won two coveted Corobrik-ILASA Awards of Excellence.

This garden functions as a rainwater harvesting and irrigation water treatment plant for the entire Botanical Garden, and forms an integral part of its sophisticated automatic irrigation system.

Constructed around the new Mining Industry Study Centre of the School of Engineering, a precedent has been set by the University for the manner in which the landscape is no longer mere beautification, but serves an essentially functional and value adding instrument in solving the many challenges that the urban environment faces, working toward 'resilient city' principles.

Hosting over 160 species of aquatic and mesophyllic plant species, including a representative sample of our peerless tropical African *Encephalartos* collection, this space has been designed to welcome visitors, and has become a firm favourite for students.

The project has attracted an enormous amount of attention and was listed as a finalist in the category 'Excellence in Building' in the International Sustainable Campus Network's annual International Sustainable Campus Network (ISCN) Awards in 2014.

By invitation, the project has been presented to the California Horticultural Society in California. A prominent member of the land art group, Site Works, is currently conducting a year-long photographic land art project, using this space and the *Genius Loci* it provides.

The aim of the Corobrik-ILASA (Institute for Landscape Architecture in South Africa) Awards of Excellence is to acknowledge and promote excellence in landscape architecture and environmental planning and management through peer review recognition, and to promote landscape architecture to client bodies, other professions and the public.

# SASAS awards Gold Medal to Prof Jannes van Ryssen

Prof Jannes Jansen van Ryssen, an extraordinary professor in the Department of Animal and Wildlife Sciences was recently awarded the Gold Medal from the South African Society for Animal Science (SASAS). The medal is awarded to a member of SASAS who has served animal science and the society honourably and in such a distinguished manner that his/her quality of scientific contributions, achievements, involvement and extended service to South Africa's animal production industry has been recognised as exceptionally meritorious by many, both nationally and internationally.

Prof Van Ryssen's research career commenced in 1966 at Cedara where he specialised in aspects of ruminant nutrition. After joining the staff of the University of Natal (UNP) in 1968, his interest in mineral nutrition developed, as reflected by his publications on minerals, particularly copper and selenium metabolism. After an illustrious career as lecturer at UNP, he was appointed by the University of Pretoria (UP) in 1995 as professor and since 2005 he was appointed as extraordinary professor at UP, and still occupies this position. Through his academic career he was instrumental in the education, mentoring and development of many of today's leading animal scientists.

While employed by UP, he was appointed as secretary of SASAS in 1998 and in 2002 he was appointed as the editor-in-chief of the *South African Journal of Animal Science (SAJAS)*.

Prof Van Ryssen was specifically awarded the Gold Medal for his distinguished academic career of teaching, mentoring young scientists and research, with an excellent NRF rating and publication record. His unstinting selfless service to animal science as a profession through his term as secretary of SASAS since 1998 and the South African Association of Professional Animal Scientists (SAAPAS) from 2003 to 2007 was mentioned. He also served on the Executive Council of SASAS since 1996.

*Prof Jannes Jansen van Ryssen*

Furthermore, Prof Van Ryssen's services as editor of *SAJAS* since 2002 made a massive contribution to the development of animal science in South Africa. Under his editorship, the journal has steadily been growing since 2002 in terms of submissions, articles published and impact factor, becoming a journal used by many scientists in Africa and the rest of the world.

Prof Van Ryssen was also the proud winner of the SASAS Silver Medal in 2000, as well as the SASAS Presidential Award in 2002. He is presently the chairperson of the committee that is tasked to develop the Continued Professional Development (CPD) programme for professional animal scientists through the South African Council for Natural Scientific Professions (SACNASP).

# Plant Pathologist also an excellent runner

Prof Jacquie van der Waals from the Department of Plant Sciences recently won a gold medal in the 4 km race at the Athletics South Africa National Cross Country Championships, in the age category 40 to 45 years. In 2009 and 2010 she also won her age category (which was then 35 to 40).

She is a seasoned athlete who also achieved an overall second place in the veteran category at the South African Athletic Championship earlier this year. Prof Van der Waals was also crowned as the 10 km champion of the Irene Running Club for 2015.

*From left: Ronel Thomas (second place), Jacquie van der Waals (winner) and Nomasosnto Skhosana (third).*

# UP student crowned World Champion in field target shooting

Laura Parson, a second-year Animal Science student at the University of Pretoria has recently been crowned Ladies World Champion in the World Field Target Championships in Lithuania.

A total of 36 countries competed, and more than 250 competitors took part. Laura was the winner of the Ladies class. She has been shooting for the past 13 years and was awarded her National Protea colours twice – in 2014 and 2015. Laura has been the SA Ladies Champion for four consecutive years, including this year.

Field target shooting is an outdoor air gun discipline that originated in the United Kingdom in the early 1980s, and is gaining popularity worldwide. Targets may be placed at any distance between 8 meters and 50 meters from the firing line. Targets are often placed at about the same height as the shooter, but it is not uncommon for them to appear high up banks or in trees, or down steep slopes.

More information can be found on www.saftaa.co.za

*Laura Parson*

# Warehouse Receipt System won International Award


*Dr André van der Vyver*

Dr André van der Vyver of the Department of Agricultural Economics, Extension and Rural Development, together with USAID Mozambique and SA Tradehub, have been actively involved in the development of a Warehouse Receipt System for the Mozambique grain and oilseed industry during the course of the past year. The project was also awarded an Oracle Global Sustainability Innovation Award which was bestowed at their prestigious Open World Conference in San Francisco.

Efforts came to fruition when the system went live with the first warehouse receipt being financed four months ago in Catandica at the ECA/Cargill grain storage facility. Although still in the pilot phase, when implemented nationally, farmers and traders will have the ability to store products safely at registered warehouses open to third party storage. In the first place, it curbs post-harvest losses that run as high as 30%. In addition, participating banks will now be able to offer farmers loans by using the product – represented by the warehouse receipt – as collateral against loans. This enables the farmer, who is in desperate need of money after a long and costly production season, to postpone his/her selling decision from harvesting time, when prices are at a season low, to two to four months later when prices often recover by around 30%. Not only does this add wealth to communities that are in desperate need for economic upliftment, but higher prices act as incentive to produce more.

Crucial to the success of the project was the development of an online database, where all users with different functionalities could log in on the system and all transactions could be electronically processed. With 'all users' it literally means a Warehouse Clerk at a remote rural warehouse (as long as there is cell phone reception) who receives the product and a Financial Manager at company headquarters in Maputo, who must approve the loan, and who are able to securely log-in to perform their various functions. This also means the warehouse receipt is an e-receipt – in fact the whole system is 'in the cloud'. For this purpose, Dr Van der Vyver appointed a Johannesburg software development company, APPSolve, which successfully developed the system by using world standard Oracle database software. Their work in October received recognition when Dr Van der Vyver and Maureen Grosvenor of APPSolve were invited to present a paper at the regional Oracle Conference in Cape Town.

# Young NAS scientists received WISA awards

Three postgraduate students from the Faculty of Natural and Agricultural Sciences were recently awarded scholarships and fellowships from the Department of Science and Technology (DST) at the 2015 Women in Science Awards (WISA). The awards were presented at a gala event in Johannesburg in August this year.

The DST annually hosts these awards in order to reward excellent female scientists and researchers, and to encourage younger women to follow in their footsteps.




*Danielle Twilley*

**Danielle Twilley**, a PhD student in the Department of Plant Science was awarded a (DST) Fellowship to pursue her studies in Medicinal Plant Sciences. Danielle completed a BSc in Biochemistry, and her BSc (Hons) and MSc (both earned with distinction, and for both of which she received academic colours) were in Medicinal Plant Science. She has been a member of the Golden Key International Honour Society since 2010.

Her doctoral research focuses on medicinal plants traditionally used in Southern Africa for the treatment of skin diseases and cancer, selected on the basis of their phytochemistry. Danielle's specific focus is to evaluate the cytotoxity of Southern African plants on melanoma. She will be looking at techniques that will yield a better understanding for the mode of action in which the plant extract inhibits melanoma cells, and whether a plant extract is able to target key characteristics of melanoma.

Danielle has presented her research results at both national and international conferences. She received an award for the best presentation by an honours student at the 2011 Fanie de Meillon Postgraduate Symposium and for the best presentation at the 2014 Indigenous Plant Use Forum. In 2011 she was the best honours student in Plant Physiology and Biotechnology at UP. Danielle has published three articles in peer-reviewed journals, resulting from research associated with cancer, and a book chapter in *Toxicological Survey of African Medicinal Plants*, in which she discusses African plants with dermatological and ocular relevance. Danielle recently filed an international patent in respect of a Southern African plant that has been proved in vitro to have high activity against epidermoid carcinoma, and in vivo to have a sun protector factor boosting effect.

**Leticia Mosina** is a PhD student in Biotechnology at the Centre for Microbial Ecology and Genomics and received a TATA Scholarship to continue her doctoral studies which she started in 2014.

She holds a BSc, BSc (Hons) and MSc from the University of KwaZulu-Natal (UKZN). Leticia's academic achievements includes a certificate of merit for her BSc (Hons), participation in the South African Breweries (SAB) intervarsity Beer Brewing Competition (2010 and 2011), a Victor Daitz Foundation Scholarship in 2009, and National Research Foundation Scholarships (honours, master's and PhD). Leticia was also awarded first prize for best student oral presentation in 2010 at the annual South African Society for Microbiology (KZN) Conference, and in 2012 at the UKZN College of Agriculture, Engineering and Life Sciences Research Day as well as the UKZN School of Life Sciences Research Day.

In 2014, Leticia's research project combined structural biology, biotechnology and enzymology techniques with the aim of elucidating the structure and function of a bifunctional exoglucanase. Exoglucanases have anumber of applications in industry and are essential in biofuel production and the bioeconomy in general. However, many industrial enzymes do not meet the criteria for bioprocesses. Using the structural and functional properties of the exoglucanase, she aims to improve the thermostability, substrate specificity and enzyme activity by protein engineering to increase its suitability for industrial application.

Leticia worked as a student assistant from 2008 to 2013, assisting undergraduate students, and has been involved in several social initiatives aimed at supporting high school learners interested in pursuing careers in science. After completing her PhD she plans to further her career in biotechnology and to collaborate with local companies.

*Leticia Mosina*

**Iketle Maharela**, a master's student in the Department of Statistics was also awarded a TATA Scholarship to further her studies at UP. She is the eldest of four children and from Mohodi Ga-Manthata, a rural village in Bochum, Limpopo, She completed a BCom degree at UP majoring in Statistics and Economics, followed by an honours in Statistics at the same university.

Her research is in spatial econometrics, an area that she wants to pursue to doctoral level. She has been working as a tutor and assistant lecturer in the Department of Statistics at UP since her final undergraduate year. Iketle's inspiration is her mother, who was the first in her family to obtain a university education, and instilled in her daughter a love of learning and an appreciation of the potential of learning to change people's lives and perspectives.

*Iketle Maharela*

**Shruti Lall**, a master's student in Electronic Engineering also received a TATA scholarship from the DST. She is the daughter of Prof Namrita Lall, an esteemed researcher in the Faculty of Natural and Agricultural Sciences.

# Consumer Science is part of almost everything we do



"Consumer Science concerns itself with people, products and services relating to food and nutrition, clothing and textiles, as well as housing and interior and therefore, Consumer Science is inescapably part of almost everything we do." These were some of the thoughts that Prof Alet Erasmus shared during her inaugural address as the Head of the Department of Consumer Science in August this year.

Prof Erasmus's address, titled *Consumer Science: Embracing consumer well-being in a global context,* explained the emergence of the discipline over time.

According to Prof Erasmus, "consumers are intricate human beings whose thought and decision processes are influenced by who they have become over time, i.e. through consumer socialisation, as well as the world we live in. Even South Africans who are part of an emerging economy with very unique characteristics, also function in a global village where sophisticated international brands are competing for our attention. The discipline of Consumer Science is highly aware of the challenges associated with global and technological influences in the market place and approaches consumer well-being from a consumer's perspective that propagates an alignment of individual and societal needs that are context specific."

"Consumer Science is inescapably part of almost everything we do. Unfortunately, because the topics that the discipline concerns itself with are so close to what we do every day, the intricacy of Consumer Science as a discipline is often grossly underestimated." She therefore took the audience through an array of research topics in which the Department is actively involved and explained the interrelationship between disciplines, such as marketing, human nutrition, psychology, sociology and cultural anthropology.

Prof Erasmus also shared the Department's successes on international platforms in recent years, which includes several international accolades, amongst others best and most innovative research awards bestowed in the USA. Furthermore, the best publication awards at the bi-annual conference of a local professional organisation, SAAFECS, were acclaimed by academics in this Department during each one of the conferences since 2006. She took the opportunity to applaud her colleagues for their commitment and willingness to support the vision of the University of Pretoria through their contributions and inputs in the Department and gave a brief overview of exceptional growth in the delivery of graduates in master's and PhD degrees.

*From left: Prof Brenda Wingfield (Deputy Dean: Research and Postgraduate Studies, Faculty of Natural and Agricultural Sciences), Prof Alet Erasmus (Head: Department of Consumer Sciences) and Prof Cheryl de la Rey (Vice-Chancellor and Principal)*

*Prof Elizabeth Boshoff and Prof Alet Erasmus*

She also shared her vision for the Department, which is to support young colleagues to excel in a competitive environment, to develop conditions in the Department in order to improve research outputs so that it would enhance the image of the Department as a leader in Africa and a noteworthy contributor on international platforms.

The event was attended by 86 guests, including two former heads of the Department, Prof Elizabeth Boshoff, who retired in 2000 and who came all the way from George, and Prof Elmarie de Klerk who retired in 2015. A three course meal, prepared by the Foods and Hospitality division of the Department of Consumer Science, was served.

# Three L'Oreal Fellowships to UP researchers

Science knows no boundaries, and that includes gender as well as age. African women have once again displayed inventiveness and excellence when it comes to the sciences.

One staff member and two PhD students from the University of Pretoria confirmed these sentiments by winning three of the twelve fellowships awarded by the 2015 L'Oréal-UNESCO *for Women in Science* Sub-Saharan Africa 2015 programme.

**Dr Jandeli Niemand**, a researcher in the NRF/DST South African Research Chair in Sustainable Malaria Control won a postdoctoral fellowship worth 10 000 Euros, while **Danielle Twilley** (Medicinal Plant Science) and **Olubokola Adenubi** (Phytomedicine) were awarded doctoral fellowships worth 5 000 Euros each.

**Dr Niemand** received the L'Oreal fellowship for her research on the membrane transport in the sexual transmissible stage of *Plasmodum Falciparum* parasites.

**Danielle** is a PhD student in the Department of Integrated Plant and Soil Sciences and her doctoral research (under supervision of Prof Namrita Lall) focuses on medicinal plants traditionally used in Southern Africa for the treatment of skin diseases and cancer, selected on the basis of their phytochemistry.

**Olubokola** is a PhD student in the Faculty of Veterinary Science and her research focuses on the tick repellent and acaricide, as well as other potential biological activities of seventeen plant species. She is doing her PhD under the supervision of Dr Vinny Naidoo in the Department of Phytomedicine.

Through the substantial diversity of their research, this year's Sub-Saharan African Fellows highlight the changing face of scientific research and the new disciplines that are continually emerging, forging the next generation of *For Women in Science* fellows. These young researchers share the thrill of curiosity and discovery, and believe strongly that science can change the world.

Sandeep Rai, Managing Director of L'Oréal South Africa remarked: "For the last 17 years, with the *For Women in Science* program, we have been fighting to advance the cause of women scientists worldwide. Much has been achieved: more than 2 000 women have been recognised worldwide, the program has gained recognition from the international scientific community, a springboard to enable women to go further and rise to greater heights. Science is part of our DNA and we are really proud of all the women who continue to make a difference in Africa through our programme."

*From left: Danielle Twilley, Olubokola Adenubi and Dr Jandeli Niemand*


*Olubokola Adenubi*

# Importance of data science as an identified research frontier

*Mankind's data obsession in the modern era* was the topic of Prof Andriëtte Bekker's inaugural address in November this year.

According to Prof Bekker, Head of the Department of Statistics, "the digital realm of recent years has expanded with rigorous intensity, and along with its expansion, the need created by mankind to cater for itself in terms of its data requirements. The necessity for data – whether digital or experimental – and the useful application and analysis thereof is arguably the driving force for today's fast-paced research, fast-paced analytical need by industry, and fast-paced daily use by society."

She emphasised that "history shows that data, combined with statistical analysis, is a powerful catalyst in the development of mankind and society." She mentioned that some buzzwords will be examined and myths will be busted by addressing three basic questions in her address: Is data science new? Is data science a science? What is a data scientist?


*Prof Andriëtte Bekker*

*From left: Prof Jean Lubuma (Dean: Faculty of Natural and Agricultural Sciences), Prof Andriëtte Bekker and Prof Stephanie Burton (Vice-Principal: Research and Postgraduate Studies)*

"To bridge the gap between global data requirements and academia's responsibility to meet that challenge, I envisage and encourage sufficient individual reflection and thought for the sustainable future of the discipline within this data science paradigm, along the following views:

- Statistics as a scientific discipline is even more important in this data era.
- The necessity of statistical education within the community of big data stakeholders.
- Statisticians are not data scientists, neither are engineers, computer programmers, database managers, IT specialists.
- Focus on developing a fundamental and core skills set for students.
- Promote co-operation and collaboration between the relevant data science branches.
- Emphasise data science as an identified research frontier within the UP framework for the Science, Engineering, and Technology Cluster."

Her address also focused on some thoughts along the lines of mankind's data obsession in the modern era and illustrated that this obsession is not a new one.

# Head of Geography, Geoinformatics and Meteorology Department inaugurated

Prof Paul Sumner recently delivered his inaugural address as the Head of the Department of Geography, Geoinformatics and Meteorology.

The title of his address, 'Geographical paradigms: from past to present, from point to planet' focused on how the development of geographical thought, theory and application over the past century has been neither smooth nor sequential. According to Prof Sumner, the expansion of knowledge is reviewed and the departmental contribution contextualised within the institutional history and the geographical academic landscape. Geography at the University of Pretoria was presented from the 1920s, gained momentum as a discipline and merged with Geoinformatics and Meteorology in the early 2000s. Expertise within all three disciplines provides a platform for academic excellence that can drive interdisciplinary expansion while still retaining discipline autonomy."

He emphasised that "as a knowledge base, Geography and its closely related disciplines progress rapidly through internally and externally derived paradigm shifts. Geoinformatics and Meteorology both attribute major advances to the technical surge in data availability, information management, computational capability and data interrogation that permit integrated and predictive modelling at a landscape to global scale."

"Furthermore, Geography has been characterised by increasing diversification within the human-environment interface, but within physical geography a shift to process studies has largely abandoned the landscape scale geomorphological paradigm. An up-scaling framework for understanding the transition from a rock-decay point to landforms and to landscapes, the combination of which ultimately describes terrestrial surfaces, is outlined. Such a conceptual paradigm may address issues of scale in physical landscape interpretation and can realign the scalar drift of form closely related disciplines."



*From left: Prof Stephanie Burton (Vice-Principal: Research and Postgraduate Studies), Prof Paul Sumner and Prof Jean Lubuma (Dean: Faculty of Natural and Agricultural Sciences)*

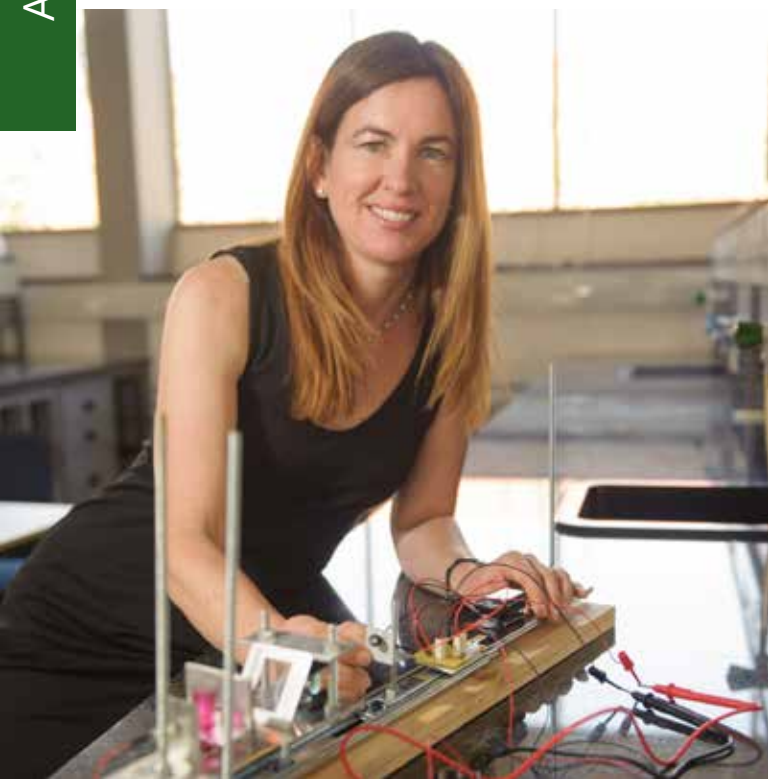
# NAS academics shine bright at *'Oscars of Higher Education Innovation'*

Two academics from the Faculty of Natural and Agricultural Sciences (NAS), Dr Patricia Forbes and Ms Thea Corbett were awarded first prizes at the *Reimagine Education 2015 Conference in* Philadelphia on 8 December 2015.

**The Global Awards for Innovative Higher Education Pedagogics Enhancing Learning and Employability are also known as the '***Oscars of Higher Education Innovation'.* This global competition received submissions from 520 universities and enterprises from 50 countries, with 22 awards judged by a panel of 40 international experts – a 'who's who' of higher education.

**Dr Forbes** *from the Department of Chemistry won the first prize* for her Spectrophotometer *in the* Presence Learning Award category. She developed an educational spectrophotometer (called the SpecUP). One of the defining features of the SpecUP is that the instrument can be built by students themselves by using a kit which costs about R600. The more expensive alternative is R30 000, which is the cost of an entry-level commercial instrument. The students can use the SpecUP in applied chemistry experiments. This makes it possible for institutions to have more spectroscopy equipment available to enable enquiry-based learning, which is of importance in a developing country context where student numbers are high and resources are scarce. Due to the hands-on nature of the SpecUP, which has moving parts, it makes it possible for students to understand what is inside the 'black box' of commercial instruments and to discover what happens when they adjust components.

She was also honoured earlier this year with the South African Chemical Institute (SACI) Education Medal for 2014, as well as a sponsorship of R30 000 from the Royal Society of Chemistry to further her research on the educational spectrophotometer.



*Dr Patricia Forbes*

*Ms Thea Corbett (standing left) and Ms Christina Kraamwinkel (standing right) with some students*

**Ms Corbett from the Department of Statistics and also involved in the UP Four-year Programme won the first prize in the** regional competition for Africa for her entry *Empowering 'weak' students through a scaffolded learning approach.* This intervention was developed for enabling ill-prepared first-year students in extended programmes (BSc Four-year Programme) to become independent, self-regulating learners through creative learning activities which include authentic real-life tasks. This Programme on the Mamelodi Campus provides access to Science and Science-based study programmes by setting lower entrance requirements and offering intensive support in order to prepare students for further studies in mainstream programmes. Subject content is presented by applying a variety of methods, designed to remedy possible gaps, focus on understanding and develop critical thinking and practical skills. Progress is continuously assessed to meet the required levels of academic performance. This project also won a third place in the Teaching Delivery Award category.

Ms Corbett and Ms Christina Kraamwinkel, also from the Department of Statistics, were also awarded with a UP Teaching Excellence and Innovation Laureate Award in the Team Category this year.

"Their achievements have advanced the University's teaching reputation and may have a positive influence on our international rankings as well," Prof Marietjie Potgieter," Deputy Dean: Teaching and Learning in the Faculty of Natural and Agricultural Sciences said.

# South Africa's first early warning system for potato growers



*Prof Kerstin Krüger*

Aphids are among the most widespread pests affecting the agricultural industry around the world. While we may not think we need to compete against these tiny insects for the potatoes on our plate, if not monitored, the effects of aphids may present a serious problem for potato production.

There are stringent requirements in place regarding the quality of tubers, or seed potatoes, based on the South African Seed Potato Certification Scheme 2010. Aphids are efficient transmitters of plant viruses that threaten the quality of seed potatoes. Two of these viruses that have devastating potential in the potato industry globally are potato virus Y (PVY) and potato leaf-roll virus (PLRV). Potato plants are susceptible to infection with these viruses by aphids feeding on them, acting as efficient vectors. Aphids feed on infected plants and are able to retain the viruses for several hours, in the case of PVY, or for their lifetime, in the case of PLRV. They feed on the sap of infected plants, after which they move on and transmit the viruses to healthy plants.

Prof Kerstin Krüger of the Department of Zoology and Entomology in the Faculty of Natural and Agricultural Sciences has been monitoring the flight patterns of different aphid species and researched their efficiency in transmitting viruses that threaten the South African seed potato industry. This research ultimately aims to provide an early warning system for potato growers who are at risk of yield losses and, consequently, huge financial losses resulting from plant viruses transmitted by aphids. This early warning system, which emulates systems used in Europe, relies on the use of a nation-wide network of suction traps that sample flying or wind-borne aphids.

Of the 4 700 aphid species known world-wide, 50 are vectors of PVY and at least 13 are vectors of PLRV. While aphid species vary in their efficiency of transmitting PVY. For example, in South Africa, Prof Krüger and her colleagues have already discovered 21 aphid species that can transmit PVY and 11 that can transmit PLRV. For this reason, it is important to have reliable species identification and estimates of aphid numbers, as well as to know the transmission efficiency of the different aphid species, in order to predict the risk of transmissions. The mostly asexual reproduction of aphids facilitates rapid increase in their numbers and the associated spread of the viruses.

In order to reliably estimate aphid numbers and the risk of virus spread, Prof Krüger and her research team collect data from the suction traps. The evaluation of the data informs them which aphid species, most capable of vectoring PVY and PLRV, occur in the various potato-growing regions. Growers are notified via the nation-wide network and are thus able to keep track of aphid numbers and vector pressures by receiving weekly SMS notifications and regular news bulletins.

This data provides very important information for the agricultural industry on specific species and the potential threat they pose in specific regions. The data also provides information on the commencement of aphid flight and peak periods, which can be used to time control measures, such as insecticide application. Not every individual of a vector species carries plant viruses. Current research involves improving risk forecasting by determining the number of individuals in a given vector species population thatcarry viruses.

The national aphid-monitoring suction trap network comprises thirteen 12,2 m Rothamsted-type suction traps situated in the major seed potato and wheat growing regions of South Africa. The height of the traps was determined in experiments carried out by the Rothamsted Experimental Station in the United Kingdom. At this height, samples provide a standardised collection of migrating winged aphids. 'They operate at a standardised air volume per hour, and the aphids caught therefore provide standardised counts, allowing for comparison, not only between species, but also of samples from different traps,' Prof Krüger explains. These traps can provide a representation of aphids in an 80 km radius. She says it is also planned to extend the use of existing traps to monitor vectors of medical and veterinary importance, such as mosquitoes.

UP's findings have identified the aphid species that are able to cause catastrophic effects. This study is also the first of its kind in South Africa to generate data on transmission efficiency for South African aphid biotypes (aphids that share a genotype).

The national aphid monitoring programme coordinated by Prof Krüger's research group forms part of a joint initiative by Potatoes South Africa, the University of Pretoria, the Department of Agriculture ( Western Cape), KwaZulu-Natal Department of Agriculture, the Agricultural Research Council (ARC) – Small Grain Institute, the Winter Cereal Trust, the ARC – Plant Protection Research Institute, and regional laboratories of Potato Laboratory Services. This research is the first in South Africa to monitor aphid movements using a nation-wide network of suction traps.

Prof Krüger's research on aphids is now also looking at aphids as indicators of climate change. Aphids react quickly to changes in climatic conditions due to their short generation time and the large number of offspring they produce. Aphid suction trap data is therefore ideal for determining the effect of changes in climatic conditions on aphid abundance and make an important contribution to our understanding thereof.

# Hot birds provide information about climate change

*Prof Andrew McKechnie*

Research

Deserts rarely conjure up images of flourishing life. They are, however, home to several species of birds that, because of their habitat, provide researchers with a unique opportunity to study the links between survival, breeding success and temperature. Researchers are learning more about the effects of climate change from these desert birds and their findings are very concerning.

While the desert is a challenging environment at the best of times, the increasing number of heat waves in these regions is placing huge pressure on endemic bird populations. Increased temperatures present birds with significant physiological challenges, making it more difficult to balance their intake and consumption of energy and water. Rising temperatures also put strain on breeding processes. Prof Andrew McKechnie of the Department of Zoology and Entomology is a physiologist who is studying the potential of desert birds to predict the effects of climate change.

Prof McKechnie and his postgraduate students work in close collaboration with Dr Susie Cunningham from the University of Cape Town's Percy FitzPatrick Institute of African Ornithology. The Hot Birds Programme, as it is suitably named, conducts research primarily in the Kalahari Desert, which covers an area of 900 000 square kilometres in Botswana, Namibia and South Africa. The programme includes a number of research areas, such as the ability of different desert birds to handle increasing maximum temperatures and more frequent heat waves. Deserts around the globe are showing an increase in the number of hot days they experience per year – in parts of Australia, for instance, the number of days per year with temperatures exceeding 40˚C has doubled since the 1960s. Also in Australia, incidents of hundreds to thousands of birds dropping dead on a single day during an extreme heat wave are becoming more frequent.

His research over the past few years has studied desert birds in North America, Australia and the Kalahari, using a standardised approach to quantify the heat tolerance limits of birds. Placing birds in metabolic chambers in order to measure their physiological capacity to keep cool may sound drastic, but this is precisely the type of data that is essential in order to understand if and to what extent, birds are able to handle such extreme heat waves.

Evaluating the temperature-dependency of physiological and behavioural responses in wild birds enables Prof McKechnie to better predict how and when birds might experience dehydration or heat

stress during extremely hot weather events. He is using the white-browed sparrow-weaver as a model species to better understand the differences in sensitivity among populations when it comes to extreme heat conditions. 'This kind of data,' Prof McKechnie says, 'enables you to come up with fairly convincing predictions of what climate change means.'

*The white-browed sparrow-weaver, a widespread southern African bird species that has become the focal species for research into the effects of rising temperatures on arid-zone birds (Photo: Adam Riley)*

*Kalahari Desert*

Research

He will soon be able to take this valuable research further with the opening of a state-of-the-art temperature-controlled facility at UP's experimental farm. The University has invested millions of rands into the commissioning of this facility in the interest of furthering research around climate change.

As many of the devastating effects of climate change will only be realised in the decades to come, the international research community still has many questions which this facility will provide the capacity to answer. Prof McKechnie says the facility will be able to simulate heat waves and allow researchers to test the ability of birds to acclimatise to different thermal conditions. One of its projects will involve breeding birds in captivity at different temperatures, in order to determine the effects of temperature on reproduction and other important processes. While the burning question of whether birds can adapt to temperatures higher than those they currently experience, remains unanswered, he is hopeful that with this new facility, he will be able to find the answer.

In conclusion, Prof McKechnie emphasised the importance of this research area: 'Birds are much more important than people realise. The ecosystem services they provide, from pollination to pest control, are significant. When we lose birds in these ecosystems, we are going to have a lot of problems.'

*Dead budgerigars during an extreme heatwave in Western Australia, January 2009. Photo: Northern Guardian.*

# Rabies can be prevented


*Prof Louis Nel*

Research

It is a modern day tragedy that the ancient scourge of rabies – entirely preventable with today's vaccines – continues to cause unspeakable suffering in Africa for no other reason than a lack of awareness.

World Rabies Day, which is annually celebrated on 28 September, raises awareness about the impact of rabies in humans and animals, how easy it is to prevent it, and how to eliminate the main sources globally.

Prof Louis Nel from the Department of Microbiology and Plant Pathology leads the Global Alliance for Rabies Control (GARC) (http://rabiesalliance.org/). On the African continent he, together with a small global GARC team and three UP PhD candidates (Terence Scott, Andre Coetzer and Nicolette Wright), were instrumental in the creation of a Pan-African Rabies Control Network (PARACON) (https://paracon.rabiesalliance.org/). The team supports African countries in PARACON with valuable information and knowledge to facilitate national programmes for the control and eventual elimination of canine (dog) rabies.

To mark World Rabies Day, UP students led by Scott, Coetzer and Wright visited schools in high-risk areas to educate children about rabies, how to prevent it, and what to do if they are exposed to rabies. The team is keen to work with schools in particular, because the majority of rabies-related deaths in humans occur in children under the age of 15 years.

GARC has been instrumental in the development of various educational materials aimed at educating communities and professionals on the risks of rabies and how to prevent being bitten by dogs. 'We encourage all people around the world to be more aware of rabies and the effects that it has on our communities. By being aware of the disease, vaccinating your animals (especially dogs and cats) and by preventing dog bites, we will be able to control and eliminate this disease and relieve the huge burden that it places on people around the world,' says Terence Scott.

Every year, almost 60 000 human deaths occur worldwide owing to canine rabies, which translates to one death and three hundred incidents of exposure every nine minutes. Almost all human fatalities occur in developing countries with 60 per cent occurring in Asia and 37 per cent in Africa.

Schools interested in hosting a WRD event can visit the GARC website at https://rabiesalliance.org/world-rabies-day/ for more ideas and resources to help plan and register an event.

If you want to become more knowledgeable about rabies and to share this life-saving information with others, you are welcome to enrol and participate in GARC's free Rabies Educator Certificate (REC) course (available at https://education.rabiesalliance.org). This online course targets any person interested in saving lives, and requires no previous experience or knowledge of rabies.

# It is possible to reduce all forms of malnutrition by 2030, says report

Lawrence Haddad, a Senior Research Fellow in the International Food Policy Research Institute's (IFPRI) Poverty Health and Nutrition Division had the rare opportunity to share a global nutrition report, hot off the press, with an eager-to-engage multi-sectoral audience when he presented an overview of the Global Nutrition Report in Johannesburg in October 2015.

The event, which was part of the National Research Foundation (NRF) Centre of Excellence's World Food Day programme, was organised by Prof Sheryl Hendriks and Prof Julian May, Directors of the Department for Science and Technology (DST) and the NRF Centre of Excellence in Food Security, and co-hosted by the universities of Pretoria (UP) and the University of the Western Cape. Prof Hendriks is also the Director of UP's Institute for Food, Nutrition and Well-being (IFNuW).

The venue was an excellent choice for the event as iNdaba is the isiXhosa word for an important meeting at which matters affecting the community are discussed. The event was attended by more than 100 South Africans representing many government departments, the academic community, civil society, the private sector and the media. The thought-provoking facts that were presented, the lively panel discussion and the engaging question-and-answer session highlighted the need for innovative thinking on how South Africa can progress with the reduction of the prevalence of malnutrition.

The timing of the discussion was perfect as it followed on the announcement of the Sustainable Development Goals, while South Africa is still grappling with how we will deliver on the targets set by the Malabo Declaration of 2014. South Africa's malnutrition statistics



*Prof Sheryl Hendriks, Director of UP's Institute for Food, Nutrition and Well-being (IFNuW) and Co-director of the (DST) and the NRF Centre of Excellence in Food Security, which is co-hosted by UP and the University of the Western Cape.*

are contrary to the expectation for a developed country that is nationally food secure. Despite gains made in reducing poverty since the election of a democratic government in 1994, and halving self-reported hunger through broad coverage with social grants, a plethora of nutrition interventions and over 70 food-security-oriented government programmes, South Africa's stunting rates are no better than those in many other African countries, and far greater than those in countries with similar gross national incomes. One in every four children is potentially severely disadvantaged for life as a consequence of under-nutrition. At the same time, South Africa still has a high prevalence of hidden hunger due to micro-nutrient deficiencies, and a further nutritional problem due to the fact that more than 60 per cent of women are overweight or obese.

Ms Yvonne Chaka, well-known singer and UNICEF Goodwill Ambassador, was a member of the panel, which also included government representatives from the agricultural, social development, health, rural development and land reform sectors. Each panellist was requested by the panel chair, Prof Eric Buch (Dean of the Faculty of Health Sciences at UP), to explain what their sector is doing to address South Africa's nutrition problems.

The report's 'six Cs' (commitment, coverage, coherence, community, cost, cash) found fertile ground among the South African government and nutrition community, encouraging them to review current interventions and policies with a view to creating more coherent strategies with greater impact on changing the rates of stunting and combating the increasing problem of over-weight.

The report helped raise levels of commitment by providing examples of how other countries have succeeded. While transformative service-delivery targets in other sectors, such as housing, sanitation and electrification, hold government accountable and have shown what the country is able to do to change the lives of the poor, we are not regularly and publicly monitoring programme coverage and need to do much more in this respect.

Policy coherence is certainly on the radar with the country's rolling reviews of various programmes and government's resolve to drive coherence in respect of key areas of growth and development.

One of the 'Cs' put forward by the participants during the lively discussion session was the importance of building the capacity to conduct such reviews of policies and programmes to develop coherence in both policy and delivery. Capacity is desperately needed in more comprehensive delivery and accountability systems at all levels – starting with the community. In particular, South Africa was unable to report on 22 indicators relevant to food security and nutrition, which shows that we need to invest more in data to be able to monitor progress and evaluate the cost and impact of programmes.

Whether the country needs to invest more cash in more nutrition programmes is not very clear. We are doing a great deal through population-wide programmes, such as compulsory fortification of staple foods and targeted programmes for specific groups in the population, but making these more nutrition focused and helping other sectors to deliver more nutrition-centred programmes must be a priority. Another poignant 'C' rose from the floor was communication – something we do not use creatively enough to encourage behaviour change, share national strategy and report on progress.

# Ancient giants reveal the realities of climate change

*The giant baobab*

When a giant baobab toppled over in the Pafuri area in the northernmost part of the Kruger National Park a number of years ago, researchers from the University of Pretoria (UP) had a hunch that the fallen giant could give them access to a wealth of information about the past. The team seized the opportunity and travelled to Kruger to collect samples.

The hunch turned out to be very plausible and their initial study soon developed into a broader project with SANParks. This research project has now evolved into an international collaborative study that covers Southern Africa and Madagascar.

The objective of the study is to determine the effects of climate change over the whole of southern Africa over the past 1 000 years by using trees to reconstruct rainfall patterns. Leading researcher, Prof Stephan Woodborne from UP's Mammal Research Institute (MRI), says, 'We are in the process of producing a mega map of rainfall and drought, and it is going to be a really magnificent climate record once this project is completed.' The study is providing valuable insight into both the natural and anthropogenic effects of climate change which, according to Prof Woodborne, is a very real issue.

The study aims to determine the extent of change in areas with varying rainfall. Baobab trees, which are found predominantly in summer rainfall areas, are excellent study models as they can live for more than 1 000 years. In winter rainfall areas, the study looks at trees such as the yellow wood, while camel thorn trees provide similar information about desert areas.

Information is retrieved from these trees by applying a method known as coring, which does not require the trees to be cut down. Coring involves the study of tree rings to determine the age and growth rate of a tree. Samples are taken to the MRI's Isotope Laboratory where isotopic analysis of the samples' properties and the age of the tree is undertaken to reconstruct rainfall patterns.

Dr Grant Hall of the Isotope Laboratory explains that isotopes are elements that are chemically the same, but differ in respect of their atomic weights. Dr Hall and his team analyse the cored parts of the trees to determine which carbon isotopes are absorbed by the leaves and the ratios between the different isotopes that are present. The chemistry of the wood reflects the growing conditions and the periods during which growth occurred (rainfall periods), as well as the periods during which the trees were under water stress (drought periods). As a tree grows, new rings are formed on the outside of trunks or branches year after year, and the chemistry of each ring gives insight in the climate changes in the area where the tree is located.

As the study develops, Prof Woodborne and Dr Hall are making some very important discoveries, which have enabled them, for example, to develop an age model for baobabs. Giant baobabs are often mistakenly believed to be just one big tree, while in fact they often consist of multiple trunks that have fused together. This explains why only some trees have hollows in their trunks.

The study has also provided insight in how communities have adapted culturally in response to the significant climate changes that have occurred over the years. Areas such as the Limpopo valley, where livestock farming and agriculture once thrived, are now desolate as they have become too dry for such activities.

The sites on which the study is conducted cover a vast area stretching from Angola to Madagascar and the southern Cape. The team hopes to get more postgraduate students on board, but according to Prof Woodborne and Dr Hall the data have already revealed that the effects of climate change are real and, more often than not, devastating. Information gained from the different baobab sites to date confirms the major climate shifts in southern Africa with, for example, the expansion of the Kalahari eastward to areas that were once characteristically summer rainfall areas. The study of the giant baobabs have put an end to the debate on whether climate change is real or not and has confirmed the very serious effects of climate change and greenhouse gases.

The following are some of the papers based on this research:


- Huffman, TN & Woodborne, S. 2015. Archaeology, baobabs and drought: cultural proxies and environmental data from the Mapungubwe landscape. *The Holocene. DOI*: 10.1177/0959683615609753.\
- Patrut, A, Woodborne, S, Patrut, RT, Hall, G, Rakosy, L, Von Reden, KF, Lowy, D & Margineanu, D. 2015. Radiocarbon dating of African baobabs with two false cavities. The investigation of Luna tree. *Studia Univ. Babes-Bolyai Ser. Chem*., 60(4):7–19.
- Patrut, A, Woodborne, S, Von Reden, KF, Hall, G, Hofmeyr, M, Lowy, DA & Patrut, RT. 2015. African baobabs with false inner cavities: The radiocarbon investigation of the Lebombo Eco Trail baobab. *PLoS ONE*, 10(1), e0117193. doi:10.1371/journal.pone.0117193.
- Woodborne, S, Hall, G, Robertson, I, Patrut, A, Rouault, M, Loader, NJ & Hofmeyr, M. 2015. A 1 000-year carbon isotope rainfall proxy record from South African baobab trees (*Adansonia digitata L*). *PLoS ONE*. 10.1371/journal.pone.0124202.

# Chemists develop cheap and disposable sampler for environmental analyses

Two chemists, Dr Yvette Naudé and Prof Egmont Rohwer from the Department of Chemistry developed a cheap, disposable sampler to collect pollutants from surface water over time (passive sampling). Water samples are generally collected in bulky, fragile glass containers which require large storage space. Opposed to this, the small in-house developed sampler is rugged, easily transportable and requires the minimum storage space.

According to Dr Naudé, the disposable sampler consists of a small section of silicone rubber tubing fashioned into a loop by joining the ends with a short glass capillary. This prevents water from entering the sampler, allowing only organic compounds to diffuse into and accumulate in the hydrophobic silicone rubber. She explains that "a bundle of loops is placed inside a stainless steel mesh mini-basket. The basket housing the samplers is submerged in a water body and left for days or weeks to accumulate chemicals. The sampler is 'green' in that it does not require costly and hazardous solvents for extraction of the accumulated pollutants prior to analyses. Instead, after passive sampling, the loops are removed from the basket and desorbed directly in an inlet of a gas chromatograph (GC) – no need for expensive thermal desorbers or liquid nitrogen for cryo-focusing of analytes. Due to the fact that the sampler is disposable, potential contamination is eliminated."

She also said: "Commercial samplers are not manufactured locally, but are imported and are therefore expensive. The in-house made mini-sampler is inexpensive, easy to make and easy to use. The sampler costs R60 in total – R7 per silicone rubber loop (five loops are used) and R25 for the stainless steel mesh mini-basket."

Dr Naudé also mentioned that the sampler was initially tested in the Hartbeesspruit at the LC de Villiers Sports Grounds at the University of Pretoria. "The sampler was left for three days to collect pollutants. Pesticides, sunscreen agents, personal care products, pharmaceutical drugs, polycyclic aromatic hydrocarbons (present where open fires are common) and food additives were detected in the stream. Passive sampling of the Moreletaspruit (sampled over three days) and Rietvleispruit (sampled over five weeks) followed."

The mini-sampler is not limited to passive sampling of water bodies, but has multi-purpose applications, for example soil, natural products, food and beverages.

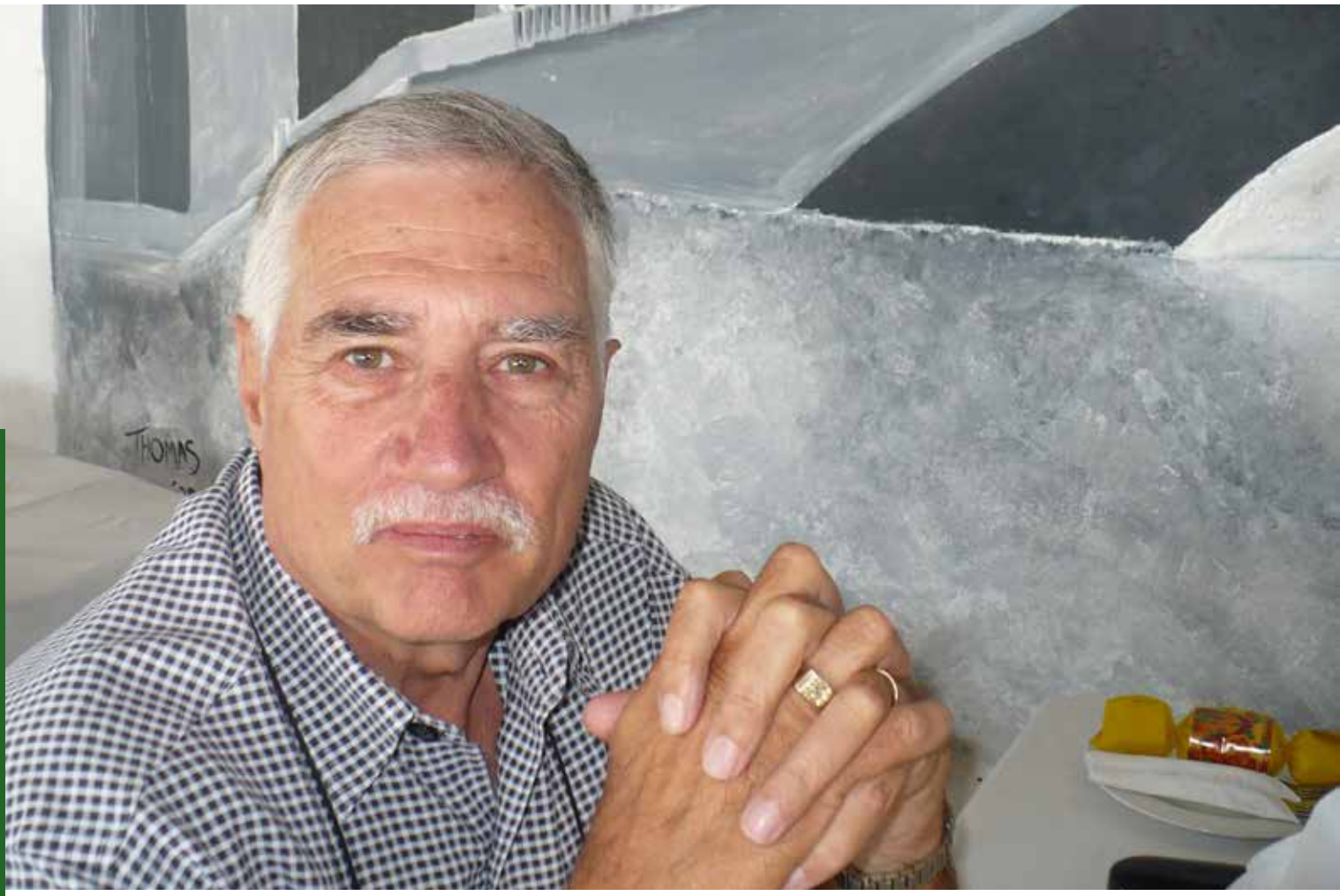
An article on this passive sampler was published in *Water SA* Volume 41 Number 2 WISA (Water Institute of Southern Africa) Special Edition 2015. The title of the article is: *A cheap and simple passive sampler using silicone rubber for the analysis of surface water by gas chromatography–time of flight mass spectrometry*, written by Yvette Naudé, Peter Gorst-Allman and Egmont Rohwer.

*The low cost sampler collecting pollutants in the Hartbeesspruit*

*Dr Yvette Naudé testing the in-house developed, inexpensive and disposable water sampler at the LC De Villiers Sports Grounds*

# Agricultural Extension recognised as a Science and a Profession





*Dr Fanie Terblanche*

The field of Extension Science has recently been brought into the fold of accepted fields of Natural Sciences, and it is now a legal requirement for Agricultural Extensionists and Advisors to register with the South African Council for Natural Scientific Professions (SACNASP). Dr Fanie Terblanche of the Department of Agricultural Economics, Extension and Rural Development was instrumental in this process.

According to Dr Terblanche there are many qualified Extension Scientists assisting farmers and providing them with the information needed to produce the most fruitful yields year in and year out. What most people do not know is that Extension Scientists utilise a scientific methodology to advice farmers, amongst other things, of the correct soil type, climate and crop that will be needed each season.

In 2012 the Department of Agriculture, Forestry and Fisheries (DAFF) requested the South African Society for Agricultural Extension (SASAE) to undertake a feasibility study for establishing a South African Extension Advisory Board. Dr Terblanche was appointed as project leader and was supported by Dr Baldur Koch, a retired extension specialist who is registered with the SACNASP.

The study addressed the advantages and disadvantages of establishing a new professional council under the auspices of the DAFF, or pursuing registration under the SACNASP, as well as the best practice with regard to establishing and managing a professional council. It also investigated the different levels of professional registration, specific qualifications required for registration at each level, ways of providing recognition for prior learning and experience and essential elements of continuous professional development (CPD) and mentorship.

Dr Terblanche emphasises that the registration of Extension Scientists by the SACNASP is a new and positive step for the Natural Sciences landscape in South Africa, and offers professional recognition and support by the SACNASP.

The process of professional registration of Extensionists and Advisors started in July 2014 and at the end of July 2015, a total of 2 779 applications have been received by the SACNASP.

Dr Fanie Terblanche has also been appointed as a council member of the SACNASP. He is also a member of two committees at the SACNASP namely, the Professional Advisory Committee for Agricultural Sciences and the Professional Advisory Committee for Extension Sciences. He was also appointed as an evaluator for the Critical Skills Committee at the SACNASP.

# The ethics of meat production



*Prof Edward Webb*

People from all over the world are increasingly concerned about the quality of the animal products they consume. However, with the rapidly increasing global human population and the impact of farming on the environment, it is becoming more difficult to maintain a balance between supply and demand. In any form of mass production involving animals, ethics will inevitably come into play.

The question thus arises: How can we deliver more animal produce while complying with the demand for wholesome food of a high quality?

Another consideration is the huge impact that farming has on the environment. It is claimed that livestock production is one of the major contributors to global environmental problems.

Prof Edward Webb, a world renowned animal scientist and Head of the Department of Animal and Wildlife Sciences at the University of Pretoria (UP), has conducted years of intensive research in animal science to find acceptable ways of improving farming methods in order to enhance the well-being of animals, which, in turn, will result in better quality animal produce. Prof Webb also took care to develop methods that will not only improve the efficiency of meat production, but will also reduce its environmental impact to the greatest practicable extent.

As an animal scientist, Webb deems it important to educate members of the public about animal production so that they are more informed about what their demands and choices mean in terms of the animal production industry, the animals themselves and the environment. Often, unbeknown to them, consumers contradict themselves in what they think they want – based on their so-called moral or ethical position – and what they choose in a product. Eighty per cent of animal produce that end up on our dinner plates, for example, have gone through a feedlot system. Many people disapprove of the feedlot system, associating it with a factory-like production line. Such perceptions and positions are, however, often unfounded and not based on scientific facts, but rather stem from sensationalist media reports.

Another problem with the public's perception of feedlot systems is that people apply human emotions to the animals' situations. Animals mostly react very differently to situations that humans typically experience as stressful. Prof Webb and his postgraduate students have conducted several experiments on different livestock to determine stress levels. When these experiments are quantified, the results are very different from what is perceived, based on human emotions.

Prof Webb hopes to get rid of some of these misconceptions and increase awareness of South Africa's excellent farming standards. Intensive farming (also referred to as factory farming) in South Africa differs significantly from intensive farming in, for example, the USA in that South Africa is a leader in considering farmed animals' well-being. Although the public may never be in favour of intensive farming, the fact is that in order for an animal product to meet consumers' expectations, the animals have to go through the feedlot system. In South Africa, newly implemented systems in preparing animals for the feedlot system are proving beneficial to the overall well-being of the animals, while enabling consumer demands to be met.

Leaders in livestock production in South Africa started pre-conditioning animals while they are grazing in the field, transitioning them from the grass feeding system (extensive) to the feedlot system (intensive). This affords animals a period of comfortable adaptation, as opposed to having to endure a stark transition. When the time comes for the animal to move into the feedlot, it is well adapted and adjusted to the diet and environment. This is a wholesome system, says Prof Webb, who has tested its benefits.

Over the years, Prof Webb has tested a number of different farming methods. He is adamant that most of the major livestock producing farms in South Africa are utilising methods, rooted in science, that not only consider animals' well-being, but also reduce environmental impact.

Even though the area of livestock production will probably always be somewhat controversial, Webb remains passionate about it because of his love for animals. His passion and expertise are attested to by the number of international and local conferences to which he is invited, as well as the chapters he is requested to write for leading textbooks on animal science. Prof Webb serves as an advisor to the Institute for Food, Nutrition and Well-being at UP.

# Finding answers to herbicide resistance

Research

Agriculture has been an integral part of human life since the earliest times. When our nomadic ancestors began to settle down and grow their own food, human society changed forever. Throughout history, humans have had a very intimate relationship with the land and no matter how sophisticated civilizations became, they could not deny their dependence on agriculture for their continued expansion and survival. Despite the fact that many of us firmly believe that a good meal is just a trip to the supermarket away, our dependence on agriculture for survival remains a reality and access to advanced biotechnology in the agricultural sector, especially in developing countries like South Africa, has become crucial for boosting agricultural productivity so as to ensure continued food security.

It is estimated that in the next three to four decades food production will have to be doubled in order to keep pace with burgeoning human populations – the global human population is projected to increase from the present six billion to more than nine billion by 2050. This has led to an important movement in agricultural research towards molecular aspects of plant growth and development, and although the use of genetically modified (GM) crops is controversial, its role in ensuring food security for the world's growing population is a reality.

The Monsanto/BE at UP Collaborative Research Programme is a joint research initiative between the University of Pretoria (UP) and Monsanto South Africa. Monsanto is a multinational agrochemical and agricultural biotechnology company and a leading producer of genetically engineered (GE) seed, as well as of the herbicide glyphosate, which it markets under the Roundup® brand. The collaborative programme was initiated in September 2012 for an initial three-year period and is based in the Department of Plant Production and Soil Science at UP. The research programme is led by Prof Carl Reinhardt (better known as Prof Charlie); the academics in charge of projects in the programme are Dr Juan Vorster and Prof Hannes Robbertse.

Plant genetic engineering methods have been refined almost to an art form over the last 30 years, and GM crops have been widely adopted across the globe. According to TerrAfrica (a NEPAD-led partnership with representation in 24 African countries that support innovative solutions to sustain landscapes, address land and water degradation and adapt to the changing climate), GM crops may increase land productivity in Africa where 49% of soil is heavily degraded, as these crops could be engineered to endure harsher conditions and be less susceptible to climate changes such as drought, which is a leading cause of food insecurity in Africa.

Genetically modifying a plant involves inserting one or more genes into its natural genetic coding in order to add desirable traits such as resistance to a particular disease or substance. The genes that are inserted may come from the same type of plant, from a completely different plant species, or even from a totally unrelated organism, making it possible to add attributes that would otherwise have been impossible. Effectively, GM crop biotechnology has reduced the time it would take to improve a crop to only a few years, from the thousands of years it took when wild plants were first cultivated some 10 000 years ago, and from the decades required in modern-day classical plant breeding methods.

GM crops have many improved traits that make them attractive to commercial farmers and governments alike. Herbicide-resistant cotton, soybeans and maize, for example, have been extensively farmed all over the world for years, and can be 'weeded' with herbicides that are more effective, less toxic and cheaper than the alternatives. In South Africa, specifically, approximately 85% of maize, 100% of cotton and 92% of soybeans currently grown are transgenic varieties that are tolerant to the herbicide glyphosate. Glyphosate is a broad-spectrum systemic herbicide that is commonly used to kill weeds, especially annual broadleaf weeds and grasses known to compete with commercial crops.

Glyphosate-tolerant crop technology has been effective in controlling a broad spectrum of weeds without risk to transgenic crops and South African farmers have used it continuously since it was first introduced in 1976. Unfortunately, as is the case with most human inventions aimed at manipulating nature, problem situations related to glyphosate-resistant weeds cropped up soon after the first introduction of Roundup Ready® crops in 1996. It is important to note though that these problems were not linked to Roundup Ready® crops specifically, but rather to the high frequency use of glyphosate in orchards and vineyards in the intervening years since the herbicide was first introduced in 1976. About five years after the release of Roundup Ready® crops in the United States (US), weed resistance to glyphosate was observed for the weeds *Amaranthus tuberculatus* (waterhemp) and *Conyza canadensis* (Canadian horseweed). Today, 32 weed species in several countries in both the southern and northern hemispheres have proven resistance to glyphosate and it is expected that the number of resistant species will increase as glyphosate use increases in current and future glyphosate-tolerant crops. It is known that herbicide resistance in weeds is a technical problem that can be managed and even neutralised through sound weed resistance management strategies that incorporate best practices.

The research component of the collaborative programme at UP aims to monitor whether glyphosate-resistance in weeds is developing and to assess the plant mechanisms involved. The emphasis is on factors affecting weed resistance, as well as ways to overcome it and avoid it from taking hold. The programme also considers opportunities for amending current research protocols that apply to weed resistance research, suggesting what kind of amendments are likely to improve research techniques and make research findings applicable to practical situations.

An important downstream facet of the programme is the dissemination of research findings in both scientific and popular media, with the ultimate aim of providing facts and a perspective on the issues pertaining to GM crops, weed resistance to glyphosate,

as well as the associated best agricultural practices. By following both a research and an advocacy approach, the programme aims to inform global efforts to manage herbicide resistance effectively and to contribute knowledge that can increase farmers' profit margins and secure rural livelihoods, especially in developing countries on the African continent.

The weed *Conyza bonariensis*, commonly known as hairy fleabane, has been chosen as the first of many weeds to be included in investigative research on glyphosate-resistant weeds. In South Africa, three species, (*C. bonariensis*, *C. canadensis* (Canadian horseweed), and *C. sumatrensis* (tall fleabane), are well-known weeds that were first noticed about a century ago, with infestations of one or more species occurring in every province. To date, only three weeds have evolved resistance to glyphosate in South Africa, namely *C. bonariensis*, *Plantago lanceolata* and *Lolium* sp, and no confirmed cases of resistance to glyphosate have been found in areas of the country (i.e. the summer rainfall region) where genetically modified crops are planted. Although these three glyphosate-resistant cases are restricted to the Western Cape region, all three species are common in other parts of South Africa. Of the 32 weed species for which glyphosate resistance have been proven worldwide, 20 species also occur in South Africa, which means we have to be vigilant.

More than 20 populations from the Western Cape and 8 from South Africa's summer rainfall region were sampled by Prof Charlie and his research team in 2012 and 2013. These populations are now used in experiments by students in the Monsanto/BE at UP Collaborative Research Programme on various topics surrounding the resistance of *Conyza bonariensis* to glyphosate, under the supervision of Prof Charlie, Dr Juan Vorster and Prof Hannes Robbertse.



# Genetics confirms the chastity of Afrikaner women

Afrikaner women have been faithful to their to their husbands for the past 330 years. This was revealed in a genetic study in which 23 general surnames of Afrikaners who have been residing in the country for the past 330 years, were investigated.

Prof Jaco Greeff, a geneticist at the University of Pretoria, and a doctoral student, Christoff Erasmus, conducted this research, of which the results were recently published in the journal, *Heredity*.

A male's Y-chromosome is transmitted to his son unchanged (but not to his daughter) as is the case with the surname. Therefore, if a son is his father's biological child, the genetic markers of descent on this chromosome will be similar to that of his father. This can also be traced back in time.

"By comparing the variation on the Y-chromosome with the surnames, we could determine how chaste our ancestors were – in this case our mothers," Prof Greeff said.

A total of 1 273 births were perused, and the fathership was tested, by investigating the Y-chromosome of the past 330 years. The study was conducted on 23 well-known Afrikaans surnames.

These ancestors originally were from Germany (eight surnames were tested), France (five surnames were tested), Holland (nine surnames were tested) and one was from Scandinavia.

The results were unexpected. In only 11 out of the 1 273 the father was not the biological parent of the son. "Of course there were small differences due to mutations. This means that in less than 1% (0,9%) of the cases, the mother cheated on her husband by conceiving a child from someone else. This is very low for an era in which there were no contraceptives," Prof Greeff added.

The families who were tested, voluntarily provided DNS-samples. The criteria were that the families had roots stretching a long way back and that there had to be living male descendants.

Prof Greeff said that it is possible that the men might have had more than on sex partner, but this was not the case with married women.

**Acknowledgement: Network24**

*Prof Jaco Greeff*

Research

*Prof Hettie Schönfeldt*

**Prof Hettie Schönfeldt is an extraordinary professor and project leader at the University of Pretoria and also involved with the DST/NRF Centre of Excellence in Food Security.*

# Healthy diet remains unaffordable for most South Africans

The food system impacts on the ability of consumers to choose healthy diets. As Archbishop Desmond Tutu said "Hunger is not a natural phenomenon. It is a manmade tragedy."

Despite marginalised consumers (LSM 1-4) spending up to 35% of their budget on food, a healthy diet remains unaffordable for these consumers. This has prompted researchers at the DST/NRF Centre of Excellence in Food Security (CoE-FS) to investigate affordable and accessible food items that are culturally acceptable to all to include in food baskets.

According to *Prof Hettie Schönfeldt and Dr Beulah Pretorius "the affordability of food has an influence on what we eat and how much of it we eat."

Together with a team of researchers from four other universities (including the University of Pretoria) and those from the Bureau for Food and Agricultural Policy, CoE-FS, project leader, Prof Hettie Schönfeldt is assessing available data to identify healthy and popular foods, as well as recommended serving sizes for amounts of energy and key nutrients necessary to meet the body's nutritional needs and prevent disease. This data will then be used as background information to compile a list of foods to include in the 'National Nutritious Food Baskets'.

National Nutritious Food Baskets will consider the quantity and cost of foods that represent a nutritious diet for individuals in various age, gender, socio-economic and cultural sub-groups. The study will support an enabling environment, cultivate a healthy food system and better governance by analysing the economic impacts of attaining a healthy diet for South Africans.

"The challenge is to improve nutrition and food system governance to ensure more nutrition and health-enhancing systems, and to achieve political and policy coherence and co-ordination across all sectors," says Prof Schönfeldt. In assition, it is important to consider how culture influences the choices people make regarding food. Thus, the National Nutritious Food Basket project will consider this factor in order to encourage healthier versions of popular foods.

Findings from this study can also be used by stakeholders at various levels of government to monitor the cost and affordability of healthy eating, and thus offer support to national government financing programmes such as social grants, which provide access to food for the poor and the marginalised.

# Effect of different feeding on nutrient content of SA beef

Notable differences were found between South African beef as produced on grass and grain based feeding systems, and distinct differences between local and international produce were reported. Grain-fed South African beef is lower in total fat, while grass-fed beef contain more heart-healthy conjugated linoleic acids (CLA).

These were some of the findings of Dr Nicolette Hall who received her received her PhD in Nutrition in the Department of Animal and Wildlife Sciences earlier this year. She focused on the sustainable consumption of South African red meat, under the supervision of Prof Hettie Schönfeldt.

As part of her thesis, Nicolette evaluated the effect of animal age, feeding regime (grass and grain), and the effect of fat trimming on the nutritional quality of the meat that reaches the consumer.

The South African policy landscape promotes and supports the sustainable production of livestock. Numerous research projects are exploring ways to mitigate greenhouse gas emissions by livestock to improve the environmental impact of the industry. However, as the concerns of sustainable development include health, economic and social aspects in addition to environmental concerns, the data and arguments generated through her research could be used as tools when nutritional concerns in particular are voiced.

The data obtained reflects the impact of South Africa's unique classification and production systems on the composition of locally produced red meat. Noteworthy differences were found in our local produce in comparison to international data. Although red meat is often considered a source of fatty acids negatively impacting on human health, many studies have reflected the variability in the quantity and quality of fatty acids found in meat produced on different production systems. Notable differences were found between South Africa beef as produced on grass and grain based feeding systems, and distinct differences between local and international produce were reported. In summary, grain-fed South African beef is lower in total fat, while grass-fed beef contain more heart-healthy conjugated linoleic acids (CLA).

Animal source foods can be considered good sources of high quantity and quality nutrients, including protein, minerals and essential fatty acids. Trimming of the visible subcutaneous and intermuscular fat deposits from the meat showed that this increases the nutritional profile positively. Fat generally dilutes other essential nutrients, while the beneficial fatty acids (omega 3's and CLA) are found in the intramuscular fat deposits between muscle cells which are not removed through trimming.

The research findings have been welcomed by the red meat industry and nutrition fraternity alike, and she has presented these findings at the Association of Dietetics South African Gauteng South Event (June 2015), the South African Association of Food Sciences and Technology Conference in Durban (September 2015), as well as the International Food Database Conference held in Hyderabad, India (November 2015).

Three noteworthy awards have already been received by the candidate on this topic, including a publication award by the *Mail & Guardian* as part of their *Science Voices* supplement in August 2014, an award for the best oral presentation in the nutrition session at the 11th International Conference of the South African Association of Family Ecology and Consumer Science held in Pretoria in March 2013, as well as Overall Best Poster Presentation Award at the 10th International Food database Conference September 2013, Granada, Spain.

*Dr Nicolette Hall*

Research

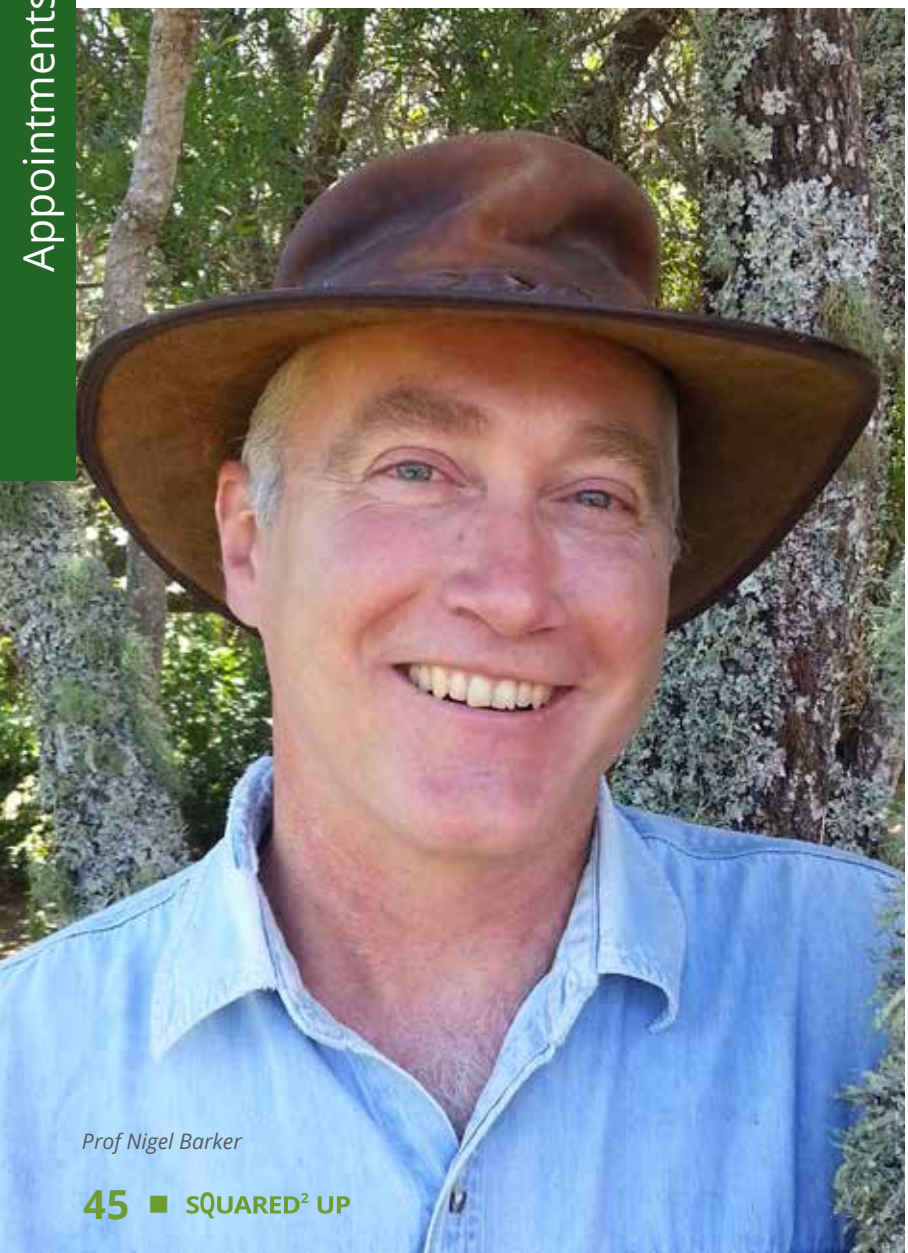
# Prof Barker strives to cure 'plant blindness'

"I would like the new Department of Integrated Plant and Soil Sciences to do its best to cure 'plant blindness!' Plants feed the world, make oxygen, enhance our aesthetic needs, and yet most of us take them for granted – a 'disease' known as 'plant blindness'. This is a topic that has been gaining increased attention." These are the words of the newly appointed Head of the Department of Integrated Plant and Soil Sciences, Prof Nigel Barker.

Prof Barker took up his new position at the University of Pretoria (UP) on 1 October 2015, after being a professor in Botany at Rhodes University. He completed his PhD at the University of Cape Town in 1995 and his research interests lie in plant and animal biodiversity, systematics, phylogeography and biogeography (including floristics and faunistics) and conservation.

"I find the creation of this Department, and the various plant-based disciplines that fall within it, to be a very exciting opportunity to take plant science (in its broadest context) to a new level at a national, continental and even global level. I think it is rare to have a group of researchers that collectively, can study the plant and ecosystem so holistically – from aspects of soils to plant growth, functioning, and ecological interactions (which include diseases)," said Prof Barker.





*Prof Nigel Barker*

He emphasised that the aim would be "to break down the artificial barriers that names (be it departmental, subject or discipline) create, and move forward in a creative and collaborative manner, seeking out new multi-/transdisciplinary research opportunities, and to grow the Department's research profile. From what I have seen and heard to date, UP is very well equipped and there are numerous assets which I would like to see being used and developed in this new venture."

Prof Barker admits that "the challenge currently for me is to get to know the staff and students much better, and to understand the support structures in place at UP that can be used to foster and support their growth and activities. I am also eager to seek out new links and collaborations across other departments on the campus, and to further enhance the image of botany/plant science among all the UP constituencies."

His research productivity is considerable. To date he has published 133 scientific papers in peer-reviewed journals and five book chapters and he holds a rating of C1 from the South African National Research Foundation. He has also been involved in 28 MSc and 17 PhD student research projects, either as supervisor or as co-supervisor. Prof Barker is also an Associate Editor for *TAXON*, the official journal of the International Association of Plant Taxonomists (April 2010 to present) and was a member of the Editorial Advisory Committee of the journal, Australian *Systematic Botany.*

Some of the awards bestowed on him over the years include the Rhodes University Vice-Chancellor's Distinguished Research Award in 2000, recipient of the 1999 FRD President's Award (Foundation for Research and Development, now the National Research Foundation (NRF)) and recipient of a short-term visiting grant from the Royal Society, London for collaborative research with an institution in the UK (University of Reading) during 1997. He also received the Royal Botanical Gardens in Sydney, Research Fellowship for the 1995-1996 and 1996-1997 financial years.

As a renowned botanist, it is also not surprising that Prof Barker has collected over 2 200 plant specimens, the majority of which are housed in the National Herbarium in Pretoria (PRE). The rest are housed in the Bolus Herbarium (BOL) of the University of Cape Town and the Selmar Schonland Herbarium (GRA).

# Final goodbye to Prof Amanda Minnaar

*Prof Amanda Minnaar*

Prof Amanda Minnaar of the Department of Food Science and the Institute for Food, Nutrition and Well-being passed away on 26 September 2015, after losing her battle against cancer.

Prof Minnaar joined the University of Pretoria (UP) in 1986. She made a significant contribution to the University in several capacities, including many years as Head of the Department of Food Science and as permanent member of the Faculty Appointments Selection Committee.

Internationally, she was a respected scientist, author or co-author of a long list of scientific papers in international research journals, research chapters in books and contributor to many conferences and events. Her research focused on the use of modern food processing technologies to improve the quality (nutritional, phytochemical, physicochemical and sensory), safety and shelf life of foods. Her specific areas of research expertise included thermal processing, ionising irradiation, sensory analysis, combination processing and fruit, vegetables and legume processing science and technology.

Prof Minnaar established a valuable research collaboration network as a result of her active involvement as a committee member in various national and international research programmes [e.g. the US Agency for International Development (USAID)-funded Dry Grain Pulse Collaborative Research Support Programs, Africa-Australia Universities Network (AAUN), the International Atomic Energy Agency and the European Union research programme].

In 2011 Prof Minnaar was recognised by the European-South African Science and Technology Advancement Programme (ESASTAP) for her contributions to Capacity Development. For the South African food industry, as President and regional chairman of the South African Association for Food Science and Technology (SAAFoST), her lifelong commitment to her profession was self-evident.

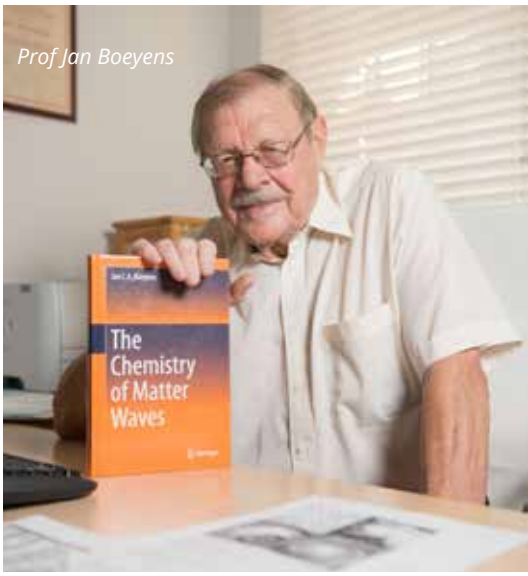
# Renowned chemist passed away

Professor Jan Boeyens, former Head of the Department of Chemistry at the University of Pretoria (UP) and Extraordinary Professor and Senior Research Fellow in the Centre for the Advancement of Scholarship, passed away on 26 August after suffering a heart attack. Prior to his untimely death, he attended the Indaba 8, a conference organised by the South African Crystallographic Society, where the third Jan Boeyens Prize was awarded to a young South African researcher who had made a distinguished contribution to the holistic utilisation of crystallography and other structural methods in the investigation of fundamental problems in nature.

He was born in Wesselsbron in 1934 and obtained his bachelor's and master's degrees at the then University of the Orange Free State (UOFS) and his doctoral degree at UP. He was a postdoctoral fellow at Stanford University in California and the University of Sussex in the United Kingdom. He lectured at UOFS and Unisa before moving to the CSIR and MINTEK. In 1981 he accepted a position at the University of the Witwatersrand where he remained for 18 years, serving as Professor of Theoretical Chemistry, Director of the Centre for Molecular Design, Head of the Chemistry Department (twice) and Dean of the Faculty of Science. He joined UP in 2000 as Professor and Head of the Department of Chemistry for one term, after which he became a Senior Research Fellow in the Centre for the Advancement of Scholarship where he devoted his attention to his research interests.

Prof Boeyens was regarded as an international leader in the field of crystallography, and authored 270 journal articles, six books, as well as numerous chapters in books and conference presentations. He was the recipient of various awards including the South African Chemical Institute Gold Medal, the Ernst Oppenheimer Fellowship, the Havenga Prize of the *SA Akademie vir Wetenskap en Kuns*, the Claude Leon Harris Award and the Alexander von Humboldt Research Prize. He delighted in his engagement with students and was the supervisor of 18 master's and 20 doctoral students all of whom shared his vision of doing interesting and innovative science.

He was widely regarded as one of the most radical and innovative thinkers in his field and believed that 'chemistry is the progeny of alchemy as modified by the theories of modern physics. Even so, it still has not resolved the ancient enigma around the nature and origin of matter'. He was determined to provide answers to this enigma, and made an attempt in his latest book, *The chemistry of matter waves,* published by Springer in 2013, that won the UP Book Prize for the Natural Sciences in 2015. His colleagues, students and friends will sorely miss their engaging and challenging discussions with him. They will also miss his wonderful bonhomie and fondness for red wine.




*Prof Jan Boeyens*

We express our deepest condolences to his family, numerous colleagues all over the world and his friends. Prof Boeyens is survived by his wife Martha, three children and their families.

# CGIS celebrates International Map Year


*Prof Serena Coetzee, Director of CGIS*



The University of Pretoria (UP) celebrated the International Map Year (2015/16) this year in three ways: the Centre for Geo-information Science (CGIS) Map Competition; a map assignment challenge for first-year and third-year students in BSc Geo-informatics and most importantly, the 2015 CGIS Mini-conference.

The 2015 CGIS Mini-conference with the title *Maps in research at UP* aims to showcase the role of maps in research conducted at UP. Postgraduate supervisors from across the University were invited to nominate students under their supervision for a presentation at the mini-conference. We asked for presentations with 'map' or 'mapping' in the title and abstracts describing the role of maps in the research.

A variety of presentations showcases the use of maps in research at UP. Maps are used in research in multiple disciplines. The following examples can be cited: the use of maps in different departments and faculties; maps are used in inter-disciplinary research, such as in cartography and psychology which are combined in research that makes use of eye tracking to study how people read and understand maps. Maps are also used in multi-disciplinary research, where, for example we draw on cartography and geography/plant science in research that aims to spatially analyse / understand natural and human-made phenomena around us.

The presentations included 'traditional' uses of mapping and spatial analysis to help us understand our natural environment; to help us plan for urbanization; and to help us plan for much needed renewable energies. There were also presentations on novel high-tech applications of cartography, such as augmented reality and 3D eye tracking. Finally, the keynote address on forensic mapping is a less frequently heard of application of mapping.

All the presenters were UP students who are supervised in more than one faculty and in various departments. In some cases co-supervisors were from other universities or research councils. At the end of the mini-conference, the winners of the 2015 UP CGIS Map Competition received their prize money and a map atlas donated by Esri.

They also celebrated the International Map Year 2015/6 with an exhibition of maps in the UP library. The exhibition showcased maps produced by students, staff and other organisations. Some interesting map books from the library are on display, such as a population map from 1904.

The International Cartographic Association's (www.icaci.org) International Map Year (IMY) is a worldwide celebration of maps and their unique role in our world. Supported by the United Nations, IMY provides opportunities to demonstrate, follow, and get involved in the art, science and technology of making and using maps and geographic information. The purposes of the International Map Year are as follows:

- Making maps visible to citizens and school children in a global context;
- Demonstrating how maps and atlases can be used in society;
- Showing how information technology can be used in getting geographic information and producing one's own maps;
- Displaying different types of maps and map production;
- Showing the technical development of mapping and atlas production;
- Showing the necessity of a sustainable development of geographic information infrastructures; and
- Increasing the recruitment of students in the cartography and cartography-related disciplines.

# Year of Light celebrated by Sci-Enza

JuniorTukkie and the Sci-Enza Science Centre at the University of Pretoria (UP) recently hosted an exciting art competition to celebrate 2015 as the "International Year of Light", as declared by the United Nations.

This worldwide celebration of light promotes the vital role that light plays in our daily lives – from the first studies of optics 1 000 years ago, to discoveries in optical communications that drive the Internet today. The fundamental level of life on earth starts with light through photosynthesis and the many applications of light have revolutionised society through medicine, communications, entertainment, technology and culture.

The theme of the art competition was "Light is Life", and learners and students were invited to create an artwork in one of five categories, namely science, technology, nature, religion, and art and culture. The winners were announced at a function, during which the "Light is Life" Art Exhibition in celebration of National Science Week and the International Year of Light, was launched.

Hannelie Ros and Aaliya Makada respectively won the nature and the religion categories. Karla Bester won the technology category and Lewis Meiring walked away as the winner of the arts and culture category.

*Lewis Meiring with his winning entry in the arts and culture category. He is currently a UP student.*

*From left: Rudi Horak (Manager: Sci-Enza Science Centre), Aaliya Makada, Lewis Meiring, Karla Bester, Hannelie Ras and Mr Bersan Lesch (Department of Science and Technology)*

# PhD student at leading conference for Polar microbiologists

Marc Van Goethem, a PhD student, working under the co-supervision of Dr Thulani Makhalanyane and Prof Don Cowan from the Centre for Microbial Ecology and Genomics (CMEG), presented his work titled "Microbial communities of Antarctic soil and lithic habitats" at the 6th Conference on Polar and Alpine Microbiology 2015 in České Budějovice, the Czech Republic.

The conference, hosted by the University of South Bohemia, showcased leading research in the field of Polar Microbiology, which forms a major research theme at CMEG in the Department of Genetics. Marc was one of the five students accepted to give an oral presentation; his first at an international conference.

In his presentation Marc provided evidence, showing significant differences between bacterial communities that inhabit ice-free habitats in the Antarctic Dry Valleys. He also described differing assembly processes between rock- and soil-based microbial communities through the application of innovative molecular techniques.

Marc's current research on Antarctic soils involves exploring the relationship between phylogenetic and functional diversity along the Mackay Glacier 'ecotone'. This work aims to understand if changes to Antarctic microbial biodiversity will have impacts on ecosystem services. Addressing this knowledge gap is important in order to better understand the role of Antarctic communities in regional processes, particularly as climate-related changes and how human activities will impact these delicate ecosystems in the foreseeable future.

*Marc Van Goethem*

# Bringing the BIOMATH network experience to South Africa

The South African Research Chair Initiative (SARChI) Chair in Mathematical Models and Methods in Bioengineering and Biosciences ($M^3B^2$) at the University of Pretoria (UP) recently hosted the first ever satellite conference as part of the established multidisciplinary *BIOMATH conferences in Bulgaria.

This BIOMATH 2015-S International conference at UP attracted 40 participants from six countries and nine South African institutions of higher education.

Prof Stephanie Burton, UP Vice-Principal: Research and Postgraduate Studies, gave the opening address with Prof Venko Beschkov speaking on behalf of the Bulgarian Academy of Science (BAS). The conference included a wide range of invited keynote presentations and contributed papers. The keynote speakers, who are among the best-reputed experts in their fields, were Professors Venco Beschkov (Institute of Chemical Engineering, BAS, Bulgaria), Samuel Bowong (University of Douala, Cameroon), Yves Dumont (CIRAD, France), Hristo Kojouharov (University of Texas at Arlington, USA) and Alun Lloyd (North Carolina State University, USA).

The theme of the conference was to provide access and scientific support to young scientists and researchers who develop and apply mathematical and computational tools to study phenomena in the broad fields of life sciences. The focus being on young scientists, students from the Department of Consumer Science at UP prepared the dinner for the guests. In addition to the Young Scientist Function, the connection with, and emphasis on young scientists was reinforced when Mr Yibeltal Terefe (UP) presented his PhD oral defense at the end of the conference.

Presentations were multidisciplinary in nature and included application of mathematics in areas such as biology, ecology, medicine, bioengineering and environmental sciences. A wide range of research work on vector born disease was presented. Some particular examples included Prof Beschkov (with his background in Chemical Engineering) speaking on *Microbial processes in immobilised cell system*; Ms Manyuchi (with her Engineering background) presenting her work on *Bio-nutrient removal using acti-zymes*; Dr Hoareau from the Genetics Department who spoke about *Parameter estimation in population genetics* and Dr Ngonghala (Havard Medical School) presenting his work *Ecological drivers of poverty and economic growth*. Of particular note, six of the presented papers were projects initiated during the Second Joint University of South Africa (Unisa)-University of Pretoria (UP) workshop organised by the DST/NRF SARChI Chair $M^3B^2$ in March 2015.

All presenters had an opportunity to submit their work to four reputable journals including the ISI listed Mathematics and Computers in Simulation.

The organisers of the BIOMATH2015 Satellite International conference are very grateful to the sponsors: DST/NRF SARChI Chair $M^3B^2$ and the Department of Mathematics and Applied Mathematics at UP. A word of thanks is also addressed to the International Steering Committee of BIOMATH (Bulgaria) for giving us the opportunity to share the BIOMATH experience.

**For further information see: http://www.up.ac.za/biomath2015-s**

The UP BIOMATH Forum is an initiative for interdisciplinary research unifying mathematical modelling, qualitative analysis and experimental investigation in biosciences with the ultimate aim of elucidating the underlying biological processes. In short, the BIOMATH Forum will stimulate research into issues of interest both to mathematicians and biologists.


*Dr Michael Chapwanya (Acting Chair: DST/NRF SARChI Chair $M^3B^2$), Prof Roumen Anguelov (Head: Department of Mathematics and Applied Mathematics), Prof Jean Lubuma (Dean: Faculty of Natural and Agricultural Sciences), Prof Stephanie Burton (Vice-Principal: Research and Postgraduate Studies) and Prof Venko Beschkov (Institute of Chemical Engineering, Bulgaria).*

# Increase the focus on extended academic programmes

We can't teach and do things in the same way as we did before. As the well-known scientist, Albert Einstein said, "insanity is doing the same thing over and over again and expecting different results."

Dr Melanie Jacobs, Faculty Quality Manager in the Faculty of Science at the University of Johannesburg was the guest speaker at the third annual Teaching and Learning Day for staff members teaching in extended programmes at the University of Pretoria (UP).

Her talk titled, *A focus on the academics who teach to Extended Science and Engineering students* focused on the reason for extending academic programmes as well as on the calibre of students in these programmes. Dr Jacobs emphasised the fact that lecturers in these programmes cannot rely on student's prior knowledge of the subjects anymore – 'we are now obliged to become 'real teachers' to support and help the students effectively."

The purpose of this Teaching and Learning Day was to give the staff members in these extended programmes the opportunity to discuss and exchange thoughts about their experiences and teaching practices. Currently UP presents five extended programmes that are funded by the Department of Higher Education and Training's (DHET) Foundation provision grant; namely; the Four-year Programmes (FYP) for BSc, BSc (IT), BIS Multimedia and BCom; and the ENGAGE programme offered by the Faculty of Engineering, Built Environment and Information Technology (EBIT).

This event provided dedicated time for staff within these programmes to share their experiences and practices on teaching and learning and, also to provide the opportunity to share their research activities (and the different theories they use in the process) with other staff members.

*From left: Prof Ansie Harding (Department of Mathematics and Applied Mathematics), Mrs Bridget Yani (Acting Director: Four-year Programmes), Ms Esther Mphanda (UP STARS), Dr Quenton Kritzinger (Department of Plant Science), Dr Melanie Jacobs (UJ) and Dr Erika Müller (Acting Manager: ENGAGE).*

# Symposium on use of representation in Science Education

The Faculty of Natural and Agricultural Sciences and the Department for Education Innovation recently presented a symposium on the use of representations in Science Education. Prof Hsin-Kai Wu from the National Taiwan Normal University was the guest speaker.

Prof Wu asked the question whether the students see what we do and elaborated on students' learning by ways of scientific representations. She also deliberated on the question whether animations are better than images. The symposium was concluded with an analysis of visual material.

Hsin-Kai Wu is a Professor in the Graduate Institute of Science Education at the National Taiwan Normal University, and a principal investigator in the Centre for Technology-Infused Learning Environments. She obtained a PhD in Science Education from the University of Michigan in 2002. Her research interests include chemistry education, scientific modelling, learning technology, and inquiry learning. Some of her articles have been published in *Journal of Research in Science Teaching, Science Education, Computers & Education*, and *International Journal of Science Education.*

As a trained chemist and a former high school chemistry teacher, she started her research on chemistry visualisation and representation. Her early work focused on how students developed their conceptual understandings and representational competence with technological tools. In 2003, her doctoral research has been recognised by the Outstanding Dissertation Award from the USA-based National Association for Research in Science Teaching (NARST).

*From left: Dr Lizelle Fletcher (Department of Statistics), Dr Ina Louw (Faculty of Natural and Agricultural Sciences), Prof Hsin-Kai Wu, Prof Marietjie Potgieter (Deputy Dean: Teaching and Learning, Faculty of Natural and Agricultural Sciences) and Prof Ansie Harding (Department of Mathematics and Applied Mathematics).*

# UP and CIRAD dedicated to governance innovation

*Front: Dr Michel Eddi (CEO: CIRAD) and Prof Anton Ströh (Vice-Principal: Institutional Planning, UP). Back: Dr Chris Ashimbi (Deputy Director: GovInn), Dr Jacques Lançon (Regional Director: CIRAD – Eastern and Southern Africa), Mr Frank Marchetti (Cultural and Cooperation Counsellor, Embassy of France) and Prof Marietjie Potgieter (Deputy Dean: Teaching and Learning, Faculty of Natural and Agricultural Sciences, UP).*

The University of Pretoria (UP) and the French Agricultural Research and International Cooperation organisation, working for the sustainable development in the South (CIRAD), have recently signed a five-year agreement establishing the Centre for the Study of Governance Innovation (GovInn) at UP as a joint centre.

With the establishment of GovInn as a joint centre, critical mass with regard to human resources, funding and experience will be reached. The aim is to become a recognised centre of excellence in and for Africa, dedicated entirely to governance innovation, as an 'innovation laboratory', capable of generating new thinking about governance and development.

GovInn is the first research institution in Africa dedicated entirely to governance innovation. It analyses and compares the complexity of decision-making processes in contemporary political and economic affairs. It focuses on cutting-edge research, as well as on advocacy and support mechanisms for innovative governance.

In contrast to the more traditional 'government', the idea of governance presupposes a fragmentation and diffusion of authority. In this regard, decision making, policy development and governance overall, being multi-actor and multi-level processes, have become more complex and need innovative thinking and support instruments. Some of the most promising innovations in contemporary governance have to do with how we redesign our economic model and, how we find better ways to share limited resources, and which instruments to develop to support innovative governance structures. GovInn focuses on innovation in the following areas: New Economic Governance, Governance of the Commons, Transboundary Governance and Security Governance.

# MoU established between FABI and CERC


*MoU signing ceremony between UP and CERC*

The International Union of Forest Research Organizations (IUFRO) Eucalyptus 2015 Conference provided the opportunity to sign an important Memorandum of Understanding (MoU) between the University of Pretoria's Forestry and Agricultural Biotechnology Institute (FABI), and China Eucalyptus Research Centre (CERC), an institute of the Chinese Academy of Forestry (CAF).

This MoU, formally establishing the CERC FABI Tree Protection Programme (CFTPP) was signed by Prof Yaojian Xie (Director of CERC) and Prof Mike Wingfield (Director of FABI and President of IUFRO) at a formal ceremony attended and overseen by Dr Zhang Shougong (President of the Chinese Academy of Forestry).

The MoU formalises what has been a long-standing collaboration between FABI, CERC and CAF, focused on sharing expertise and opportunities to better understand the health of trees globally. While there is a focus on the health of planted forests, substantial collaborative research is also being conducted on pest and disease problems that threaten the health of trees in natural forests globally. This MoU will provide new opportunities for both teams to leverage funding to promote the study of tree pest problems, including those from national governments and universities.

# BFAP Baseline: Navigating policy and strategies in a turbulent world economy


*From left: Prof Julian Binfield: Food and Agricultural Policy Research Institute (FAPRI), University of Missouri)), Ms Elaine Alexander (Deputy Director General: Economic Development, Trade and Marketing, Department of Agriculture, Forestry and Fisheries), Dr Mmatlou Kalaba(BFAP) and Prof Ferdi Meyer (Director: BFAP).*



The Bureau for Food and Agricultural Policy (BFAP) launched its 11th edition of the BFAP Baseline at the University of Pretoria at the end of July. A 10-year forecast of agricultural production, consumption, prices and trade in South Africa was presented. More than 200 business and policy stakeholders attended this event that has become a milestone in the calendar of the agricultural and food industry over the past ten years by relating plausible future scenarios to policy and business decisions. The event was opened by the deputy director general of the Department of Agriculture, Forestry and Fisheries, Elaine Alexander

According to Prof Ferdi Meyer, Director of BFAP, "the main findings of the outlook indicated that the return to favourable weather conditions globally, combined with the sharp decline in fossil fuel prices has induced a cycle of lower agricultural commodity prices. The summer grain producing regions in South Africa, however, experienced exceptionally dry weather conditions in 2015, causing domestic prices to increase in the short term within the long term lower commodity price cycle. Whilst favourable for livestock production, the cycle implies tighter margins in the field crop sector, which is projected to continue in the short term."

"Compared to leading global producers, the cost of producing maize under dry land conditions in South Africa is significantly higher, with the comparatively high cost of fertiliser in South Africa accounting for a substantial share of this difference. Within the lower price cycle, management of the cost squeeze effect will be critical in order to remain sustainable. This will entail continuous improvements in productivity to ensure favourable returns. However, such commodity cycles have also been evident in the past, and following the projected recovery in prices from 2017 onwards, the prospects for more favourable returns in the field crop sector do improve. Given the expected currency devaluation, the outlook for livestock and horticultural production remains favourable. However the reduced currency value also impacts on the cost of key inputs and consequently, continuous gains in productivity remain crucial for the entire agricultural sector going forward."

From the consumer perspective, the cost of an affordable healthy eating plan for a family of four (two adults and two children) increased by 36% from January 2011 to April 2015. The cost of healthy eating has therefore increased at a faster rate than general inflation in South Africa, with the CPI headline index reflecting an increase of 27% over the same period.

The full version of the BFAP Baseline 2015 can be downloaded from the website www.bfap.co.za. The next event in the BFAP calendar is the 2nd Regional Stakeholder Conference of the Regional Network of Agricultural Policy Research Institutes (ReNAPRI) held in Maputo at the end of October, where BFAP is one of the proud founding members. ReNAPRI consists of research institutions in nine African countries that collaborate in a range of research activities, which include the development of a 10-year forecast for regional markets.

# Student exchange programme between UP and Karlsruhe University initiated

The University of Pretoria (UP) and the Karlsruhe University of Applied Sciences in Germany have initiated a two year student exchange programme, commencing in September 2015.

The project, 'Geomatics and participation – study and research in the tension field between a European technology region and an African emerging country', aims at joining students from the technology and innovation region Baden-Württemberg and students from emerging South Africa so that they can benefit from the experiences and knowledge regarding real-time Geomatics at the respective universities.

The goal is to start a long-term partnership and student exchange programme. For example, in future it might be possible for honours students from UP to do a semester in Karlsruhe and for their master's students to join UP for a semester in Pretoria. The master's degree in Geomatics in Karlsruhe is course-based and presented in English. As part of this initial three-year project, a group of honours students will visit Karlsruhe in July next year and there are also three to six-month student exchanges planned for master's and PhD students.

Prof Gertrud Schaab and Prof Heinz Saler from the Karlsruhe University of Applied Sciences in Germany recently visited UP for the project initiation meeting. During their visit, Prof Schaab introduced the Karlsruhe University of Applied Sciences and the project on campus.

The programme is funded by the Baden-Württemberg Stiftung, and will benefit the students involved with geomatics knowledge as well as the course regimes at the respective universities. Moreover this project not only benefits the students involved, but the two universities involved with regard to the flow of technology innovations as well as skills that would have been limited to either university.

The Baden-Württemberg-STIPENDIUM for university students (www.bw-stipendium.de the Baden-Württemberg Stiftung) enables some 1 200 students a year from all over the world to study in a foreign country for a period of three to eleven months. The objective of the Baden-Württemberg-STIPENDIUM for University Students is to promote the international exchange of highly qualified German and foreign students. The scholarships are divided equally between applicants from Baden-Württemberg and from abroad.

The Baden-Württemberg Stiftung (www.bwstiftung.de) advocates a vital Baden-Württemberg principle with a high quality of life for all its residents. It helps to pave the way for advanced technological progress, high quality education, and a responsible relationship with fellow human beings. The Baden-Württemberg Stiftung is one of the major foundations in Germany. It is the only foundation which exclusively and outside of party lines invests in the future of the state of Baden-Württemberg – and thus in the future of its citizens.

*Front: Prof Dr Heinz Saler (Karlsruhe), Prof Dr Gertrud Schaab (Karlsruhe University) and Mr Fritz van der Merwe (UP). Back: Prof Serena Coetzee (UP), Prof Paul Sumner (Head: Department of Geography, Geoinformatics and Meteorology (UP) and Ms Victoria Rautenbach (UP).*

# SACI Medal and sponsorship for Dr Patricia Forbes


*From left: Dr Patricia Forbes (recipient of the award), Suzanne Finney (Royal Society of Chemistry, Northern Branch), Prof Marietjie Potgieter (Deputy Dean, Teaching and Learning, Faculty of Natural and Agricultural Sciences) and Prof Simon Lotz (outgoing president of SACI),*



Not only was Dr Patricia Forbes from the Department of Chemistry recently honoured with the South African Chemical Institute (SACI) Education Medal for 2014, but she also received a sponsorship of R30 000 from the Royal Society of Chemistry to further her research on the educational spectrophotometer. These awards were made at the recent Science Teaching and Learning Forum (SCITAL) of the Faculty of Natural and Agricultural Sciences, where she was also the guest speaker. The topic of her speech was, 'Seeing the light: an inquiry-based learning approach to analytical measurements'.

Dr Patricia Forbes developed an educational spectrophotometer (called the SpecUP). One of the defining features of the SpecUP is that the instrument can be built by students themselves by using a kit which costs about R600. The more expensive alternative is R30 000 which is the cost of an entry-level commercial instrument. The students can use the SpecUP in applied chemistry experiments. This makes it possible for institutions to have more spectroscopy equipment available to enable enquiry-based learning, which is of importance in a developing country context where student numbers are high and resources are scarce. Due to the hands-on nature of the SpecUP, which has moving parts, it makes it possible for students to understand what is inside the 'black box' of commercial instruments and to discover what happens when they adjust components. The project was funded by the African Laser Centre and the distribution of the SpecUP to other universities throughout Africa commenced in 2013 via a workshop held at the University of Pretoria, where eight academic participants from five countries attended.

A journal article on the SpecUP was published in the *South African Journal of Science*, in 2014 and Patricia Forbes gave an invited oral presentation and video demonstration of the instrument at the ETOP (Education and Teaching in Optics and Photonics) Conference in Portugal in 2013, as well as an oral presentation at the 12 th International Chemistry Conference Africa in 2013 in Pretoria. Dr Forbes was invited to present a second SpecUP workshop in Tunisia in March 2014 and again in 2015, where delegates included a diverse mix of academics, as well as postgraduate and undergraduate students. The SpecUP has been widely lauded as an enquiry-based educational tool and its development and implementation has gone from strength to strength. The impact of this instrument as a tool in chemical education is clear and was recently acknowledged by a sponsorship from the Royal Society of Chemistry.

The SCITAL Forum (Science Teaching and Learning Forum) of the Faculty of Natural and Agricultural Sciences is a professional community which brings together staff with a particular interest in teaching and learning tertiary Mathematics and Science.

# African Diaspora fellow collaborates on GIS and Technology project at UP



The University of Pretoria (UP) was selected by the Carnegie African Diaspora Fellowship Program (CADFP) in the USA to host an African Diaspora scholar, Dr Paddington Hodza, who will be collaborating with local scholars on a project on Geographic Information Science and Technology (GIS&T). Prof Serena Coetzee, Director of the UP Centre for Geoinformation Science (CGIS), will lead the project together with Dr Hodza, a Fellow of the Wyoming Geographic Information Science Center (WyGISC) at the University of Wyoming in Laramie, Wyoming, USA.

The project aims to establish a sustainable GIS&T cooperative relationship on curriculum development, student mentoring and research between UP and the University of Wyoming. In anticipation of the visit, Prof Coetzee, Dr Hodza and two co-authors from the USA and Germany prepared a paper titled 'Comparing proportional compositions of geospatial technology-related programs at three universities'. The study illustrates how a comparison of proportional programme composition can reveal significant differences and similarities that are not obvious when only content is compared. The compositional differences naturally result in graduates with different knowledge and skills, which allow for different career paths and meet different job market needs. Dr Hodza presented the paper at the Geomatics Indaba 2015 held in August.

Other activities during Dr Hodza's one-month visit included a workshop on 'Appreciative GIS' at the Geomatics Indaba 2015; accompanying third-year Geoinformatics students to an informal settlement on the outskirts of Mamelodi, where they participated in a community engagement project; a demonstration of the WyGISC geoportal and brainstorming for a similar implementation at UP; a seminar in Internet GIS designed for postgraduate students; and guest lectures attended by staff, students and industry representatives.

The UP project is one of 17 projects that will pair African Diaspora scholars with institutions of higher education and collaborators in Africa to work together on curriculum development, research, graduate teaching, training and mentoring in the months ahead.

This innovative fellowship programme facilitates engagement between scholars born in Africa who are now based in the United States or Canada and scholars living in Africa on mutually beneficial academic activities. The programme is managed by the Institute of International Education (IIE) in collaboration with Quinnipiac University, through Dr Paul Tiyambe Zeleza, who chairs the Advisory Council, and is funded by the Carnegie Corporation of New York.

The Carnegie African Diaspora Fellowship Program (CADFP) Advisory Council, comprising academic leaders from Africa and prominent African Diaspora academics, has remarked on the rapid growth, quality, impact and uniqueness of the programme, which allows African universities to host African Diaspora scholars at their institutions.

*Front: Sean Cullen (MSc Geoinformatics), Dr Paddington Hodza and Prof Serena Coetzee. Back: Victoria Rautenbach (PhD Geoinformatics), Linda Khoza (DST/NRF intern) and Danie Jooste (BSc Hons Geoinformatics).*

# Honey, food and wine celebrated


*Honey tasting - Acacia, Fynbos Multi-Flora, Lucern and Orange Blossom*



The recent epidemic outbreak of American Foulbrood disease in the Western Cape and the subsequent honeybee colony losses is a great cause for concern, since the production of almost a third of the food humans consume depends on honeybee pollination. Apart from their importance as pollinators, honeybees produce honey and other hive products.

The fourth-year Hospitality Management students of the Department of Consumer Science recently hosted a wine and honey pairing dinner to create awareness of the importance of the interaction between man and bees, as well as the versatility of honey. Honey with unique flavours and tastes were sourced directly from commercial South African beekeepers and Bayer Southern Africa made a generous financial contribution. The evening was also supported by the Social Insect Research Group (SIRG) that resorts under the Department of Zoology and Entomology at the University.

A buzz was in the air and guests were welcomed with a refreshing ruby red grapefruit, rosemary and honey cocktail. Prof Robin Crewe, Director of the Centre for the Advancement of Scholarship and a member of SIRG, addressed the guests on the importance of honey bees and Prof Emeritus Erik Holm from the Department of Zoology and Entomology, shared his knowledge of honey with the guests. A honey tasting preceded the exquisitely prepared four course dinner. Each course featured a dish with honey as ingredient, paired with a honey and alcoholic beverage.

The evening was very enjoyable and guests had the opportunity to celebrate honey in all its glory.

*Prof Robin Crewe*

*Cheese Platter - Myrtle honey and Proposis honey, served with cheese, fruit and nuts*

# Plant Breeding Symposium brings together experts from around the world



*Mr John Arbuckle, Vice–President, Crop Genetics Research and Development at DuPont Pioneer delivering the keynote address at the DuPont Plant Sciences Symposium.*


*PhD student Osmond Mlonyeni from FABI won the prize for the Best Student Presentation for his talk, "The value of population genetics in managing invasive pests through biological control: The Sirex noctilio-Deladenus siricidicola example."*

At the end of September scientists and industry leaders in plant science shared the latest advances in plant breeding at the Second Annual DuPont Plant Breeding Symposium Africa, held at the University of Pretoria (UP). The only student-led symposium sponsored by DuPont Pioneer in Africa, the meeting brought together researchers, students and industry leaders from across the globe through live streaming on the Internet, and Instagram (Dupont_Africa).

Hosted by the Genomics Research Institute (GRI) and the Department of Plant Science at UP, the meeting was organised by a postgraduate student committee, led by David Nsibo, a PhD student in Plant Science, with the Forestry and Agricultural Biotechnology Institute (FABI) from Uganda and Joel Dube, a PhD student in Plant Pathology, from Zimbabwe. The rest of the Committee consisted of Megan MacCaghey (graduate student on a USAID RIFA Fellowship visit to the Department of Plant Science at UP, from the University of California Davis, USA), Katrien De Ridder (MSc student, Plant Pathology, FABI), Johan Liversage, (PhD student in Biotechnology, FABI), and Katlego Masike (honours student in Plant Science). The event was co-ordinated by Prof Dave Berger of the Department of Plant Science, Dr Rikus Kloppers of Pannar Seed (Pty) Ltd and Dr Tabare Abadie of DuPont Pioneer, USA.

The Dean of the Faculty of Natural and Agricultural Sciences, Prof Jean Lubuma opened the symposium and congratulated the organising committee for being at the forefront of the meeting and for promoting UP's vision of being a leading research intensive university in Africa.

The topic for this year's symposium, "Current innovations in insect resistance management and pest control" highlighted the challenges faced by various players in the agricultural sector, as well as scientific research conducted worldwide, to address them.

Speakers included the Vice-President of Crop Genetics Research and Development at DuPont Pioneer, John Arbuckle, as well as academics from the North West University, the University of the Free State, the Agricultural Research Council and UP. The interdisciplinary nature of the event was illustrated by the spread of speakers from UP, namely Prof Kerstin Kruger, (Department of Zoology and Entomology), Dr Juan Vorster (Department of Plant Production and Soil Science) and Dr Bridget Crampton (Department of Plant Science).

Participants came from China, Egypt, Ethiopia, Kenya, South Africa, Switzerland, Taiwan, the United States and Zimbabwe. The meeting was one of more than 40 plant breeding symposia sponsored by DuPont at universities worldwide since 2008. The symposium presented students with a valuable opportunity to foster relationships with experts that could advance their research and professional careers in the future.

# Successes of Forest Molecular Genetics Programme showcased



The Forest Molecular Genetics (FMG) Programme and the Forestry and Agricultural Biological Institute (FABI) recently hosted a visit by a high level delegation, welcoming representatives from several government departments and industry associations.

The FMG Programme is one of the flagship genomics platforms funded by the Department of Science and Technology's (DST) Biotechnology Programme and the visit gave all delegates first hand insight into the research being conducted by the FMG at FABI.

The delegates included the Deputy Director General: Technology Innovation of the Department of Science and Technology (DST), Dr Mmboneni Muofhe, as well as senior representatives from the Department of Agriculture, Forestry and Fisheries (DAFF), Department of Public Enterprises (DPE), the University of Pretoria, Forestry South Africa, Sappi, the Agricultural Research Council (ARC) and GrainSA.

The DST is currently identifying suitable research platforms to fund under the new Bio-Economy Strategy and the FMG's partnership is presented as one of the most successful partnerships among universities (academia), the industry and government institutions to conduct world-class scientific research.

*Dr Mmboneni Muofhe from the DST*

The guests were welcomed by UP's Vice Principal for Institutional Planning, Prof Anton Ströh, while the Faculty of Natural and Agricultural Sciences was represented by the Deputy Dean of Research and Postgraduate Studies, Prof Brenda Wingfield.

FMG Director, Prof Zander Myburg presented a brief overview of the FMG Programme and its many successes. He also outlined the lessons learnt from this programme and how these can be used to foster similar research programmes in other commercial biomass crops in South Africa. He is a recent recipient of the TW Kambule National Science and Technology Forum (NSTF) Award for research and outputs over the last five to ten years by an individual for his exemplary overall contribution to forest molecular genetics research.

*Members of FABI with a high level delegation, welcoming representatives from several government departments and industry associations*

# PhD candidates in Food Science selected to present papers at IAFP

Earlier this year, two PhD candidates in Food Science from the University of Pretoria (UP), were among a group of only 19 students from across the world, selected to present papers at the International Association for Food Protection (IAFP).

The IAFP is an international body that represents over 4 000 educators, scientists, government officials and professionals involved in aspects related to the growing, storing, transporting, processing and preparing of all types of food. Its purpose is to protect the global food supply.

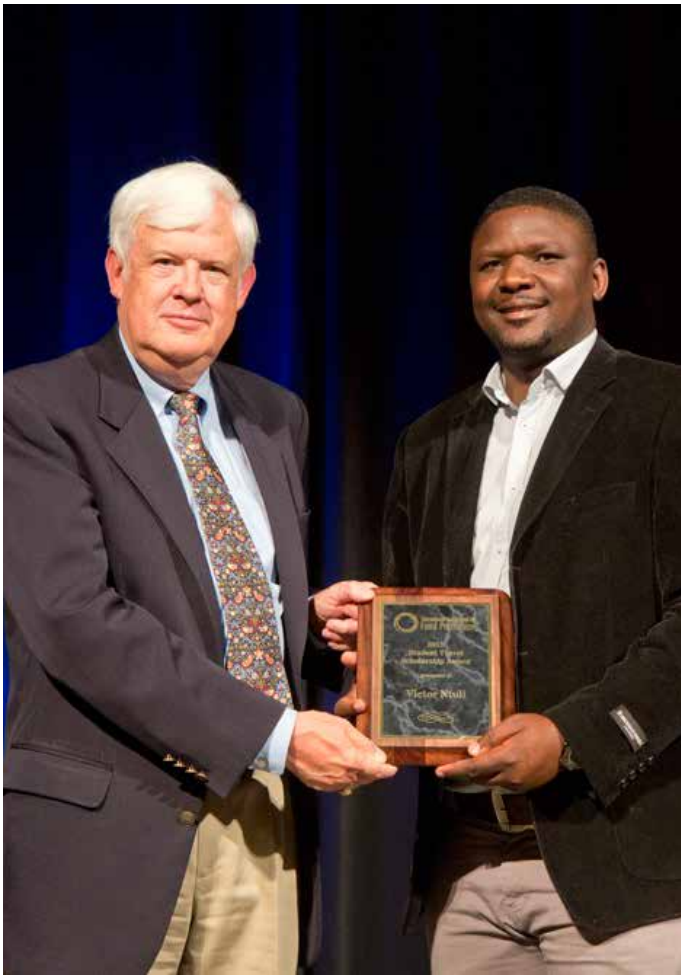
The IAFP hosts an annual meeting that has earned global recognition as the leading food safety conference. This year's meeting, held in Portland, Oregon, USA, had a record-breaking 3 200 attendees, representing 49 countries.

Every year the IAFP awards several postgraduate students its Student Travel Scholarship to enable them to attend the meeting. This year, 19 of these scholarships were available. Two PhD candidates from the University of Pretoria's Department of Food Science, Desmond Mugadza and Victor Ntuli, were awarded IAFP Student Travel Scholarships for their outstanding work in the area of food safety. They were the only students from African universities to receive the scholarships.

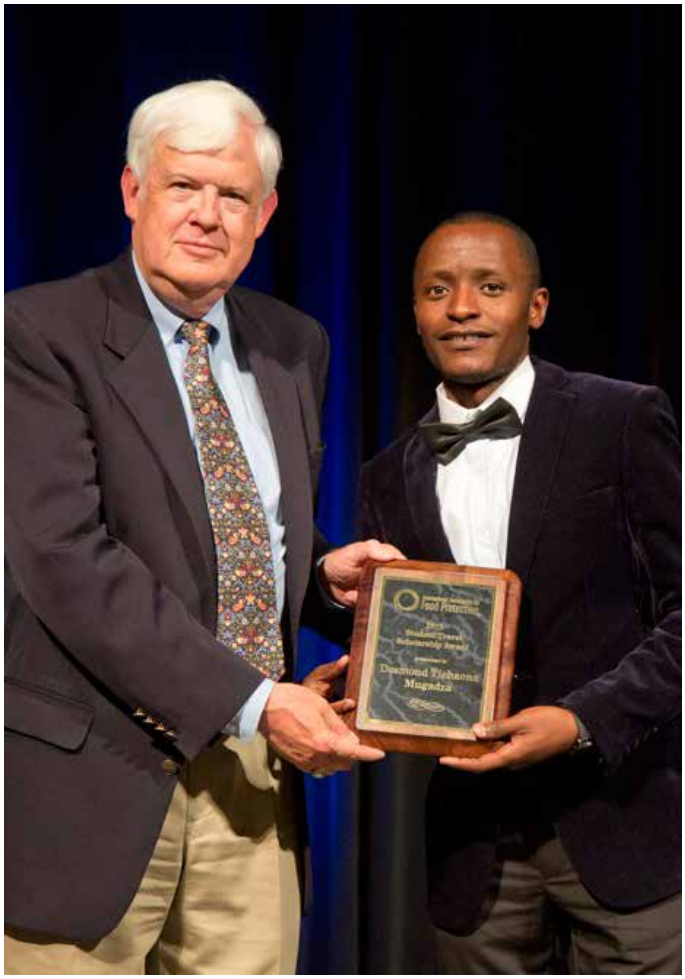
Mugadza presented a paper titled, 'The characterisation of *Bacillus cereus* in extended shelf life milk'. Reflecting on the event, he said: "Being at such a prestigious meeting was a great experience and an opportunity to mingle with experts and receive technical insights into my PhD work."

Ntuli said that the IAFP's acceptance of his paper, titled 'The characterisation and source tracking of *E coli* in bulk milk sold in the informal sector in South Africa' showed that his work was internationally relevant. "Other attendees showed interest in our work. It was found to contribute valuable information on the risk analysis of milk sold informally to the public and on food safety in general," Ntuli said.

Both Mugadza and Ntuli are focussing their PhD dissertations on the area of microbiology, food safety and risk assessment. They are both supervised by Prof Elna Buys, Head of the Department of Food Science at UP.



*Donald L. Zink (Past President: IAFP) and Victor Ntuli*



*Donald L. Zink (Past President: IAFP) and Desmond Mugadza*

# IUFRO assembles African forestry leaders at WFC 2015

The President of the International Union of Forest Research Organizations (IUFRO), Prof Mike Wingfield hosted a gathering of 20 African forestry research leaders, senior IUFRO and postgraduate student representatives during the recent 14th World Forestry Congress 2015.

This dialogue was aimed at a better understanding of the status of African forestry research and how to address the challenges these researchers and students face. Statistics indicate that Africa is responsible for a mere 2% of the scientific papers relating to forestry published annually, with the majority of these coming from South African academic institutions.

ollaboration across borders is viewed as the key to improve these statistics. To this end a more expanded meeting, including a greater number of academics from across the continent is proposed for 2016. The aim will be to give the process impetus by utilising the more than 15 000 IUFRO members in 110 countries across the globe. Social media is regarded as another way of linking academics across the world. Understanding how to optimally harness this technology will reap benefits for the international scientific community, but especially for the African members.

Two student representatives, one each from Nigeria and South Africa, from the International Forestry Student's Association (IFSA), also shared their experiences, the challenges they face and their expectations as future researchers and forestry professionals. Prof Mike Wingfield, in addressing the IFSA pre side-event workshop, urged IFSA members to join IUFRO, pointing out that this would allow them to improve the quality of their science through utilising leveraging the massive scientific network of IUFRO members.



*Front row: Mercy Gichora (IUFRO Africa Liaison Officer, KEFRI); Victor Agyeman (CSIR Ghana); Ben Chikamai (Director: KEFRI and Network for Gums and Resns in Africa (NGARA)); Dos Santos Silayo (Acting Dean: Faculty of Forestry and Nature Conservation, Sokoine University of Agriculture, Tanzania). Second row: Joe Cobinnah (FORNESSA); John Parrotta (Vice President: IUFRO); Björn Hånell (I Vice President: UFRO); Godwin Kowero (Executive Secretary: AFF); August Temu; Paxie Chirwa (University of Pretoria); Peter Mayer (Deputy Co-Ordinator SP Directors Forum) Third row: Bamidele Oni (Green Impact International – Nigeria); Brendan Marais (Student: Stellenbosch University); Josh Louw (HOD: Saasveld College); Ronald Heath (Forestry SA); Pierre Ackerman (Stellenbosch University); Colin Dyer (ICFR); Alexander Buck (Executive Director: IUFRO); Michael Kleine (Deputy Executive Director: IUFRO); Mike Wingfield (President: IUFRO).*

# JuniorTukkie Geospatial Tech Camp provides opportunities to learners

A total of forty nine (49) Grade 11 learners from all over South Africa participated in this year's JuniorTukkie Geospatial Tech Camp. This Camp is a locally developed follow-up to the successful *Global Connections and Exchange: My Community, Our Earth Tech (MyCoE)* Camp that was held at the University of Pretoria in 2014.

The event was organised by JuniorTukkie, the Centre for Geoinformation Science, EIS-Africa and the South African Geography Teachers Association. The support of the sponsors – Statistics South Africa, Esri South Africa, the CSIR and the Geo-information Society of South Africa (GISSA) – has made this week possible. Learners received valuable experience and information to assist them in making informed study and career choices. Fun events, including drumming and a potjiekos competition occurred during the evenings.

The Tech Camp programme (based on *MyCoE*) incorporates the following: three days of training, cultural exchange, mapping and planning, hands-on sessions with geospatial technologies, designing community team projects, meeting leading industry partners, and learning basic computer literacy and essential life skills, such as study methods and time management. Learners learnt more about how to apply geospatial technologies in support of their communities. They were also well-informed about study options, bursary opportunities and careers where geospatial technologies are applied.

High school teachers and several UP students guided the learning experiences and acted as chaperones for social experiences during the week. The activities included a mix of presentations, small group discussions, lectures, interactive training sessions, simulations and role-playing, teambuilding exercises, case studies, leadership training, and social time with peers. These activities were counterbalanced with hands-on applied activities such as site visits, work in computer labs, and team-based community project design and development. The teams were given the task of identifying and solving a current and relevant problem on campus for which a map would be required. Examples included mapping noise pollution and finding a suitable site for a new residence. Learners were encouraged and guided to form scientifically derived understandings of problems and to take action, make a difference, and participate in applying solutions.

Participants were selected on the criteria that they:

- demonstrate an interest in geospatial technology;
- demonstrate leadership aptitude and service to the community;
- exhibit creativity, flexibility, maturity, integrity, good social skills, and open-mindedness;
- have the motivation necessary to be active and successful;
- have sufficient proficiency in English to participate fully in all exchange activities;
- meet the JuniorTukkie membership requirements of an average percentage of at least 70%; and
- obtain an average of at least 60% in Mathematics, English and Physical Science.

At the end of the week, learners presented the projects they worked on during the week and also received feedback on their respective projects.

The JuniorTukkie Geospatial Tech Camp was concluded during an official closing ceremony where each participant received a Certificate of Attendance, presented to them by the Dean of the Faculty of Natural and Agricultural Sciences.



*All participants received a Certificate of Attendance, presented to them by the Dean of the Faculty of Natural and Agricultural Sciences, Prof Jean Lubuma.*

***Report from Kathleen Godfrey, one of the UP students who was a chaperone during the week:***

*Tech Camp 2015 kicked off with some joyful noise at the amphitheatre thanks to the Roarrr team. There can be no better way to get to know your fellow camp goers than learning to 'Coca Cola Clap'. It was a great start to a great week! The students were then lucky enough to be given access to a full online grade 11 maths and science syllabus. We had an incredible African drumming session on the first day and settled in at Altelekker, where we were greeted with a smile and a delicious dinner. The next day began with some very interesting talks on how to do presentations, careers in GIS and GIS theory, and we all got our hands on some computers for an interesting practical session on OpenStreetMap. It was really exciting to see how the information added by the students appeared on the website! That evening the Roarrr team did an awesome presentation on leadership and personal branding, which was insightful and interesting for everyone.*

*On Wednesday we began working on group projects. First up, each group decided on their topic, then tasks were allocated to each member and the fun began again! Data was collected on UP campus and then transformed into information which was used to solve each group's specific issue. This was especially exciting, as it was a chance for the attending scholars to showcase their unique talents and an opportunity to work hands on with QGIS. The groups gathered their own data and created their own maps and the presentations they would be giving the next day. It was exciting to see the groups become more comfortable and enthusiastic about their projects.*

*Thursday was the big day! After a wonderful presentation on how some of the GISc professionals had entered into this fascinating field, it was time for presentations! All the groups presented extremely interesting topics, such as the best possible location for a new entrance on campus, and the areas on campus where the campus security program could be updated and altered. The presentations were professional and interesting, and the chaperones and facilitators were bursting with pride! That evening spirits ran high at the potjiekos competition. Each team was given a pot, wood and ingredients, and left to cook up a storm! With teams like this, who needs restaurants! The competition was great fun, and a wonderful way to round up Tech Camp 2015!*

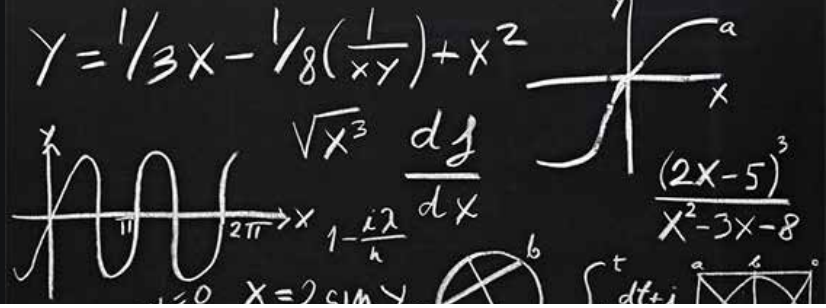
*Learners during hands-on sessions with geospatial technologies*



### What is Geospatial Technology?

Geography is the science of place and space. Geographers ask where things are located on the surface of the earth, why they are located where they are, how places differ from one another, and how people interact with the environment. As the study of the earth's landscapes, peoples, places and environments, it is, quite simply, about the world in which we live. Geography is unique in bridging the social sciences (human geography) with the natural sciences (physical geography). Because thinking about space and place is relevant in a variety of sciences such as economics, health, engineering, climate, plants and animals, geography is highly interdisciplinary. It is also a very appropriate perspective from which to consider complex issues, such as sustainable development, that involve economic, social, and environmental dimensions at the same time. Geographers, planners and other scientists and professionals use many technologies and techniques to learn about our world. Such geospatial technologies are increasingly used in some of the most important emerging fields for understanding our complex world. They include mobile maps, in-vehicle navigation, geographic information systems (GIS), remote sensing, earth observation, the Global Positioning System (GPS), and online maps such as Google Earth and OpenStreetMap. Geospatial technologies allow us to view, understand, question, interpret, and visualise data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts. They assist in answering questions and solving problems by looking at data in a way that is quickly understood and easily shared. Geospatial technologies also help us to make intelligent and informed decisions about the way we live on our planet. Increasingly, geospatial technologies are also used by individuals on a daily basis – driving directions and finding the closest fast food outlet are examples.

# The (Maths and) Science behind the dream to succeed



For pupils in their final year of secondary school, the last quarter of the year is characterised by nerves, hopes and dreams as they prepare for the looming final examinations. Passing these examinations with good marks signals the beginning of the makings of a dream. Grade 11 learners like Ofentse Maleka, Zanele Hadebe, Lethabo Mokhonoana, Simphiwe Mahlangu and Queen Sebola have dreams of studying in varied fields, such as veterinary sciences, virology, biochemistry and dentistry. For these study programmes and others that provide students with more than 95% of the scarce skills identified by the Department of Labour, Mathematics and Physical Science are required subjects.

Although the state of Mathematics and Science education in South Africa has been reported to be poor nationally, the University of Pretoria (UP) is working on uplifting the standard for teachers and learners from the Mamelodi community, where the University has a campus. The Mamelodi Mathematics and Physical Science after school programme aims to ensure that pupils improve their marks and that teachers are equipped with the knowledge necessary to teach these subjects in an improved way. The programme begins in January, when 300 pupils in Grade 10, 11, and 12 are invited to UP's Mamelodi Campus to attend weekly additional classes in Mathematics and Physical Science. These classes apply innovative teaching methods; pupils get individual attention, they interact with their peers from other schools and they are encouraged to believe in their dreams.

'Attending these classes is very good for me because I did not understand some of the concepts very well, but now my marks have improved and I stand a chance to study virology so that I can eliminate viruses that make people sick,' said Simphiwe Mahlangu, a learner at Thuto Botlhale High School.

Donations from industry partners, such as EnviroServ Waste Management Ltd, make it possible for the programme to supplement the regular after school classes with a rigorous holiday programme. It requires dedication and hard work for learners to spend school holidays doing school work rather than enjoying the fun activities that other teenagers may be up to. They do it because they have dreams, and it is these dreams that South Africa, UP and industry partners are nurturing. Actualising these dreams entails providing an environment and tools that unlock opportunities for pupils to pass matric, study at a tertiary institution, have a career and contribute towards a better quality of life in our country.

Group Chief Executive of EnviroServ, Mr Des Gordon says: 'We are not just a waste management company; we are an important part of South African society and are aware of the unique South African challenges. We are therefore pleased to provide resources to make the children's dreams possible. Education is a basic need and EnviroServ is committed to playing a role in ensuring that future generations are skilled and literate.'

The short-term goal of UP's Mamelodi Mathematics and Physical Science after school programme is to improve the marks of learners. In the long run, it is envisioned that these learners will achieve their personal goals while also being of service to others in a number of ways.

Donors wanting to become part of the dream may contact Lebo Ngwatle at 012 420 2977 or at lebo.ngwatle@up.ac.za

Students

# PhD student in malaria wins presenters trophy

Mr Shehu S Awandu, a PhD student at the University of Pretoria Centre for Sustainable Malaria Control (UP CSMC) won, as first prize, the trophy as best presenter at the Limpopo Provincial Health Research day held in Polokwane in November 2015.

The event, organised by the Department of Health, brought together several researchers in the Limpopo Province, from diverse backgrounds who gave oral and poster presentations. The event, with the theme "Working together – setting the stage for evidence based planning" was held at the Polokwane Royal Hotel.

Topics included, amongst others, tuberculosis, malaria, HIV/AIDS, cardiovascular diseases, health systems strengthening, drugs, therapeutics, maternal and childhood mortality, women's health, life style and behavioural diseases. Mr Awandu's speech, based on his PhD research on the molecular epidemiology of malaria transmission in the Vhembe District, Limpopo Province won the first prize. He is supervised by Prof Lyn-Marie Birkholtz, SARChI Chair on Sustainable Malaria Control, in the Department of Biochemistry. The findings of his study will provide the much-needed evidence to the malaria control programme on the malaria elimination agenda.

*Ms Victoria Ramonyai (Team leader for Makonde West Malaria Camp, Vhembe District Malaria Control Programme in Limpopo) and Mr Shehu Awandu*

# Animal Science students triumph again

Students in Animal Science at the University of Pretoria (UP) once again achieved the first place in the student quiz at the annual South African Society for Animal Science (SASAS) Congress in Empangeni. The KwaZulu-Natal branch of SASAS hosted this year's 48th Congress.

The UP students have taken the top spot for two years running and the Department has once again show-cased its students' excellent training.

Animal science students of tertiary institutions across the country competed in the 2015 Stock Farm/SASAS animal science students quiz. Teams comprised of three final-year or postgraduate animal science students each. Questions covered the basic disciplines of animal science, including nutrition, physiology, breeding and a general applied knowledge of animal science.

Great excitement prevailed when the 12 teams competed in the first round which consisted of multiple-choice questions, with marks deducted based on how long teams took to give the correct answer. The top three teams advanced to the final round where the teams' answers to each of the 15 questions had to obtain the approval of the judges. Two teams, Tuks 1 and Tuks 2, were entered by the University of Pretoria, and together with team XXY from the University of Stellenbosch, they competed in the final round. Tuks 2 emerged from the battle as winner, and Tuks 1 with just one point behind the winners, took second place.

During the gala dinner which concluded the Conference, Prof Jannes Jansen van Ryssen, Editor-in-Chief of the *South African Journal for Animal Science* and Professor Emeritus of UP's Department of Animal and Wildlife Sciences was awarded the SASAS gold medal for his honourable service to animal science and the society.


*From left: Tuks 1 - Izaan du Plooy, Gino Galetti and Ashley England*


*From left: Tuks 2 - Rulien Grobler, JW van Niekerk and Chantelle Cronjé*

Students

# UP students participated in South African Tertiary Mathematics Olympiad

The South African Tertiary Mathematics Olympiad (SATMO) was held in late August this year. The Olympiad was written by a total of 47 undergraduate students who each received a certificate. The three top achievers from UP were Jan Wuzyk, Izak Haasbroek, and Avikar Maharaj.

Jan Wuzyk, a first-year BSc Applied Mathematics student, achieved a score of 9 out of 20. Izak Haasbroek and Avikar Maharaj, both BSc Actuarial and Financial Mathematics third year students, achieved 8 out of 20 and 7 out of 20 respectively. The best score came from UCT, with 13 out of 20.

A word of thanks to Dr Charles Maepe (local organiser), and Dr Ruaan Kellerman from the Department of Mathematics and Applied Mathematics for organising this undergraduate activity.

*Dr Charles Maepe, Avikar Maharaj and Izak Haasbroek*

# Every day is different with Science

"The UP with Science Programme definitely intensified my interest in Science. Science taught me to ask questions and I am still asking questions." This thought was shared by Jacques Pienaar (27), a Fulbright scholar at Purdue University, a major research university located in Indiana, United States.

He is one of the many success stories of the UP with Science project in the Faculty of Natural and Agricultural Sciences. Jacques is currently pursuing his PhD at Purdue University after completing his master's degree in 2013 at the same University.

"In Grade 10 I became part of the *UP with Science Programme, which fuelled my interest in Science. I also had very good Science teachers who encouraged my interest in Science. I must admit, I always loved science fiction.

"With Science, and specific, Physics not one day is the same. Every day is different," Jacques said.

In his matric year Jacques wrote the Scholastic Aptitude Test (SAT) and thanks to achieving the test results he was selected to visit the USA to study particle physics at Stanford University for a month. Then already his mind was set to study Physics and he enrolled at the University of Pretoria (UP). Jacques studied Physics at UP from 2007 to 2010, and completed his Honours in Physics.

Jacques' postgraduate study, which is partially funded by the National Research Foundation focuses on astro-particle physics, with the emphasis on dark matter. "The same techniques which are used in high energy physics are also used to detect dark matter. I love what I am doing. As part of my research I am working in an underground laboratory (the XENON1T detector is located at the Gran Sasso Underground Laboratory in Italy, where it may capture signatures of dark matter that flow through the Earth (as it moves through space). Therefore I spend most of my free time in some of the big beautiful parks and lakes, kayaking and enjoying nature."

Jacques plans to complete his PhD by the end of 2016, after which he hopes to execute his postdoctoral research in an international research group. He is already collaborating with about 20 institutions through his research.

He recently visited the UP with Science programme, which still functions excellently after almost 15 years. He was delighted to meet the current students and delivered a speech to them about his research.

Jacques was recently also a guest on *Catalyst,* Australia's premier science investigation series on television, where he spoke on dark matter.

*The UP with Science Programme is a science enrichment programme for senior secondary school learners, presented by the University of Pretoria. Approximately 50 grade 10 learners who have a high potential for and a keen interest in Science are annually selected to participate in the science enrichment programme. While part of the Programme they are exposed to an enquiry-based approach to Science. It runs over a period of three years, after which the learners may qualify for a scholarship valid for most of the study programmes that are offered in the Faculty of Natural and Agricultural Sciences, provided that they meet the normal admission requirements. This Programme includes Saturday meetings once a month and a project week during the holidays once a year. The programme is aimed at increasing young people's interest in, knowledge of, and skills in Science.

Visit http://www.upwithscience.up.ac.za/ for more information on the UP with Science Programme



*Jacques Pienaar standing next to the 'cryostat' of the XENON1T detector in the water tank of the same experiment.*