

SQUARED² UP

Newsletter of the Faculty of Natural and Agricultural Sciences ■ Issue 1 ■ July 2014



Faculty proudly delivers most PhD degrees

Many studies have shown that South Africa, and indeed the African region as a whole, needs to give urgent attention to increasing the per capita output of doctorate graduates. One of the most significant ways a research university contributes to development is through its graduates, particularly at the highest level, namely doctoral study.

Developing the next generation of scholars is a priority for the University of Pretoria. Therefore it is gratifying that last year, UP once again produced the highest number of master's and doctorate graduates among all South African universities.

Although not the biggest faculty of the University, the Faculty of Natural and Agricultural Sciences, annually contributes the most doctorate candidates of all faculties. During the recent autumn graduation ceremonies in April, 37 out of a total of 127 doctoral degrees were awarded to graduates from the Faculty of Natural and Agricultural Sciences.

Ground-breaking and exciting research was produced in the goldmine of research conducted by the cohort of doctorate graduates. These include investigating the damage caused by 4 x 4 vehicles to soil, an in-depth-look at the West Coast's own Heaviside dolphins, and how nuclear magnetic resonance based metabolomics techniques can be used to speed up the process of discovering drugs against diseases such as HIV. Read more about these different research findings in the newsletter on page 4.

PhD candidate, Mr Ryan Reisinger, was named the runner-up in the Science in Action category for his photograph of an adult female killer whale and her three year old calf trying to drag an elephant seal off a ledge at Marion Island in the Southern Ocean. Read more on this on page 22.



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Faculty of Natural and Agricultural Sciences



Many studies have shown that South Africa, and indeed the African region as a whole, needs to give urgent attention to increasing the per capita output of doctorate graduates. Although not the biggest faculty of the University, the Faculty of Natural and Agricultural Sciences annually contribute the most doctorate candidates of all faculties. During the recent autumn graduation ceremonies in April, 37 out of a total of 127 doctoral degrees were awarded to graduates from the Faculty (Read more on page 1).

Prof Zander Myburg, Director of the Forestry Molecular Genetics Programme in the Department of Genetics was the lead investigator in a global project to unravel the genetic blueprint of *Eucalyptus grandis*, a species from a genus of fast-growing trees, commonly known as blue gum trees in South Africa. The successful sequencing of this genome was published in the prestigious, high-impact scientific journal, *Nature*, on 19 June 2014 (page 20).

As research is part of the Faculty's core business, the official launch of the **South African Research Chairs Initiative (SARChI) in Sustainable Malaria Control** in the Department of Biochemistry reiterated the importance of on-going, trans-disciplinary research, in an effort to eliminate the disease that remains one of Africa's greatest killers (page 27).

Three UP researchers from the Faculty of Natural and Agricultural Sciences have emerged as winners of their respective categories in the NSTF-BHP Billiton Awards Ceremony recently – **Prof Brenda Wingfield**, **Prof Don Cowan** and **Prof Wanda Markotter** (page 3).

One of the interesting research projects in the Faculty is that of two scientists from the Department of Chemistry, **Prof Egmont Rohwer** and **Dr Yvette Naudé**, who investigated coffee-styled pinotage wine to establish the compounds

Message from the Dean

Be a part of the future of science

responsible for this contemporary profile.(page 34). Master's degree students, under the supervision of **Prof John Taylor** at the Department of Food Science at UP, developed a "super biscuit" that is rich in essential nutrients (page 31)

The University's commitment to the fight against hunger was reaffirmed when the **High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security** came together at the University during April.(page 39).

The University of Pretoria and the University of the Western Cape, together with their consortia partners will co-host the **DST Centre of Excellence for Food Security** and will provide an exciting opportunity to expand the work of the UP Institute for Food Nutrition and Well-being (page 26).

As always, we are very proud of the outstanding achievements of our staff in the Faculty, **Prof Brenda Wingfield**, Deputy Dean: Research and Postgraduate Studies received an A-rating from the National Research Foundation in 2014 (page 17). **Prof Namrita Lall**, an expert in Medicinal Plant Science was awarded the highest South African honour, the Order of Mapungubwe (Bronze), for her outstanding contribution in the field of medical sciences (page 18).

Prof Jolanda Roux from the Forestry and Agricultural Biotechnology Institute was awarded the International Union of Forest Research Organizations Scientific Award (page 15). Based on his citation rate, **Prof Kenneth Ozoemena**, an Extraordinary Professor in the Department of Chemistry, was ranked in the world's top 1% of chemists (page 16).

Two researchers in the Department of Zoology and Entomology featured prominently among the recently announced winners of the 2013 Southern African Science Lens (SASL) competition. **Dr Morgan Trimble** won first prize in the Science in Society category, while PhD candidate, **Mr Ryan Reisinger**, was named the runner-up in the Science in Action category for his photograph (page 22).

Werner Pansegrouw made the Department of Insurance and Actuarial Science proud when he was awarded the Vice-Chancellor and Principal's Medal for Excellent Undergraduate Academic Achievement as the best student in the Faculty of Natural and Agricultural Sciences, with a weighted average performance of 92% over his three years of study (page 47).

Stefan de Bruin, a BSc (Hons) (Geoinformatics)

student from the Department of Geography, Geoinformatics and Meteorology was awarded first prize in the category Best Student Project, at the first annual Isibalo Award Evening (page 47).

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.

As this is the last newsletter in which I will deliver the Dean's message before I take up the position of Vice-Principal: Institutional Planning, I would like to express my sincere gratitude and emphasise that it was an honour to lead the Faculty for ten years. This Faculty is one of the top faculties of sciences in the country, and I believe that it will continue to grow and prosper under the new leadership. Prof Brenda Wingfield will be the acting Dean from 15 August. I wish her well and trust that she will receive the same support from all of you.

Prof Anton Ströh

Dean: Faculty of Natural and Agricultural Sciences

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The Faculty of Natural and Agricultural Sciences also has a Facebook page. Please like us.

Three winners of NSTF-BHP Billiton Awards from Natural and Agricultural Sciences

Three researchers from the Faculty of Natural and Agricultural Sciences have emerged as winners of their respective categories in the NSTF-BHP Billiton Awards Ceremony held at Emperor's Palace on 3 July 2014.

They are “tree doctor” Prof Brenda Wingfield, genomics expert Prof Don Cowan and bat researcher Prof Wanda Markotter. The annual NSTF-BHP Billiton Awards Ceremony is widely recognised as South Africa’s “Science Oscars”, honouring achievers in scientific research and related activities. This year, seven of the 48 finalists came from UP.

Prof Brenda Wingfield’s work focuses on tree diseases caused by fungi. By unravelling the genetic make-up of these micro-organisms, she is helping the forestry industry combat tree pathogens that can decimate commercial plantations. In addition to several other leadership positions in the scientific community, she is also the Deputy Dean of the Faculty of Natural and Agricultural Sciences. Prof Wingfield won in the category for an outstanding contribution to science, engineering, technology and innovation (SETI) through research capacity development over the last five to ten years, an award sponsored by Eskom.

Prof Don Cowan, Director of UP’s Centre for Microbial Ecology and the Genomics and Genomics Research Institute, was a finalist in three categories, but shared the first place in the capacity building category with Prof Wingfield. His research focuses on microbial life found in extreme environments and he has done extensive work in Antarctica and the Namib.

Prof Wanda Markotter won in the category honouring emerging researchers who have made an outstanding contribution to SETI over a period of up to six years after obtaining a PhD. She is fascinated by bats and the role they play in ecosystems and in the spreading of diseases. Her research helps us understand where and how lyssa viruses – a type of virus carried by bats – occur.

The NSTF-BHP Billiton Awards are unique in South Africa, in that the call for nominations is public, the selection process and awards ceremony are collaborative, and the awards recognise a variety of outstanding contributions by individuals and teams to SETI. Top performing learners in mathematics and science in Grade 12 are also recognised each year as part of the Brilliant Programme for Future Innovators. The awards, under the patronage of the Minister of Science and Technology, have grown to be the most prestigious public SETI awards made in South Africa.



Prof Brenda Wingfield



Prof Don Cowan



Prof Wanda Markotter

First in-depth look at West Coast's own Heaviside's dolphins

All Heaviside's dolphins found along Southern Africa's West Coast are related and belong to one of two major populations. This is one of the findings of the first in-depth genetic study about this endemic dolphin species that is only found from Table Bay to southern Angola. The species may be sensitive to overharvesting by the hake fishing industry.

The study was conducted by conservation geneticist and Capetonian, Dr Keshni Gopal, as part of her doctoral research in Zoology. She received her PhD degree from the University of Pretoria in April, during the University's Autumn Graduation Ceremonies.

She conducted various sensitivity analyses, to consider how changes in life history traits or environmental variations can influence the resilience of the populations.

These techniques were also used to test the effect of different management approaches. In the process, her research revealed that, if as

few as 15 individuals are removed from a small population of 10 000 members, it can have a dire effect on the overall population size of Heaviside's dolphins (*Cephalorhynchus heavisidii*).

By determining the genetic relationship between the different populations, Dr Gopal helped to identify smaller population units. Knowledge of such units is vital to ensure effective conservation management strategies. Her data will have great value in updating the species' conservation status.

Heaviside's dolphins are currently classified as "Data Deficient" by the IUCN Red List of Threatened Species, because so little is known about their population size and life history traits, including direct and indirect threats that may lead to their extinction.



Dr Keshni Gopal during one of her many sampling trips off the West Coast.

Heaviside's dolphins are endemic to the Southern African coastline, and are only found from Table Bay to southern Angola. Photo: Dr Ryan Reisinger





All Heaviside's dolphins found along southern Africa's West Coast are related, and belong to one of two major populations.

Photo: NanaTakanawa

"What is currently known about its biology and behaviour comes from opportunistic research, rather than long term studies," explains Dr Gopal. "Hopefully the results of this study can be incorporated into risk assessments and much-needed conservation management and monitoring strategies for this species, and help towards its long-term survival."

"I've always had a great passion for the marine world, and using dolphins as my study subject to conduct genetic analyses, was a dream come true," says Dr Gopal, who has done similar studies on rock lobsters in the past.

The sight of an albino Heaviside's dolphin off Hondeklipbaai during one of her sampling trips is one that she will always treasure. Hondeklipbaai is one of seven coastal areas along the West

Coast that she visited regularly during the course of four hot summers. She collected biopsy tissue samples from 395 dolphins living in Table Bay, St Helena Bay, Lambert's Bay, Hondeklipbaai, Port Nolloth, as well as near Luderitz and Walvis Bay in Namibia.

Dr Gopal did her genetic analyses in Leslie Hill Molecular Laboratory of the South African National Biodiversity Institute in Cape Town, where she works as a scientist.

"An unexpected, but positive experience was the opportunity to share information about my research to local fishermen in some of the fishing villages along the West Coast." Dr Gopal remembers the opportunities she had to convey valuable information about marine conservation.

"The fishing communities in these areas have adopted the dolphins as their own, as I still often receive messages from them informing me about 'their dolphins' and new additions to their area."

Reference: Gopal, K. (2014). A genetic study of two inshore dolphin species (*Cephalorhynchus heavisidii* and *Tursiops aduncus*) found along the coast of South Africa. Unpublished doctoral thesis, University of Pretoria.

New technique finds anti-HIV compounds in indigenous plant species

An indigenous grey-leaved shrub with clusters of tiny honey-scented flowers gave Dr Heino Heyman, a researcher in the Department of Plant Science in the Faculty of Natural and Agricultural Sciences all the proof that he wanted: nuclear magnetic resonance-based techniques (NMR-based techniques) can speed up the testing of various compounds to see which are the most applicable to use in the development of HIV medicines.

Dr Heyman received his doctorate in medical plant science at the University of Pretoria in April, for the research he has done to show how nuclear magnetic resonance (NMR) based metabolomics techniques can be used to speed up the process of discovering drugs against diseases like HIV. His doctorate research is an extension of the work he did in 2009 as part of his MSc degree, in which he started to use NMR-based metabolomics techniques to test for the anti-HIV properties of *Helichrysum* species.

Researchers worldwide realise the urgency of finding drugs which can be used to treat the effects state of diseases that occur concurrently with HIV-infection. In this way the epidemic effects of the dissemination of this infection can be curtailed. However, there are vast numbers of compounds and extracts that first need to be chemically screened to ultimately find a few that have the potential to kill or suppress this virus.

"The drug discovery process of antiviral constituents is very tedious, time consuming and also expensive," Dr Heyman says. "We therefore need a method with which to perform the fractionation, purification and isolation of compounds more efficiently."

To this end, he turned his attention to securing a quick and effective technique that can help other researchers in this screening process.

He focussed his research on nuclear magnetic resonance (NMR) techniques with which specific metabolites can be identified. NMR spectrometers



Dr Heino Heyman in the laboratory, making plant extracts.

can determine the specific characteristic of a molecule. Metabolites are small molecules that are produced during the metabolism process of a cell, and can, for instance, be involved in producing energy or cell structures, or in providing defence mechanisms to a cell.

All metabolites have their own unique sets of "fingerprints", based on the chemicals from which they are built up of. These all radiate energy at a specific, unique and therefore identifiable frequency when investigated with NMR spectrometers.



Dr Heyman found that NMR-based metabolomics and multivariate data analysis can be successfully combined to compare the chemistry of numerous samples, based on their specific weight, with that of HIV.

"This information can be used to determine the differences and similarities between various samples, based on their specific activity against HIV," he says.

The common chemical factor or "fingerprint" of various samples that have high activity against HIV was successfully determined. Dr Heyman then used this "fingerprint" to see if his method would also work to identify virus-fighting compounds among selected South Africa's indigenous plants – and to do so quickly and effectively.

His attention fell on members of the *Helichrysum* genus of plants, as these are often used as traditional remedies to treat coughs, colds, fever, infection, headaches, and menstrual pain. The plants are also sometimes used as wound dressing because of their potential antibacterial properties. Previous studies have shown that *Helichrysum aureonitens* has anti-virus properties that can be used to fight the herpes virus, while other *Helichrysum* species could have an effect on HIV.

After testing 30 species, Dr Heyman discovered anti-HIV compounds for the first time in *Helichrysum populifolium*. This shrub of up to 2 meters tall, is called the *poplar helichrysum*, because its grey leaves resemble that of poplar trees.

Reference:

Heyman, H.M. (2014): Identification of anti-HIV compounds in *Helichrysum* species (Asteraceae) by means of NMR-based metabolomic guided fractionation. Unpublished PhD thesis, University of Pretoria.

Helichrysum populifolium, known locally as *poplar helichrysum*.

Study asks for ban on 4x4s in protected areas

Soil damage caused by 4x4 vehicles is underestimated, long term – between 5 and 1 000 years – and mostly irreversible. Due to their negative environmental impact, vehicles should not be allowed to do off-road driving in protected areas. Strict legal measures should be applied to regulate 4x4 use in such areas, while very sensitive areas, such as wetland areas, should be classified as absolute no-go areas.

The abovementioned is the conclusion of Dr Gerhard Nortjé, a soil scientist, based on findings from his doctoral research in wildlife management. He did his research at the University of Pretoria's Centre for Wildlife Management in the Faculty of Natural and Agricultural Sciences. He received his PhD degree earlier this year.

"While it may not seem that off-road driving has negative impacts on the environment, especially on the soil and vegetation, the risk of damage is real," says Dr Nortjé. "It is not an ecologically sustainable practice and should therefore not be allowed." He says that increased soil erosion, damage to vegetation and habitat destruction are only some of the visible negative impacts of this popular so-called 'eco-tourism' activity.

Dr Nortjé, who focused his research in the Makuleke Contractual Park in the northern Pafuri section of the Kruger National Park (KNP), argues that SANParks should reconsider its management strategies for off-road driving in protected areas altogether.

SANPark's best practice guidelines currently recognise the potential of off-road driving to negatively impact natural resources, but do not explicitly refer to soil damage. Some of the current off-road driving guidelines have, up until Dr Nortjé's study, never been tested or scientifically validated. One guideline, for instance, states that vehicles may not drive in each other's tracks when going off-road. This is exactly the opposite of what Dr Nortjé's research has shown, namely that up to 90% of damage is caused the first time a vehicle passes over an area, irrespective of soil type or tyre pressure of the vehicle. Driving on the same tracks a few times is therefore much less damaging than driving only once on different tracks.

"Vehicles should be driven in the same tracks when driving off-road as a form of traffic control, and lower tyre pressures should be used," advises Dr Nortjé.

He says that in game reserves, off-road driving is often done on virgin, undisturbed soils. Wild animals tend to concentrate in areas with the most nutritious and palatable vegetation. Consequently, these are also the areas where predators are most likely to be found, and the areas with the highest frequencies of off-road driving, to bring tourists close to wildlife.

"Tourists' ignorance and lack of consideration for the environment – or the soil for that matter – combined with operators' and land owners' need to make money, is normally the reason for allowing off-road driving," says Dr Nortjé.



Dr Gerhard Nortjé owns a 4x4, but only uses it in designated areas, such as official 4x4 routes, where damage to road surfaces is kept to a minimum.

Photo: Gerhard Nortjé.



A game drive vehicle loaded with 10 sand bags, each weighing 70 kg, was used to simulate conditions in which a vehicle, fully laden with tourists (weighing about 3 795 kg in total) will drive in different conditions.

Photo: Gerhard Nortjé

Woven mats can mean the end of dongas



Palm mats



Dr Garry Paterson

Woven mats, made from palm leaves, might just be the solution to the soil erosion problem in many parts of South Africa and could also lead to the start of various local mat-weaving enterprises.

This is the finding of Dr Garry Paterson after the research he has done on the effective use of natural geotextiles to control soil erosion.

Paterson, a soil scientist at the Agricultural Research Council's Institute for Soil, Climate and Water, received his doctoral degree from the University of Pretoria in April this year.

As an experienced soil scientist, the results of poor land use practices in many South African regions are all too obvious to him. "When the soil surface becomes exposed, valuable topsoil is easily washed away during intense rains," explains Dr Paterson. "This eventually leads to the formation of rills and gullies, otherwise known as dongas."

The best way to prevent this from happening is to cover the surface with some sort of material which will intercept the rain and stop the surface runoff that leads to soil removal. Geotextiles, made from plastic or wire, are often used for this purpose, but can be expensive. Furthermore, being synthetic, these are not preferable for the environment. (Geotextiles are materials that can be placed or rolled out on the soil surface).

A possible solution is to use locally occurring plant materials, which can be woven into mesh-like, yet flexible 50 x 50 cm mats. These waffle-like mats are fixed to the soil surface to provide the required protection. The effectiveness of such mats, made from *Borassus* palm tree leaves, sourced from the Gambia were initially tested by researchers from the University of Wolverhampton in the United Kingdom.

This subsequently led to a project between 2005 and 2009, funded by the European Commission. This project tested and quantified the effectiveness of the mats in tropical and sub-tropical areas. It involved ten countries, including the UK, Belgium, Hungary and Lithuania, as well as Brazil, the Gambia, Thailand, China, South Africa and Vietnam. Dr Paterson was responsible for evaluating the mats under South African conditions, and assessed the benefits of the mats at various sites in KwaZulu-Natal, the Free State, Gauteng, and Limpopo.

He found that the mats are a practical, natural alternative to synthetic geo-textiles, and can be used in a range of environments to reduce damaging soil erosion. Results were very positive, with significant reduction in the amount of surface runoff, as well as the sediment carried away by the water. The mats stabilised the soil, which in turn, allowed the re-establishment of plants. The fact that the mats are made from natural material means that they decompose slowly into the topsoil.

An added benefit is that the mats can be produced, using low-input techniques, by harnessing the weaving skills of people in many rural communities. "Communities that use this technique benefit from soil conservation and income generation," reflects Dr Paterson, who says that the organisation "Working for Wetlands" has shown interest in using the technique in some of their field areas.

"With some basic sponsorship, and collaboration between the local structures of various provincial departments, a worthwhile co-operative could be established to supply material to participants for weaving," he believes. "The mats can then be used at sites in the local environment, where they are most needed."

Dr Paterson is of Scottish descent, but has worked as a soil scientist at the Agricultural Research Council's Institute for Soil, Climate and Water in Pretoria since 1981. He has worked on various soil classification, investigation, and mapping projects throughout South Africa. This includes the Gautrain project and the erection of Eskom transmission lines. He has done surveys for mining, housing, roads, pipelines and forestry.

Dr Paterson is the past President of the Soil Science Society of South Africa (SSSSA), as well as the current Vice-Chairman of the South African Chapter of the International Erosion Control Association and Convenor of the South African Soil Classification Working Group.

Top academics inspire with their awards

The University of Pretoria recently paid tribute to its academics from various fields of study, for their outstanding research and teaching and learning endeavours.

Awards for Exceptional Academic Achievers, Exceptional Young Researchers, and the Teaching Excellence and Innovation Laureate Awards were presented. Researchers and teaching staff in the Faculty of Natural and Agricultural Sciences performed extremely well and scooped up many of the awards at the 2014 Awards Ceremony, held in May.

On this evening, the University's brightest minds were honoured at a gala dinner. The new National Research Foundation (NRF)-rated researchers were announced, with more than 60 academics being recognised at the event. Prof Don Cowan and Prof Brenda Wingfield, both from the Faculty of Natural and Agricultural Sciences, received their NRF A-ratings and many others received B, C and Y ratings from the NRF. Two B-ratings, 24 C-ratings, and 12 Y-ratings were awarded.

Through this event, the University of Pretoria formally paid tribute to the level of commitment of its academics to furthering the University's vision of being a leading research intensive university in Africa.

New A-rated researchers



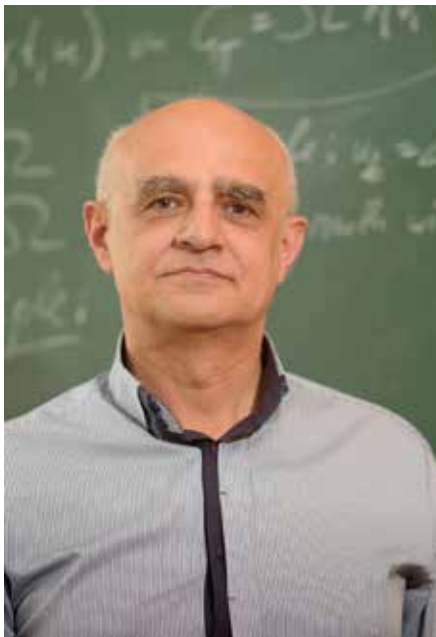
Prof Don Cowan



Prof Brenda Wingfield

In the category **Exceptional Academic Achievers** the following academics from the Faculty of Natural and Agricultural Sciences were recognised for their research: Prof Roumen Anguelov (Department of Mathematics and Applied Mathematics), Prof Marthan Bester (Mammal Research Institute and Department of Zoology and Entomology), Prof Jaco Greeff (Department of Genetics), Prof Lise Korsten (Department of Microbiology and Plant Pathology), Prof Zander Myburg (Department of Genetics – Chair in Forest Genomics and Biotechnology) and Prof Jolanda Roux (Forestry and Agricultural Biotechnology Institute and Department of Microbiology and Plant Pathology).

Exceptional Academic Achievers



Prof Roumen Anguelov



Prof Marthan Bester



Prof Jaco Greeff



Prof Lise Korsten



Prof Zander Myburg



Prof Jolanda Roux

Exceptional Young Researchers



Prof Wanda Markotter



Prof Ferdinand Meyer



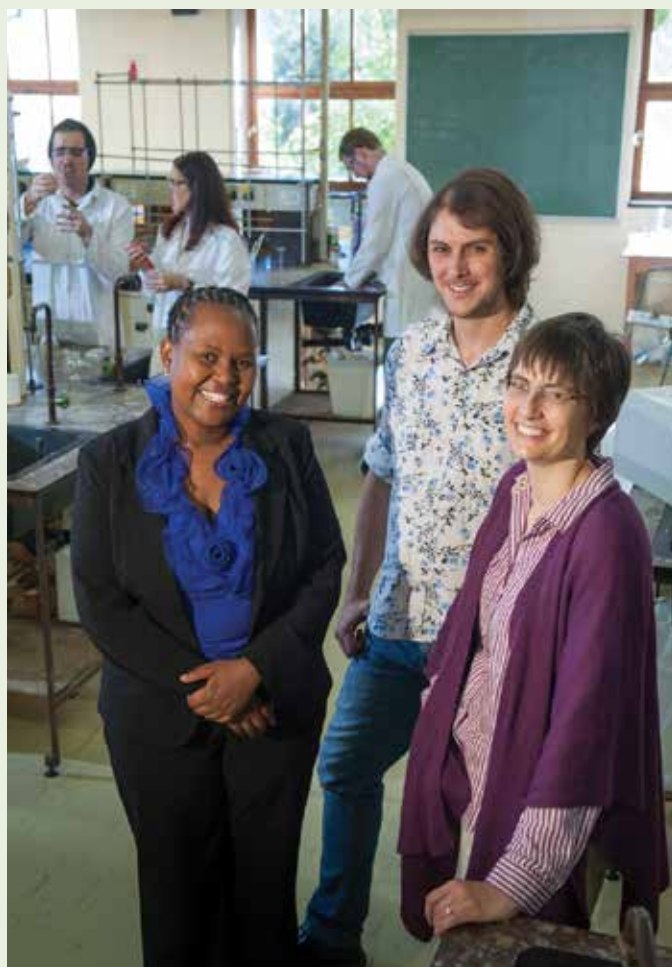
Dr Chris Weldon

The **Exceptional Young Researchers** in the Faculty are: Prof Wanda Markotter (Viral Zoonosis Research Group, Department of Microbiology and Plant Pathology), Prof Ferdinand Meyer (Bureau for Food and Agricultural Policy, Department of Agricultural Economics, Extension and Rural Development) and Dr Chris Weldon (Department of Zoology and Entomology).

The **Teaching Excellence and Innovation Laureate Awards** were awarded for the project *Organic chemistry practicals: paradigm shift*. Two of the three staff members involved in this project, Dr Darren Riley and Dr Lynne Pilcher are from the Department of Chemistry.

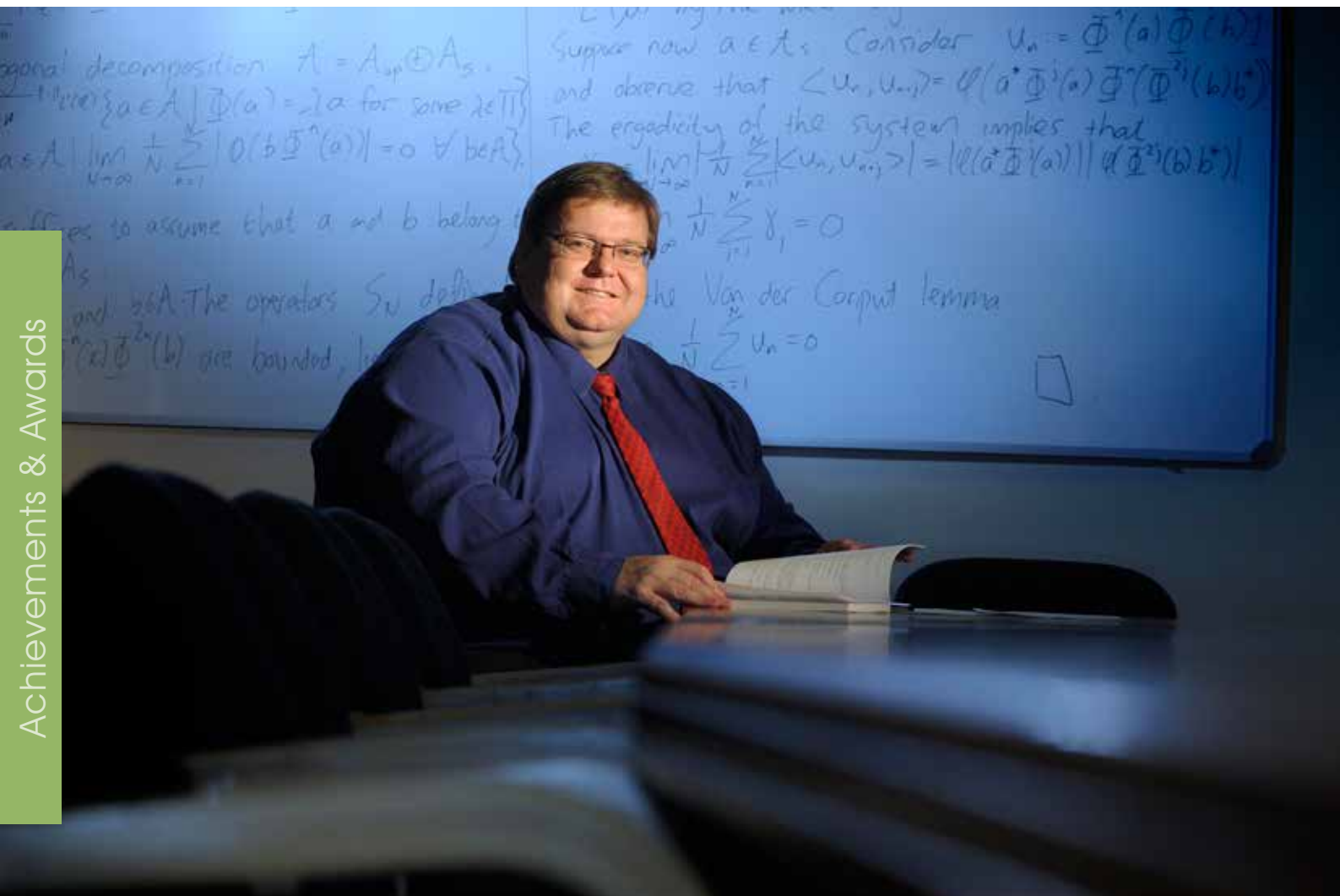
Guest speaker and President of the Academy of Science of South Africa, and holder of the South African Research Chair in Computational Mechanics at UCT, Prof Daya Reddy, inspired the audience by giving due respect to the quality and importance of research and research intensive universities. He congratulated the achievers, saying: "We can be certain of one thing: this country needs you, needs top scholars, wherever your interests lie along the spectrum of applicability. You need to be inspired, and as a successful scholar, also to inspire. In fact, seduce the younger generation of bright sparks into the world of scholarship which is worthy of the name."

Teaching Excellence and Innovation Laureate Award winners



Kgadi Mathabathe, Dr Darren Riley and Dr Lynne Pilcher

Prof Ströh appointed as Vice-Principal: Institutional Planning



Prof Anton Ströh

Prof Anton Ströh (49), Dean of the Faculty of Natural and Agricultural Sciences, will take up the position as the new Vice-Principal: Institutional Planning at the University, on 15 August 2014.

This appointment confirms his continuing list of achievements and reflects on his life and career – characterised by a long list of personal, as well as professional highlights and achievements.

As Prof Ströh said: “This position will be an opportunity for me to contribute in shaping the future of the University, and through collective

leadership, steer the University of Pretoria towards achieving the goals as set out in the UP Strategic Plan. The cross-cutting nature of this position is particularly interesting, since I will work closely with other executive members, the deans of faculties and directors of support departments to integrate and optimise the strategic planning needed for shaping the future of the University.”

Not only was he the youngest person ever to be appointed as Dean of this Faculty, but he was also the first Dean to be re-appointed for a third consecutive term, in June 2012.

Prof Ströh will most definitely leave a legacy of excellence behind when he takes up his new position. During his term as Dean, the Faculty was able to significantly enhance its international research profile. Publication outputs increased meaningfully over the past five years, from 235 DHET units in 2007 to 335 units in 2013. Through a well-defined staff development programme introduced under his stewardship, the number of NRF rated scientists increased by 65% to a total of 150, which constitutes more than 40% of the UP establishment. In addition, the percentage of academic staff with PhD as the

highest qualification increased from 60% to 73% during the past four years. Research publications improved substantially in number and quality and currently, 95% of our publications are published in ISI journals. The Faculty increased its PhD student numbers by doubling the annual new enrolments, while the number of postdoctoral fellows increased by more than 50%. The diversity profile of our students improved considerably and students from the designated groups currently represent more than 50% of the total number of students.

"People are the most important asset of a university and it is through demonstrating exceptional leadership and human relationship skills that I believe I have succeeded in inspiring academic and support staff to achieve excellence in their work across the Faculty," Prof Ströh said when asked why the Faculty has performed so well.

Prof Ströh obtained his PhD at the age of 24 and throughout his life he demonstrated his passion for mathematics, as researcher and problem-solver at heart.

In 1988 he was appointed as Lecturer in the Department of Mathematics and Applied Mathematics and in 1990 he was promoted to the position of Senior Lecturer. In 1994, the renowned Banach Centre in Warsaw invited him to do research for a period of six months. During this visit Prof Ströh managed to obtain a complete Riesz decomposition theory, relative to closed ideals in operator algebras, by solving in its most general form, a question on ideal structures of operator algebras jointly with Prof L Zsido from Rome, Italy. In July of the same year he received the University's Young Researcher of the Year Award and in 1996 Prof Ströh was promoted to the position of Associate Professor.

In January 2000 he was promoted to the position of Professor and in October 2000 he was appointed as the Head of the Department of Mathematics and Applied Mathematics. In the same year, he was appointed

as the Chairperson of the School of Mathematical Sciences, which comprises the departments of Mathematics and Applied Mathematics, Statistics and Insurance and Actuarial Science. His first term as Dean commenced in 2004 and he was reappointed in 2008, to serve another four years. In 2008 he was also elected by the Senate as a member of the Council of the University. In 2010 the Council elected him to serve on its standing Committee of the Council. Furthermore, Prof Ströh was elected Chair of the National Science Deans Forum (NSDF) in 2009.

Apart from establishing the Faculty as one of the top science faculties in South Africa, he continuously endeavoured to position the Faculty as the leading science faculty on the African continent. The Faculty contributes significantly, through its postgraduate research, to solve some of the major challenges the continent faces regarding poverty, food-, energy- and water security, climate change and its impact on agriculture, animal- and human health, as well as economic sustainability.

Prof Ströh delivered various papers at local and international conferences and was an organiser of five international conferences. He is the author of various research articles published in internationally accredited journals. In 2001, he received a gold medal from the South African Mathematical Society for his contribution to research capacity building and in 2003, 2006, 2009 and 2012, he received an Exceptional Achievers Award from the University of Pretoria. He is currently recognised by the international fraternity in his field for the significant scholarly contributions in his field of research and held a B2 rating from the National Research Foundation from 2009 to 2013.

Prof Ströh is married to Ronel and they have two sons, Werner and Reinhardt.

Prof Brenda Wingfield, currently Deputy Dean: Research and Postgraduate Studies, will act as Dean, from 15 August 2014 until an appointment is made.



Prof Anton Ströh and Derek Hanekom, former Minister of Science and Technology at a National Science Deans Forum (NSDF) meeting.

Prof Jolanda Roux receives IUFRO Scientific Award

Prof Jolanda Roux from the University of Pretoria's Forestry and Agricultural Biotechnology Institute (FABI) in the Faculty of Natural and Agricultural Sciences, was awarded the International Union of Forest Research Organizations (IUFRO) Scientific Award.

This prestigious award, which is the highest that is given to forestry researchers, will be bestowed on her at the next IUFRO World Congress in October this year. One award is given every five years in each of nine categories and Prof Roux will receive the award for research accomplishment in the field of Tree Health.

In 2012 Prof Roux also won the NSTF-BHP-Billiton Award (sponsored by Eskom) in the category Female Researcher who made an outstanding contribution to SETI through Research Capacity Development over the last five to ten years. In 2011 she was awarded

the Queen's Award for Forestry, by the Commonwealth Forestry Association, when she met Queen Elizabeth II. Prof Roux has received many other forms of recognition for her work, notably the DSTs Distinguished Young Women in Science Award, also in 2011.

Prof Roux is a professor in the Department of Microbiology and Plant Pathology, a member of the management committee of FABI and the manager of the Tree Protection Cooperative Programme's field and extension services.

Her research focuses on tree diseases and she is particularly passionate about tree health in general and more specifically, fungi that cause diseases of trees on the African continent. She collaborates with researchers in many other parts of the world and has travelled widely to undertake her research.

Prof Roux has published over 120 papers in her research area and has successfully supervised numerous PhD and MSc students. She serves on a number of international committees and is currently the coordinator for the Division Research Group on Forest Pathology of the International Union of Forestry Research Organisation.

She is currently the Vice-President of the Southern African Society for Plant Pathology, serves on the editorial boards of the *South African Journal of Science, Forestry and Forest Pathology*, and is an honorary professor in the Chinese Academy of Forestry.

Prof Jolanda Roux



Prof Kenneth Ozoemena ranked in top 1% of world's chemists

Based on his citation rate, Prof Kenneth Ozoemena, an Extraordinary Professor in the Department of Chemistry, was ranked in the world's top 1% of chemists. This is according to the *Essential Science Indicators* of ISI Thomson Reuters and is based on journal article citation rates.

By February 2014, he had published 125 articles in leading scientific journals (such as *ChemComm*, *J Mater Chem*, *Energy Environ Sci*, *PCCP*, *ACS Appl Mater Interfaces*, *Langmuir*, *Electrochem Commun*, and *Electrochim Acta*) as well as six book chapters. He was cited 2 674 times and holds an H-index of 30 and i10-index of 74 (indicating that each of his 74 papers has been cited at least 10 times). Between 2006 and 2010 four of his publications were recognised by the Royal Society of Chemistry and Elsevier Publishers as "top hottest articles".

Prof Ozoemena is the Principal Researcher and Research Group Leader of the Electrochemical Energy Technologies at the CSIR Materials Science and Manufacturing Division. His research is highly interdisciplinary, spanning several areas of Materials Science and Electrochemistry. This includes among others, synthetic inorganic chemistry and electrochemical sensing to electrocatalysis and electrochemical energy systems. Presently, his research focus is on the electrochemistry of nanostructured materials and redox-active N4-macrocyclic metal complexes (e.g. metallophthalocyanines) with a view to establishing their potential applications in the development of electrochemical energy systems (i.e. fuel cells, electrochemical capacitors, and lithium/sodium ion batteries, as well as dye-sensitised solar cells).

He obtained his PhD degree in Chemistry in 2003 at Rhodes University, after which he completed postgraduate qualifications in Management Development (MDP), as well as in Higher Education (PGCHE) at the University of Pretoria. Furthermore, he is an Extraordinary Professor at the University of the Western Cape. Prof Ozoemena is currently a B-2 rated NRF researcher. Besides being awarded the

"*Exceptional Young Researcher Achievement Award*" by UP in 2009, he also received the "*Outstanding Young Academic Award*" from Nigeria (Office of the Nigeria High Commissioner in South Africa) in 2009, and the CSIR "*Research Excellence Award*" for 2012.

Prof Ozoemena was admitted as a Fellow of the Royal Society of Chemistry (FRSC) (UK) in May 2011 and attained the status of *Chartered Chemist (CChem)* of the Royal Society of Chemistry (UK) in February 2008.

He also attained the *Chartered Scientist (CSci)* qualification of the Science Council (UK) in 2008. He is a member of the editorial board of several scientific journals, (including *Electrochemistry Communications*), as well as Associate Editor of *Materials Focus*, and served as Guest Editor of *Electrochemical Acta* and *Journal of Porphyrins and Phthalocyanines*.

Prof Kenneth Ozoemena



Prof Brenda Wingfield received A-rating from NRF

Prof Brenda Wingfield, a researcher of high international standing received an A-rating from the National Research Foundation (NRF), effective from 2014. She is also the first women in the Faculty to receive this rating.

This achievement is even more exceptional because both she and her husband, Prof Mike Wingfield, Director of the Forestry and Agricultural Biotechnology Institute (FABI) will now be A-rated scientists in the same faculty.

Prof Wingfield is the Deputy Dean for Research and Postgraduate Studies in the Faculty of Natural and Agricultural Sciences and was elected to the Council of the Academy of Science of South Africa (ASSAf) for the 2012 to 2016 cycle. She is also the Secretary General of the International Society for Plant Pathology (ISPP).

She has published more than 300 peer-reviewed articles. Prof Wingfield is one of the Research Leaders of the Department of Science and Technology (DST)/NRF Centre of Excellence in Tree Health Biotechnology, past Chairperson of the National Science and Technology Forum (NSTF) and previous Vice-Chairperson of the Board of Trustees of PlantBio, one of the national biotechnology innovation centres.

Prof Wingfield was the winner of the Department of Water Affairs and Forestry's Women in Water, Sanitation, and Forestry Research Award in 2007, the DSTs Distinguished Women in Science Award in 2008 and the African Union's Women in Science Regional (Southern) Award in 2009. Prior to this award, she was recognised four times as an Exceptional Academic Achiever. She was awarded the Chancellor's Award for Research in 2012.

Her research interests include fungal population genetics and fungal phylogenetics. In addition to her internationally recognised research programme on the molecular phylogeny and taxonomy of tree pathogenic fungi, she is now developing a fungal genomics programme. Prof Wingfield's research team has recently published their first genomics paper, *First fungal genome sequence from Africa: Consequences scientific*

and regional. Her research team has already sequenced an additional twenty fungal genomes. This veritable "tsunami" of sequence data is contributing significantly to the research which is being accomplished at the University of Pretoria.

The Faculty of Natural and Agricultural Sciences is proud to add Prof Brenda Wingfield's name to the list of existing A-rated researchers in the Faculty. These researchers are Prof Nigel Bennett, Prof Don Cowan, Prof Robert (Bob) Millar, Prof Brian Rand and Prof Mike Wingfield.

Prof Brenda Wingfield



Prof Lall received Presidential Award for outstanding research in medical sciences

Prof Namrita Lall, an expert in Medicinal Plant Science at the University of Pretoria has been awarded the highest South African honour, the Order of Mapungubwe (Bronze), for her outstanding contribution in the field of medical sciences.

The official awards ceremony was held on 27 April 2014, at the Presidential Guest House. According to Dr Cassius Lubisi, director-general in the Presidency and Secretary of the Cabinet, "Prof Lall's research is giving hope to many who are plagued with the scourge of tuberculosis."

The Order of Mapungubwe recognises South Africans who have accomplished excellence and exceptional achievement to the benefit of South Africa and beyond.

Prof Lall was elated about the award and said: "I am highly inspired and motivated and would like to pursue my research activities with more enthusiasm. I am utilising the potential of this country's plant-diversity for the betterment of human kind."

"The support from the University of Pretoria, funding organisations, National Research Foundation, Department of Science and Technology and above all, my colleagues, in particular, Prof Marion Meyer, and postgraduate students is greatly acknowledged. My success would not be possible without their support."

Prof Lall also received the prestigious South African Women in Science Award from the Department of Science and Technology in 2011 for her outstanding scientific contributions to advancing science and building the knowledge base in the field of Indigenous Knowledge Systems. She has also received numerous other awards, including the prestigious "UNESCO-L'Oréal for Women in Science" award in 2002.

She has developed novel assays for the application in drug-screening and analysis from botanical sources. Prof Lall is internationally recognised for her contributions to bio-prospecting

from traditional knowledge on medicinal plants. Her research focus has been on scientifically validating the usages of plants for diseases such as TB, cancer, hyperpigmentation disorders and periodontal diseases. In this context, she has also demonstrated her commitment to various communities around the country by engaging them towards a better understanding of indigenous knowledge and by advancing phytomedicines towards conventional pharmaceutical products.

Prof Lall is currently on the editorial boards of several academic journals and is a reviewer for over 15 local and international research journals. Her academic record speaks for itself with more than 100 peer-reviewed articles published. She is also the co-inventor of 11 international and national patents. In addition to this, she has authored seven book chapters.

"I am fascinated by South Africa's plant diversity and its largely untapped potential in the use thereof in medicinal and cosmeceutical fields. With about 25 000 known species, this country is third only to Brazil and Indonesia as far as biodiversity is concerned. This constitutes about one tenth of all plant species in the world."

Prof Lall added that "most people are unaware that a significant percentage of the active ingredients used in modern medicine originated from plants. For example, quinine, until fairly recently the most common treatment for malaria, is extracted from the bark of the Cinchona plants, while aspirin was developed from willow bark extract. Therefore, our goal is to scientifically explore and test South Africa's indigenous plants and see which of them could possibly provide chemical compounds that could be of benefit to all mankind."

Prof Namrita Lall



Debra Deel-science programme on television

Debra Deel, a television programme which aims to make science more accessible to the public at large, started on Wednesday, 9 July at 20:30 on KykNET.

The programme is the brainchild of Prof Debra Meyer, acclaimed researcher and Head of the Department of Biochemistry in the Faculty of Natural- and Agricultural Sciences. She is also the programme presenter.

Prof Meyer is a familiar person on television – she was the weather presenter on SABC 2 for more than twelve years.

“Science is part of everything and good research is the reason why the quality of life of modern man is continually improving. With this programme we will endeavour, in simple terms, to explain current matters which are related to science,” said Prof Meyer.

Topics which will be addressed in this series include, amongst others, hydro fracking and its implications for the Karoo, what biofuels are and whether we need it or not, the reason why lifestyle diseases are becoming more common, large data-projects such as the SKA, innovative technologies, home remedies or science in common things and how to control infectious diseases .

“Many of the things in daily use had their origin in laboratories and the public at large do not always realise this.”

Prof Meyer pointed out that the series will not promote a specific point of view, regarding the topics of the programmes, but will only endeavour to highlight the more important aspects of each topic. “Afterwards viewers can investigate further and come to their own conclusions.”

The series is produced by Khaki Productions and consists of thirteen episodes. KykNET (Channel 144) and “KykNET en Kie” (Channel 145) is on the pay channel, DSTV.



Prof Debra Meyer

Prestigious journal, *Nature*, publishes research led by UP scientist

A researcher at the University of Pretoria (UP), Prof Zander Myburg, was the lead investigator in a global project to unravel the genetic blueprint of *Eucalyptus grandis*, a species from a genus of fast-growing trees, commonly known as blue gum trees in South Africa. Prof Myburg is the Director of the Forestry Molecular Genetics Programme in the Department of Genetics at the University of Pretoria.

The successful sequencing of this genome was published in the prestigious, high-impact scientific journal, *Nature*, on 19 June 2014.

"Now that we understand which genes determine specific characteristics in these trees, we can breed trees that grow faster, have higher quality wood, use water more efficiently, and will better cope with climate change," Prof Myburg explains the significance of this major scientific

milestone. "Even more, we can turn well-managed *Eucalyptus* plantations into bio-factories to produce specific kinds of sought-after materials and chemicals."

"With this new knowledge regarding the molecular basis for superior growth and specific adaptations in plants, we can apply the same techniques to other woody plants that can be used as feedstock in the bio-economy of the future."

Blue gum trees are highly adaptable and grow exceptionally fast. While native to Australia, these trees are planted worldwide, mainly for timber, pulp and paper production, but increasingly also for "chemical cellulose" – a form of pure cellulose which is used in a wide variety of industrial products, including textiles and pharmaceuticals.

The project to sequence the *Eucalyptus grandis* genome involved 80 researchers from 30 institutions across 18 countries. It took them five years to sequence and analyse the 640 million base pair genome. Combing through the more than 36 000 genes found in *Eucalyptus*, the researchers homed in on those that may be able to boost the economic value of the trees. This can be done by influencing the production of cellulosic raw material which can be processed for pulp, paper, biomaterials and bioenergy applications.

"As one of the lead organisations, the University of Pretoria is delighted with the positive outcomes of the project and the exciting new opportunities for our genomic research programmes," says Prof Anton Ströh, Dean of the Faculty of Natural and Agricultural Sciences at UP.



Prof Zander Myburg

Prominent co-leaders on the project include: Prof Dario Grattapaglia of the Brazilian Agricultural Research Corporation (EMBRAPA) and Catholic University of Brasilia; Dr Gerald Tuskan of the Oak Ridge National Laboratory (ORNL) and the BioEnergy Science Centre (BESC) and US Department of Energy Joint Genome Institute (DOE JGI); Prof Dan Rokhsar of the DOE JGI and Dr Jeremy Schmutz of the DOE JGI and the Hudson Alpha Institute for Biotechnology.

The US Department of Energy was a major funder of this project, via its Joint Genome Institute in Walnut Creek, California, where most of the DNA sequencing was done. South Africa's Department of Science and Technology (DST), together with forestry companies, Sappi and Mondi, supported Prof Myburg and his team by funding the construction of the genome map, used as a scaffold for genome assembly, as well as the sequencing of expressed genes used for annotation of the genome.

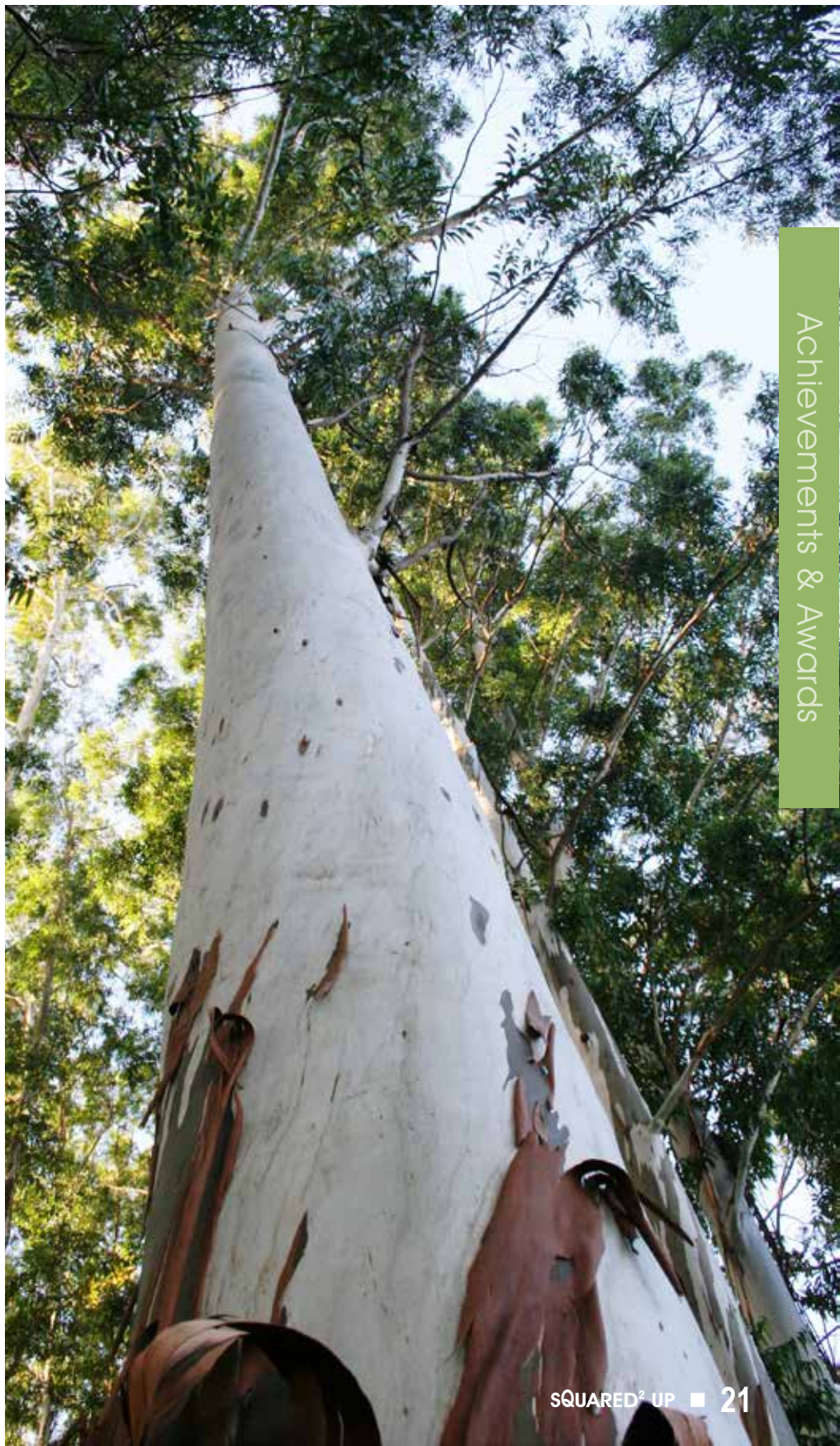
"The development of new knowledge and skills in tree genomics and the application of that knowledge to enhance industry competitiveness is directly aligned with the DSTs vision of a bio-economy", says Dr Phil Mjwara, Director General of the Department of Science and Technology. "This is a superb example of full value-chain thinking, and thus an important investment for the Department."

Prof Myburg's research team identified genes encoding 18 final enzymatic steps for the production of cellulose and the hemicellulose xylan, both carbohydrates that are enriched in wood fibre cells and can be used for biofuel production. "By tracing their evolutionary lineages and expression in woody tissues, we defined a core set of genes for biopolymer production that are highly expressed in the development of xylem – the woody tissue that helps to channel water throughout the plant and strengthens the tree," he explains.

Team members, Dr Carsten Külheim and Prof Bill Foley at the Australian National University (ANU) also found that among sequenced plants to date, *Eucalyptus* showed the highest diversity of genes for specialised metabolites, such as terpenes. These hydrocarbons serve as chemical self-defences against pests, as well as providing the familiar aromatic essential oils used in medicinal cough drops and in industrial processes.

Among the family of terpene compounds naturally produced in plants and in particularly high abundance in *Eucalyptus* trees, derivatives of sesquiterpenes that contain 15-carbon atoms (diesel fuel typically contains 10 to 24 carbon atoms) may be promising alternatives for petroleum-based fuels. Researchers have already made important break-throughs in engineering aspects of terpene biosynthesis into microbes, such as bacteria and yeast.

"This means that in future we could use specially selected *Eucalyptus* genes in bacteria and yeasts, turning them into bio-factories to manufacture advanced biofuels on a large scale," Prof Myburg says. "In future, jumbo jets may take off, powered by renewable *Eucalyptus*-based fuel."



Winning photographs communicate contributions of Science

Category:
International Year of Water Cooperation



Achievements & Awards

Title: Water's Bounty

The International Year of Water Cooperation intends to raise awareness that concrete cooperative actions are needed to manage water resources for the benefit of people, ecosystems, and the biosphere as a whole. Scientists have a prominent role to play in determining how such cooperation can be achieved with the goals of promoting peace and security, sustainable development and environmental sustainability, and poverty alleviation and universal water access. Water cooperation moves beyond the provision of water itself to the provision of services maintained by water, such as food production, as this photo illustrates. This photograph was taken during a scientific study of the structure of fisheries in the Bangweulu Wetlands of northern Zambia. In this project, researchers worked with local fishermen to measure the number and size of fish of different species, gained in the unique swamp fishery to better understand the sustainability of the system. The area is interesting in that it is managed as a conservation area, yet communities are allowed to carry on with traditional fishing practices, managed by local elders.

(Photo: Dr Morgan Trimble)

All of the winning photographs from the 2013 SASL competition, as well as those from earlier rounds, can be viewed on the NRF SAASTA website: <http://www.saasta.ac.za>

more winning photos on next page...

Two researchers in the Department of Zoology and Entomology featured prominently among the recently announced winners of the 2013 Southern African Science Lens (SASL) competition.

Dr Morgan Trimble won first prize in the Science in Society category. Her winning photograph captures researchers meeting with local traders to determine the quantity and market value of a season's worth of dried fish extracted from the Bangweulu Wetlands of northern Zambia. In addition, a further three of her photographs were classed as 'highly recommended' in the Science in Action, Science Close-up, and International Year of Water Cooperation categories.

PhD candidate, Mr Ryan Reisinger, was named the runner-up in the Science in Action category for his photograph of an adult female killer whale and her three year old calf, trying to drag an elephant seal off a ledge at Marion Island in the Southern Ocean.

The competition encourages scientists, science communicators and science enthusiasts, as well as professional photographers and amateurs, to capture and submit stunning, dramatic, or spectacular images, related to Science and Technology. Photographs entered in the SASL competition can be entered in one of five categories: Science in Action, Science Close-up, and Science as Art, International Year of Water Cooperation, and Science in Society.

These awards continue the tradition of researchers in the Department of Entomology and Zoology receiving recognition for the scientific value and public appeal of their photographs.

The SASL competition is organised and sponsored semi-annually by the South African Agency for Science and Technology Advancement (SAASTA), a business unit of the South African National Research Foundation. SAASTA is dedicated to engaging people with Science and Technology.

Category: Science Close-up



Title: Sweet Thorn Flower

This close up photo was taken with a macro lens and shows an interesting pattern of Acacia Karoo flowers, not obvious to the casual observer. This photo was taken as part of a survey of biodiversity in regenerating coastal forests in South Africa after the forests had been cleared for mining. Coastal forest is a rare habitat type, restricted to a small linear belt along the east coast of Southern Africa and is home to a rich diversity of species across different taxonomic groups. By monitoring species communities in forest patches that have been regenerating for differing numbers of years, researchers can understand the trajectory of species reconolonisations as the forests age and become more similar to old-growth forests. This fast-growing tree, also known as Sweet Thorn, is a pioneer species that is very abundant in early stages of forest regeneration. Eventually, after many years, individuals start to collapse and trees, typical of old-growth forests, grow in the canopy gaps created. *(Photo: Dr Morgan Trimble)*

Category:
Science In Action



Title: Fighting the Poaching Crisis

Caption: Veterinary and scientific staff in the Kruger National Park come together in a rhinoceros translocation effort. Here, scientists take blood samples from the ear for later analysis in the laboratory and measure the horn of a white rhino individual that was darted for translocation, from a poaching hotspot to a safer area. Rhino poaching has increased exponentially since 2008, fuelled by desire for traditional Asian medicine and ornamentation in Asia, and conservation biologists and conservationists have had to scramble to prepare strategies to fend off the onslaught. This, and other on the ground efforts to safeguard the five extant rhino species, must be seen against the backdrop of a flurry of scientific effort among social scientists, economists, and conservation biologists to better understand the social drivers of the rhino horn trade, the question of quantity, supply and demand for horn products. They endeavour to determine the efficacy of deterrents to illegal killing of rhinos. In addition, forensic scientists and criminologists have been working to increase the likelihood of successful law enforcement, for example through genetic fingerprinting of individual rhinos. **(Photo: Dr Morgan Trimble)**

Winning photo -
Category: Science in Society



Title: Society's Resources

One way scientists can support society is through recommendations aimed at the management of natural resources. This photograph was taken during a scientific study of the structure of fisheries in the Bangweulu Wetlands of northern Zambia. In this project, researchers worked with local fishermen to measure the number and size of fish of different species in the unique swamp fishery to better understand the sustainability of the system. Here, researchers meet with local traders to determine the quantity and market value of a season's worth of dried fish extracted from the swamp, while children inquisitively peer in from the next room. The Bangweulu ecosystem is interesting in that it is managed as a conservation area, crucial for many species, yet communities are allowed to carry on with traditional fishing practices, managed by local elders. Even so, scientists can contribute to the management of the resource by offering recommendations to ensure that shared resources, such as fisheries, are not compromised, thus maintaining the support system for society. **(Photo: Dr Morgan Trimble)**



Runner-up Category: Science In Action

Title: Killer Impact

Caption: Killer whales (Orcinus orca) are the oceans' apex predators. Over 140 species of marine vertebrates have been reported as killer whale prey. Their top predator status and eclectic diet, along with their large energy requirements, means that killer whales can have big effects on marine ecosystems. In the Southern Ocean elephant seal (Mirounga leonina) populations crashed between the 1950s and 1990s. Since many killer whales prey on elephant seals, some researchers suggested that killer whales may have caused the declines (a top down explanation) while others suggested that environmental changes were the primary drivers of the crash (a bottom up explanation). At Marion Island in the Southern Ocean, nearly 15 000

elephant seals have been marked and re-sighted through their lives, to try and understand how the environment is changing. Recently, researchers have also started studying the killer whales there (which can be individually identified by their unique dorsal fins) to fathom how they can influence other species. In this photograph, an adult female killer whale – M002 (right) – and her three year old calf – M027 (left) – try to drag a one year old elephant seal – GR346 – off a ledge. The coloured 'tags' used to uniquely identify the seal, can be seen in its hind flippers. The photograph illustrates predator-prey relationships, and how datasets on two species can intersect.

(Photo: Ryan Reisinger)

Dr Wayne Truter awarded for his contribution to SA Seed Industry

Dr Wayne Truter from the Department of Plant Production and Soil Science was recently awarded the South African National Seed Organisation (SANSOR)-Bayer "Science for a Better Life Award" for 2014.

With this award, Dr Truter received acknowledgment and recognition for his great effort and positive contribution to the South African Seed Industry.

Dr Wayne Truter is a Land Rehabilitation and Pasture Science Specialist and has been involved in this discipline for the past 15 years, doing research and in an advisory capacity.

His research interests include aspects of mine rehabilitation, like the use of fly ash for soil amelioration, the use of gypsiferous water for irrigation, animal production on rehabilitated mine land and alleviation of compacted mine soils. Other research, focusing on planted pastures, includes irrigation scheduling for ryegrass and kikuyu and research in seed coating technology and its influence on pasture establishment.

Dr Truter is also involved in professional associations, for example the Grassland Society of Southern Africa, South African Coal Ash Association, Institute for Environmental Management and Assessment American Society for Mining and Reclamation and the Canadian Land Reclamation Association. He was also the first the first President of the Land Rehabilitation Society of Southern Africa, which was established in 2012.



Dr Wayne Truter

International Award for Prof Hannes Robbertse

An Award of Honour by the International Plant Propagators' Society (IPPS) was recently bestowed upon Prof Hannes Robbertse (82), an Emeritus Professor in the Department of Plant Production and Soil Science. Prof Robbertse received this award for his exceptional and distinguished service to the Society and outstanding accomplishments in the field of plant propagation.

During his career, Prof Robbertse was also a professor in Botany at the University of Pretoria, occupying the Louis Botha Chair of Botany, as well as being the Director of the Margaretha Mes Institute for Seed Research.

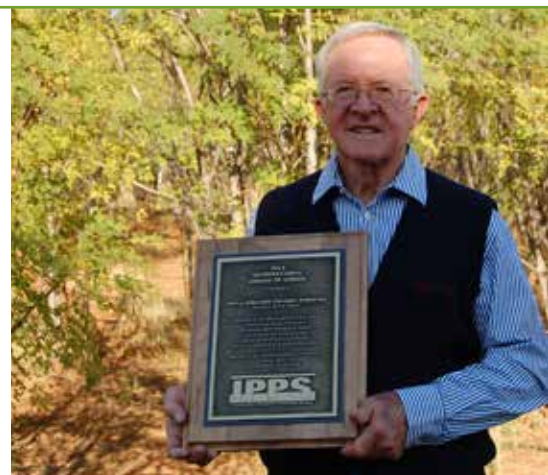
Besides doing research on contract basis and assisting postgraduate students (master's and PhD's), he is also in charge of the Tissue Culture Laboratory on the Hatfield Experimental Farm.

Prof Robbertse's main fields of research are the reproductive biology of flowering plants: structure and functioning of reproductive parts, pollination, fruit setting, and fruit development. Furthermore, he is very interested in general plant structure and function, as well as plant propagation and tunnel production.

He authored or co-authored in 117 subsidised, scientific journals as well as authored or co-authored in 60 other scientific journals. Prof Robbertse also published in 60 popular scientific papers and delivered 162 papers at conferences.

To date, Prof Robbertse has supervised 41 MSc and 16 PhD students, and he is still supervising two master's and two PhD students.

Furthermore, he was instrumental in the planning, construction, and maintenance of the Manie



Prof Hannes Robbertse

van der Schijff Botanical Garden, as well as the planning and construction of dams and planting of trees during the development of the Hartebeesspruit-project at LC de Villiers sports grounds.

From 1994 to 1997 Prof Robbertse was the President of the Cycad Society of South Africa and from 1999 to 2001 he was the President of the International Plant Propagators Society, Southern African Potential Region (now the South African Region).

Centre of Excellence in Food Security at UP and UWC officially launched

"Every South African must be able to develop their full potential and this can't be done on an empty stomach. This is why this new Centre of Excellence (CoE) in Food Security is so unique – it must lead to interventions that will positively change people's lives and combat food insecurity in our country."

This was the central message of the former Minister of Science and Technology, Derek Hanekom at the official launch of the CoE in Food Security at the University of the Western Cape (UWC). The University of Pretoria (UP) co-hosts the CoE with the UWC.

The Food Security Centre of Excellence is the first CoE to be hosted or co-hosted by a historically black university since the Department of Science and Technology (DST) – National Research Foundation (NRF) Centres of Excellence Programme began 10 years ago. Former Minister of Science and Technology, Derek Hanekom, said he hoped that this would be the start of a trend.

Mr Hanekom emphasised that food security was high on the country's list of priorities. "In case there was any doubt, the release last year of the South African National Health and Nutrition Examination Survey confirmed that too many of our people are underfed, overfed, or both. The fact that this is occurring in a relatively well-off nation, and despite adequate domestic food production, is a reality of which all of us here today are no doubt keenly aware.

"Obviously, food security is a subject that requires comprehensive treatment. This is true of most important socio-economic issues, of course, but food security is arguably an extreme case, because it involves questions of agricultural production systems, market dynamics, nutrition, people's habits and preferences, our social security system, and so on. This is one reason why achieving food security is such a challenge, and why the centre of excellence approach is particularly appropriate in meeting this challenge

Dr Romilla Maharaj, Acting Executive Director: Research Chairs and Centres for Excellence at the National Research Foundation (NRF) referred

in her address to countries such as India and Japan who created CoEs to promote excellence in specific fields. "The CoEs are one of the NRF's strategic tools to drive research excellence and promote inter-institutional collaboration and multi-disciplinary research for societal impact in the country".

Prof Julian May from UWC and the Director of the CoE, emphasised the importance of food security by comparing a malnourished three-year old child's brain with a normal three-year old – the latter's brain was much bigger. "In South Africa over twenty per cent of South Africans are food insecure and this must change drastically. We will make a difference to food security by linking innovative science to critical enquiry," Prof May said.

Prof Sheryl Hendriks, Co-Director of the CoE and also Director of the Institute for Food, Nutrition and Well-being at UP explained that the research activities of the CoE will be carried out in four thematic areas, i.e. Food Creation, which concerns production, processing and preservation; Food Distribution, which concerns markets, livelihoods and value chains; Food Consumption, which concerns health, nutrition, choice and behaviour; and Food Governance, which focuses on safety, standards, policy and rights. She also added that

"the new CoE creates an exciting opportunity for researchers to make a meaningful difference to solving some of the complex problems regarding how to address poverty, hunger and inequality."

The Department of Science and Technology-National Research Foundation CoE in Food Security will bring together a cohort of experts and researchers from 19 South African and international institutions to study the systemic and structural factors that shape food access and dietary choice; as well as food security strategies, choices and decisions for poor and vulnerable people. It will not look at agricultural productivity in isolation, but will take a "farm to fork" approach to the food system.



Minister Derek Hanekom



From left: Dr Thomas Auf der Heyde (Deputy Director-General, DST), Prof Brian O'Connell (Rector: UWC), Minister Derek Hanekom (DST), Prof Stephanie Burton (Vice-Principal: Research and Postgraduate Studies, UP), Dr Romilla Maharaj (NRF), Prof Sheryl Hendriks (Co-Director: CoE, UP), Dr Phil Mjwara (Director-General: DST), Prof Julian May (Director: CoE, UWC) and Prof Ramesh Bharuthram (Deputy Vice-Chancellor, UWC).

SARChI Sustainable Malaria Control Chair to boost SA's only comprehensive malaria research effort

"Malaria is a very complex disease. Trying to stop it is like trying to hit thousands of tennis balls with a teaspoon." Using this analogy, Lyn-Marie Birkholtz, an Associate Professor in the Department of Biochemistry and a member of the Centre for Sustainable Malaria Control at the University of Pretoria (UPCSMC) reiterated the importance of on-going, trans-disciplinary research, in an effort to eliminate the disease that remains one of Africa's greatest killers.

Prof Birkholtz is a leader in the discipline of antimalarial target discovery, and Head of the South African Research Chair (SARChI Chair) in Sustainable Malaria Control, which was launched on 24 April, on the eve of World Malaria Day.

With a budget of R1.5 million per year, funded by the Department of Science and Technology (DST) through the National Research Foundation (NRF), the Chair will enhance UPs recognised and unique integrated focus on malaria parasite biology, functional genomics, drug discovery efforts, innovative mosquito control strategies, as well as public health and community engagement. As holder of the Chair, Prof Birkholtz will use her expertise on the parasite to investigate sustainable mechanisms to control not only the parasite itself, but also its mosquito vector.

Prof Lyn-Marie Birkholtz



“When it comes to the Big Five of most dangerous organisms on our planet, three are mosquitoes. What’s more, these three species – *Anopheles gambiae*, *Anopheles arabiensis*, and *Anopheles funestus* – are the most efficient carriers of the fourth of the Big Five killers: the malaria parasite itself,” explains Prof Leo Braack, a specialist in mosquito ecology. His newly established Research Initiative in Integrated Vector Management (IVM) was also launched on 24 April.

Prof Birkholtz, in collaboration with scientists from Wits and the CSIR, constitute the Gauteng Malaria Transmission Blocking Platform. This platform focuses particularly on the identification, validation and characterisation of chemical entities with potential transmission blocking ability. The effect of potential antimalarial drugs on the complete life cycle of the *P. falciparum* parasite will be looked at.

Malaria is a complex parasitic disease, confined mainly to tropical areas and is transmitted by female *Anopheles* mosquitoes. There are an estimated 250 million clinical cases of malaria annually, which cause more than half a million deaths, mostly of children under five years of age and mostly in sub-Saharan Africa. Malaria-endemic countries are faced with the high cost of prevention and treatment of the disease.



From left: Minister Derek Hanekom, Prof Lyn-Marie Birkholtz and Deputy President Kgalema Motlanthe (Outgoing Deputy President of South Africa) at the Department of Science and Technology’s launch of the SARChI Chair in Sustainable Malaria Control.

Malaria is transmitted by female Anopheles mosquitoes.



Prof Harding awarded for Excellence in Teaching Award

Prof Ansie Harding received the prestigious Excellence in Teaching Award for 2013 in the Department of Mathematics and Applied Mathematics. Prof Izak Broere, Chair of the Teaching Award Committee made the announcement during the annual Bosberaad, end of 2013.

The reward gives recognition to Prof Harding who taught extremely large classes, with glowing feedback from students. She coordinated very large modules, with equally appreciative feedback from her colleagues. Prof Harding is seen as a leader in teaching and the innovation of teaching practices in the Department of Mathematics and Applied Mathematics, and much wider.



Prof Ansie Harding receives the award from the Vice Principal: Academic, Prof Tyrone Pretorius

Large data project reveals where carbon stocking projects in Africa provide the greatest benefits

Carbon forestation project in Patako, Senegal. The project is coordinated through the EU-funded Undesert Project. It involves planting indigenous trees in a degraded area and getting carbon credits from these. (Photo: Fatimata Niang-Diop).



One of the ways to reduce concentrations of greenhouse gases in the atmosphere is to ensure that carbon is stored on the ground to the greatest extent possible. But how does one quantify the potential of landscapes to stock carbon? Researchers from Aarhus University, Denmark, the University of Pretoria (UP), and the Council for Scientific and Industrial Research (CSIR) in South Africa now present the first continental-scale assessment of which areas may provide the greatest direct and indirect benefits from carbon storage reforestation projects in Africa.

According to Dr Michelle Greve from the Department of Plant Science at UP, who led the project as part of her PhD at Aarhus University, it is increasingly recognised that climate change has the potential to threaten people and nature. It is therefore imperative to tackle the drivers of climate change, namely greenhouse gases. One way to slow down climate change is to increase the number of trees on Earth, because, through photosynthesis, trees take up the greenhouse gas carbon dioxide, converting it to carbon products which are stored in the vegetation (in the form of wood, roots, leaves), and oxygen.

New forests continue to accumulate carbon for hundreds of years. Therefore, forestation projects are one way of generating 'carbon credits', which are tradable units on the carbon market. The more carbon is stored in the vegetation, the more profitable such projects are.

Restoring forests should bring especially high carbon returns in areas where plants grow fast and become large in size. Additionally, where past disturbances, such as deforestation, fires, and degradation of the

environment have resulted in much of the vegetation being destroyed, there exists a large difference between what is there and what could potentially be there. There areas would therefore also bring especially high returns. However, little information exists on where such areas are, and how large their carbon storage potential is.

Researchers have now developed a method to calculate the difference between the potential carbon that could be stored in vegetation if there were no disturbances, and the carbon that is currently stored in vegetation in tropical Africa.

The researchers based their analysis on a satellite-derived map of current carbon being stored in vegetation. Combining this with data on environmental factors that affect plant growth, such as climate and soil, they could model the maximum amount of carbon that could potentially be stored in vegetation across tropical Africa. By subtracting the actual amount of carbon currently stored in vegetation from this maximum potential carbon, they could therefore show where in Africa carbon stocking projects would be particularly profitable.

In reality, such a map of where most carbon could be stored is probably of limited use for deciding where to plan carbon projects, because there may be a number of constraints to setting up forestation projects to stock carbon. For example, a densely populated agricultural area with high levels of rainfall and temperatures might bring high carbon returns; however, it would be unlikely to be profitable as land value in these areas is high, and because it would

be problematic to have to relocate people. Therefore, such constraints must be considered when planning carbon forests. In addition, it might be a good idea to consider whether there is a wider range of benefits to setting up such projects.

"We used our map which indicated where carbon forests would bring high returns, to ask where carbon stocking by forestation would not only be highly profitable, but where it would also minimise conflict with people, and benefit biodiversity and people," said Dr Greve.

"Therefore, we applied a method to optimally select areas which would not only have high carbon returns, but would also conserve native biodiversity and support ecosystem services, that is, services that the environment

provides which benefit humans. The areas also had to have low land value and human population density, so as to reduce conflict with people, and high levels of governance, because setting up projects in areas with high levels of violence and corruption would be too risky and have too low success rates," Dr Greve explains.

Dr Greve and her colleagues could therefore identify areas where carbon projects would have more co-benefits. An example of an area that showed high carbon returns, but was less important when these other factors were considered, was the region around Lake Victoria in East Africa. This area currently has little vegetation biomass, due to heavy degradation, but has an excellent climate for tree growth, and therefore has a high potential for carbon stocking through forests. However, it does not support as high a biodiversity as some other areas and, more importantly, it is also densely populated by people who practice intensive agriculture in the area. Therefore, setting aside land here to plant carbon forests would not be optimal.

Rather, regions of the Upper Guinean Rainforests of West Africa, and the Lower Guinean Rainforests which are situated on the coast of Nigeria and Cameroon, were identified as having more optimal combinations of high carbon stocking potential, high co-benefits for wildlife conservation and humans, as well as high feasibility.

"There exists a great need to reduce the amount of greenhouse gasses in the atmosphere. Our approach exemplifies how strategies to do this can be targeted to optimise feasibility and co-benefits for biodiversity and people," concluded Prof Jens-Christian Svenning, from Aarhus University and supervisor on the PhD project.

The article *Spatial optimisation of carbon stocking projects across Africa integrating stocking potential with co-benefits and feasibility* was published in *Nature Communications* in 2013.

Source: AU Communication, Science and Technology (Aarhus University)



Dr Michelle Greve

As part of the forestation project in Patako, Senegal, the local community is educated about the benefits they will receive from the project through the carbon accreditation scheme. (Photo: Anne Mette Lykke).



A biscuit brings hope



Postgraduate students with Prof Taylor (far right) involved in the development of the sorghum biscuits.

Could there be a single solution to Africa's battle against poverty, hunger and unemployment? Master's degree students, under the supervision of Prof John Taylor at the Department of Food Science at UP, came up with a "super biscuit" that is rich in essential nutrients.

Protein-energy malnutrition (PEM) is a deficiency disease resulting from undernourishment, a common problem among children in developing countries. After almost ten years' worth of research, the UP team came up with a simple formula for a biscuit that contains nutrients essential for young children. The flour in the biscuit is made from nutritionally rich, locally grown sorghum, to which cowpea is added, which enriches the protein content of the formula. Only two biscuits a day can supply up to 20% of a young child's daily energy requirements.

An objective behind this study has always been to use only ingredients produced by small-scale food producers in South Africa, thereby creating business opportunities. The production of these biscuits may be a viable enterprise for small-scale food producers in the country and across Africa.

Previously, students looked at biscuits made from sorghum and soya. However, soya is not commonly grown in Africa. Pam Dovi, a master's degree student in the Department, refined the recipe to a simple, low-cost formulation that uses cowpea as a substitute for soya. Cowpea is an African pulse, rich in protein and calories and it also contains minerals and vitamins.

Students from all over Africa were involved in this research, aimed at benefitting many rural communities across Africa. Students can make the formula known in their home countries, for instance Rwanda and Kenya, to address food problems there.

The aim is to provide the biscuits to children at schools. This biscuit has several benefits, including the fact that there are no preparation requirements as with other school meals and, because it is made with very little water (the product contains less than 3% moisture), it is nutrient dense, and also has a long shelf life. In addition, there is great potential for street vendors to sell the biscuit. Another aspect that could make the biscuit popular, according to Prof Taylor, is that food serves an aspirational function, and because children might regard 'eating Western food as cool', the biscuit could appeal to them.

The UP team tested the biscuit in a true market setting on the University's Mamelodi Campus. The biscuits were favourably received, especially in comparison to a cheap and basic "sugar and flour" biscuit, thereby affirming its viability. In collaboration with the University of Limpopo's Limpopo Agro-Food Technology Station (LATS), an initiative of the Department of Science and Technology, the team has trained small-scale entrepreneurs at the Howard G Buffett Foundation Ukulima Research Farm in Limpopo, to prepare the biscuits.

Prof Taylor says they hope that provincial governments will ultimately endorse the biscuit for use in school nutrition programmes across South Africa, because it has the potential to make a real difference. This simple biscuit meets the challenges of being easy to produce, having a high nutritional value, being favoured by the target group, combating hunger and its associated problems, and holding the promise of profitable small-scale production. He emphasises that 'nutrition and small-scale enterprise should go hand in hand' and that small-scale enterprise needs to receive a lot more attention than it currently does.

Pam Dovi from Rwanda.



Ion Torrent™ Sequencing facility making its mark

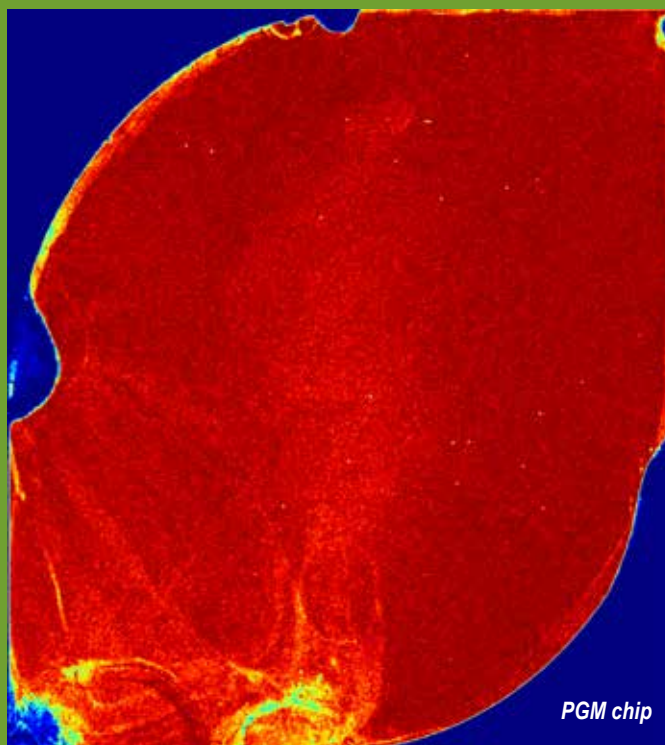
The UP Ion Torrent™ sequencing facility, currently in the Faculty of Natural and Agricultural Sciences, occupies three of the top eight international ranking spots for data output from an Ion Torrent™ PGM™ sequencing run. This grants the facility the highest overall profile on the ranking list for any single laboratory.

The Ion Torrent™ PGM™ sequencing facility was established in 2012 to provide life science researchers at the University greater access to small scale next generation DNA sequencing. This increased the turn-around time for data generation and project completion, and also enabled more affordable amplicon sequencing projects on the proven Ion Torrent™ Ampliseq™ platform. Projects to date include the sequencing of bacterial, fungal and viral genomes, human cancer genotyping, fosmid library clone sequencing and meta-genomic identification. To optimise throughput and cost efficiency, multiple DNA samples can be individually bar-coded and sequenced during the same reaction.

Users from the faculties of Health Sciences, Natural and Agricultural Sciences and Veterinary Sciences have made use of the facility services, with several publications resulting from the research. In addition to the three high ranking spots, the facility has also won five weekly and three monthly prizes for the quality and quantity of data produced.

The facility is co-managed by Renate Zipfel (Department of Genetics) and Nicky Olivier (Department of Plant Sciences), while Dr Elrietha van Zyl and Busi Zondi are the technicians responsible for library preparations and sequencing.

For queries on sequencing projects please send an email to Renate (renate.zipfel@fab.up.ac.za) or Nicky (nicky.olivier@fab.up.ac.za).



New diagnostic method to detect TB wins award

The *MARTI* (Mycolic Acid Antibody Real-Time Inhibition) Tuberculosis Diagnostics team was the winners of the Gauteng Accelerator Programme (GAP) Innovation Competitions for novel technologies and innovations in the Biosciences for 2013. They received R500 000 seed funding and incubation for this project.

The *MARTI* Diagnostic focuses on a diagnostic method that uses a blood sample – only one drop is required – to detect Tuberculosis (TB) at the point of care regardless of the patient's HIV status, or whether the TB infection is inside or outside the lungs.

According to Mr Carl Baumeister, co-inventor of the *MARTI* TB Diagnostics, sputum collection is hazardous to healthcare workers and fellow patients. It is also problematic for HIV positive patients and children to produce sputum samples. The *MARTI* technique is accurate in HIV-positive TB patients and detects active TB, regardless of whether it is inside or outside the lungs.

The diagnosis technology was primarily developed by Prof Jan Verschoor, a senior researcher in the Department of Biochemistry in the Faculty of Natural and Agricultural Sciences, ably assisted over the years by numerous postgraduate students and colleagues. Prof Verschoor has published more than 51 scientific papers in this field and is the key inventor of seven TB-related patents. The current *MARTI* technology is the subject of four new patent applications, the first of which was dated from 2005 and the latest will be filed as a Patent Cooperation Treaty (PCT) application during 2014.

The Council of the University of Pretoria has approved the founding of a new start-up company that will be the vehicle through which the *MARTI* technology will be commercialised. One of Prof Verschoor's graduate students and co-inventor, Mr Carl Baumeister, was recruited to spearhead the venture, now known as *MARTI* TB Diagnostics Pty Ltd. This venture was selected to represent South Africa in the Swiss-South African Venture Leaders Programme in Switzerland during June 2014.

The team's first major objective is to raise adequate funding with which to conduct the required clinical validation trial. The ultimate objective is to obtain a positive policy directive from the World Health Organisation to support the technology's international roll-out. Having won the GAP Biosciences Award against stiff competition as adjudicated by a panel of international judges, was a major contribution to raise the profile of the project, which in turn supports the fund raising drive.

The development of the *MARTI* TB Diagnostic has come a long way under Prof Verschoor, but an equally long distance remains to be covered to commercialise this product successfully.

In 2013, the GAP Innovation Competitions attracted more than 200 entries and awarded over R3 million in seed funding and incubation support to 13 start-ups in the ICT, green economy, medical and biotechnology sectors.



The MARTI TB Diagnostics team winning the GAP Biosciences business plan competition. From left: Prof Jan Verschoor, Prof Anton Stoltz and Mr Carl Baumeister.

What is the origin of coffee flavour in pinotage wines?



“Is the whole greater than the sum of its parts?”, the well-known philosopher, Aristotle asked. When it comes to investigating the compounds responsible for the coffee flavour in pinotage wine, this may well be true.

For many years, pinotage wines with a novel coffee flavour were produced by several South African wine cellars. Two scientists from the Department of Chemistry, Prof Egmont Rohwer and Dr Yvette Naudé investigated coffee-styled pinotage wine to establish the compounds responsible for this contemporary profile. This was done by using their own in-house developed and unique offline olfactometric technique, which allows the human nose to characterise odours in a controlled fashion.

In their research, Prof Rohwer and Dr Naudé unexpectedly found that it was a combination of two compounds, furfural and 2-furanmethanol, that gave rise to a coffee-like perception. “This was quite interesting, as furfural smells sweet and almond-like, while 2-furanmethanol is described as having an unpleasant, burnt smell. This coffee perception, arising from a mixture of two compounds, appears to be the result of a synergistic effect in which no individual compound was responsible for the coffee aroma.”

“A simple analogy would be the mixing of two colours to obtain a third, new colour, for example, by mixing the colour yellow with the colour blue, a totally different colour, green, emerges. Thus, the recomposition of aroma compounds results in the sum of the parts having a completely different odour, compared to that of the individual components.

Furfural in wine results from exposure to oak. In wine, furfural may, chemically or microbiologically, convert to 2-furanmethanol. It is of interest that furfural and 2-furanmethanol are amongst the key odorants thought to be particularly responsible for a coffee aroma in brewed coffee.

In traditional olfactometry, an analyst would sniff compounds and record the odour as the components that elute at the exit of a gas chromatograph (GC). Chromatography is a technique that is used to separate the components of a mixture by passing the mixture over a medium in which the components move at a different rate, allowing pure components to exit at a given time. The researchers used the offline olfactometer to play back odours to the human nose, to identify the chromatographic region where the coffee aroma appears. The coffee region was then further deconstructed, leading to the discovery that no individual compound was responsible for the coffee aroma of coffee-styled pinotage wine.

According to Prof Rohwer and Dr Naudé, the behaviour of compounds in mixtures cannot be evaluated with traditional olfactometry, because single compounds are sniffed. "Our approach permits deconstruction of a global aroma profile and the recombination of chosen odour compounds, by including or excluding selected compounds to determine single compounds, or a combination of compounds, responsible for a specific odour. In this way, a chromatogram of coffee-styled pinotage wine was "chopped-up" into sections and each section was sniffed in our novel offline olfactometer (a stand-alone device entirely uncoupled from a GC).

As the addition of coffee to wine is prohibited, a coffee-like aroma is normally deliberately engineered from a particular combination of pinotage, alternative toasted wood products (toasted oak chips or staves) and malolactic fermentation. A desired flavour profile can be obtained, depending on the toast level and type of oak product used for maturation of the wine. For example, American oak medium toast chips may impart a vanilla flavour, while French oak medium toast chips impart subtle smokiness and coffee characteristics to wine.



This work was published in: Naudé, Y. and Rohwer, E.R., 2013. Investigating the coffee flavour in South African pinotage wine using novel offline olfactometry and comprehensive gas chromatography with time of flight mass spectrometry. *Journal of Chromatography A* 1271, 176-180. <http://ac.els-cdn.com/S0021967312017499/dx.doi.org/10.1016/j.chroma.2012.11.019>



Dr Yvette Naudé sniffing the odour arising from a recombination of specifically selected compounds from coffee-styled pinotage wine in an in-house developed offline olfactometer.

Research for *National Geographic* programme regarding the digestive system of lions

How effective might the digestive system of lions be?

According to Prof Eddie Webb, Head of the Department of Animal and Wildlife Sciences in the Faculty of Natural and Agricultural Sciences, as well as his co-researchers, who recently did research for the internationally acclaimed programme, *National Geographic*, lions possess a very effective digestive system.

"Normally, lions only feed once per week and must then survive on this food intake for a few days. In order to determine whether or not an animal effectively digests its food, there are two important elements which must be taken into account, namely the nutrient value of the food, as well as to what extent it can be digested."

Prof Webb explains that one of the methods used to determine the digestive extent of the food, is to analyse the animals' droppings. "When it can be determined to what extent the nutrients have been absorbed and thus, in a manner of speaking, have disappeared, then it can be concluded to what extent the food has been absorbed and digested. There are certain parameters, such as the bruto energy value, protein content and minerals, such as phosphorous

and potassium in the droppings, which can indicate what the remaining nutrient value is and how much of the food has been digested," Prof Webb explained.

"Lions are single stomach animals and digest their food (prey, mostly fresh animal carcasses) extremely well. Another reason why lions digest their food so effectively is because the moisture content of the carcasses are very high – 60 to 70%. Lions not only eat the muscle tissue, fat and the bones, but also the liver and lungs and even that which the prey has digested, for example the grass in digestive system of the prey.

Stock and wildlife experts are able to effectively analyse the composition of a carcass, based on, for example, the bone content, protein, and minerals. Very little of this is found with lions, which indicates that these animals have extremely effective digestive systems.

The research programme for *National Geographic*'s "Inside the Giants" is part of the main research focus in the Department. The feeding models used for domesticated animals, such as sheep, cattle and chickens, among others, can be successfully used as basis for game, with adaptations for the different species.



From left: Dr André Botha, Prof Eddie Webb and the late Prof Woody Meltzer.

Genomics of a maize disease accelerated through international collaborations

Genomics Research Institute member, Prof Dave Berger from the Plant Science Department in the Faculty of Natural and Agricultural Sciences recently returned from a three months sabbatical. He was awarded the 2013 Norman E Borlaug Fellowship for International Agricultural Science and Technology research from the US Department of Agriculture (USDA).

These fellowships were established in honour of Norman Borlaug, recipient of the Nobel Peace Prize in 1972, for his role in breeding improved varieties of wheat, which led to the Green Revolution. The fellowships provide opportunities for agricultural researchers around the world to work with USA scientists for periods of up to three months.

For three months, Prof Berger was hosted by Dr Burt Bluhm, in the Department of Plant Pathology at the University of Arkansas, Fayetteville. Dr Bluhm is a leading international researcher in the genetics of fungal pathogens of crops. During his sabbatical, Prof Berger researched grey leaf spot disease of maize, a limiting factor in maize production, globally as well as in sub-Saharan Africa.

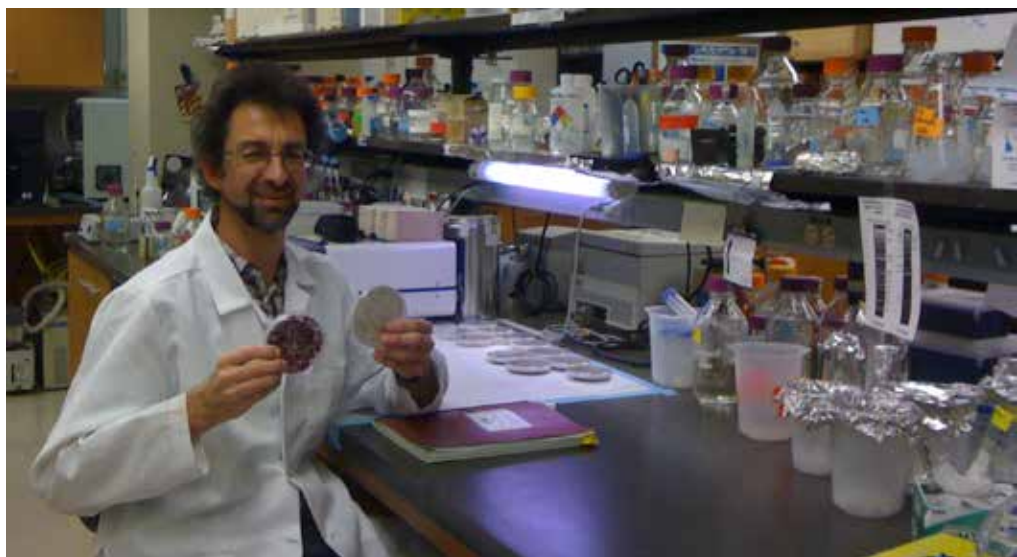
Prof Berger's Molecular Plant Pathogen Interactions Research Group focused on the fungus *Cercospora zeina*, the causal agent of this disease in Africa. Genome sequencing of an African isolate of the fungus is underway, partially funded by the Genomics Research Institute at UP, with additional funds leveraged from a National Research Foundation (NRF) Bio-informatics and Functional Genomics grant.

During his sabbatical Prof Berger visited the Genomics Facility at Purdue University, USA, as well as the Yale Centre for Genome Analysis, New Haven, Connecticut which has a state-of-the-art PacBio single molecule sequencer. This technology has the advantage over current next-generation sequencing methods of direct sequencing of the fungal DNA and produces longer DNA sequence runs.

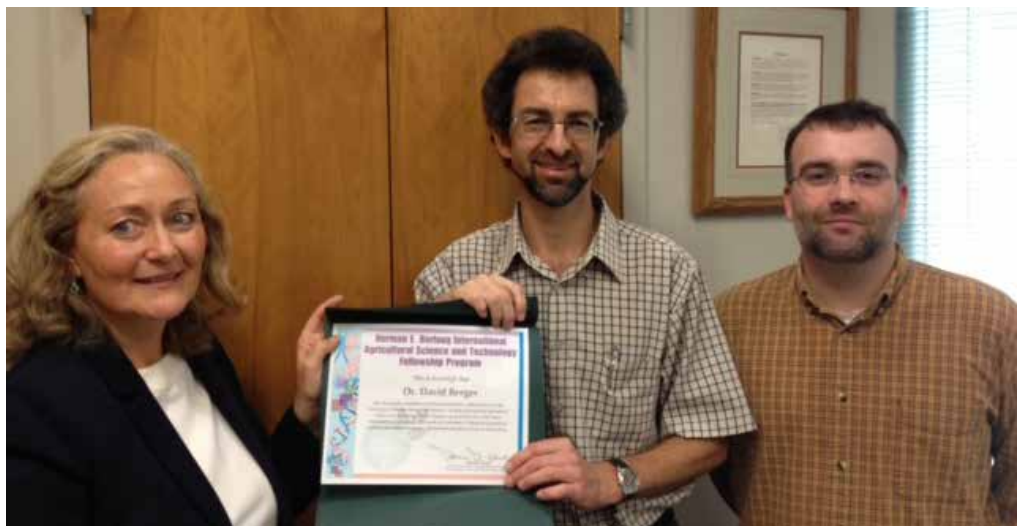
An outcome of the visit was the resolution to improve the *C.zeina* genome sequence, using PacBio. Genome assembly and annotation

are being carried out in collaboration with Prof Yves van der Peer, Professor in Bio-informatics and Genome Biology and Group Leader of Bio-informatics and Systems Biology, Ghent University, Belgium, who also holds a joint appointment at the University of Pretoria. Prof Van der Peer hosted UP PhD student Nicky Olivier during 2013, and the *C. zeina* genome assembly was subsequently improved. This visit was funded by the NRF, the Department of Plant Science, the Faculty of Natural and Agricultural Sciences, the GRI and the NRF. The Ghent group visited UP in April 2014, and a follow-up visit by Prof Berger to Ghent is planned for later this year.

Further outcomes of the USDA Borlaug Fellowship are the planned visit of a student from Dr Bluhm's laboratory to UP in May 2014 and a USDA-funded follow-up visit by Dr Bluhm to Prof Berger's laboratory in mid-2014. This collaborative research, in which Dr Bridget Crampton of the Department of Plant Science and FABI is also involved, investigates the pathogenicity mechanisms and population genetics of *C. zeina* and has the long-term aim of finding weaknesses in the armoury of the fungus, which can be exploited to develop novel control strategies.



Prof Berger in the Laboratory at the University of Arkansas



From left: Karen Utrecht (Africa Programme Manager: Borlaug and Scientific Exchange Programs, USDA), Prof Berger and Dr Burt Bluhm (University of Arkansas)

Exciting research done in Antarctica



Dr Thulani Makhalanyane in Antarctica

"The opportunity to travel down to Antarctica fulfilled a lifelong dream and is certainly one off the bucket list! It was truly spectacular spending three weeks in Antarctica. Being in the Dry Valleys gives you amazing perspective and understanding of the environment and it has stimulated many questions for future research."

These thoughts were shared by Dr Thulani Makhalanyane, a postdoctoral fellow from the Centre for Microbial Ecology and Genomics in the Department of Genetics at the University of Pretoria, who recently returned from a sampling expedition to Antarctica. The visit, which brought together a multidisciplinary team of researchers from Germany, Canada, Australia, and the United States, was led by Prof Craig Cary from the International Centre for Terrestrial Antarctic Research at the University of Waikato in New Zealand. Dr Makhalanyane spent three weeks, in Antarctica, camping in the Taylor Valley

"Being part of such a multidisciplinary team, which included geologists, engineers and microbiologists has afforded me the opportunity to gain new skills," said Dr Makhalanyane.

The field trip, which was undertaken as part of a long standing collaboration, was broadly aimed at predicting biocomplexity in Dry Valley ecosystems, in order to foresee the effects of climate change on biological diversity in Antarctica. As part of Prof Don Cowan's research group, Dr Makhalanyane has been studying the microbial ecology of hypolithic communities (which are microbial communities found below rocks) from Antarctica for the past six years. This project was extremely successful and has led to the publication

of several articles in respected international journals. The latest article was published in a nature publishing group journal *ISME J.*, the leading microbial ecology journal. To read the article, click on this link: <http://www.nature.com/ismej/journal/v7/n11/full/ismej201394a.html>.

During the trip, Dr Makhalanyane had the opportunity to collect hypoliths, several kilometres from the main camp. "The hikes were exciting; we undertook hikes of 10 to 15 kilometres (uphill) and these were extremely challenging, especially when returning with heavy samples. But the extreme conditions were all worthwhile, since we brought back excellent samples, which will become the bases for future masters and doctoral degrees. I am grateful to Prof Cowan for the opportunity and the NRF for providing travel funding," added Dr Makhalanyane.

The researchers were supported by Antarctica New Zealand that provided both field support and logistics such as helicopters, camping gear and field training.

A glimpse of Antarctica



UP hosts High Level Panel of Experts on Food Security and Nutrition

The High Level Panel of Experts (HLPE) on Food Security and Nutrition of the Committee on World Food Security (CFS) had a meeting at the University during April and was also hosted by the Vice-Chancellor and Principal, Prof Cheryl de la Rey.

The 17-member panel consists of international experts appointed from 17 countries to prepare papers on food security issues, to advise and guide regarding policy decisions and programmes.

Prof De la Rey explained that hosting the panel was of extreme importance to the University, especially because the University's research strategy development process in 2010, identified food security as one of a set of strategic transdisciplinary research themes.

The Institute for Food, Nutrition and Well-being (IFNuW) was established to coordinate the work in this area to focus the University's research into addressing the national and international imperative to reduce hunger and poverty and achieve Millennium Development Goal 1 in comprehensive and innovative ways. The University has recognised that addressing the contrasts and contradictions in Africa, requires integrated approaches to research that draw on a range of expertise.

Prof Per Pinstrup-Andersen, Chair of this panel, explained that the work of the panel was to provide strategic guidance to the CFS by establishing what research has been conducted on each of the topics commissioned and organising this as strategic policy guidance to the CFS member states to assist them in addressing food security. The panel takes this responsibility very seriously. The diversity of experience and expertise of the panel members is unique to the HLPE. Prof Pinstrup-Andersen noted that 'the work by the HLPE addresses questions similar to those addressed by the Institute for Food, Nutrition and Well-being'.

Prof Sheryl Hendriks, Director of the IFNuW is a member of HLPE and expressed appreciation for the opportunity to serve the global food security agenda through the panel.



Prof Sheryl Hendriks, Director of the IFNuW (far right in the middle row) with her fellow members of the High Level Panel of Experts (HLPE) on Food Security and Nutrition of the Committee on World Food Security (CFS).

Massive boost for research equipment in Faculty

The University of Pretoria will be enabled to continue its pioneering research, thanks to a significant investment in cutting-edge scientific instrumentation, some of which has not previously been available in South Africa or on the African continent.

The University is set to acquire advanced research equipment to the value of more than R55 million during 2014, following the approval of six funding applications submitted to the National Research Foundation (NRF). The NRF will contribute a little more than R37 million, while the rest of the funding will be contributed by the University.

Several of the scientific instruments listed below will be the first of their kind in the country (and in one case, a first for Africa) and will therefore enable UP to take the lead in these fields.

The Faculty of Natural and Agricultural Sciences received three of these instruments.

The cutting-edge single-molecule spectroscope destined for the Department of Physics will be the first of its kind on the African continent. **Dr Tjaart Krüger** and his team will use it to study processes occurring between single molecules inside living cells. "We will obtain incredibly detailed

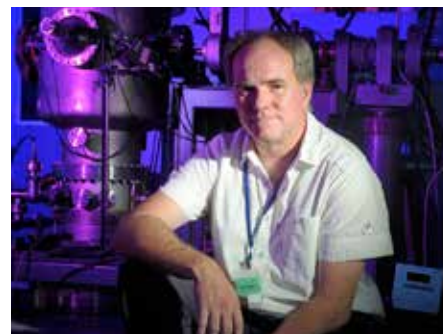
information regarding interactions and energy transfer processes inside living cells, looking at one molecule at a time – something that has not been possible before at this detailed level," he explains. "This new technique will help us to unravel how living cells protect themselves against stress conditions, such as intense light or disease."

The Department of Physics is also acquiring a new molecular beam epitaxy system – the first one in South Africa. "We will use this equipment to build crystals, one atomic layer at a time, in a highly controlled and pure environment," **Prof Chris Theron** explains. "Our ultimate goal is to confine electrons within specific regions of the crystal so that we will be able to study quantum effects."

The high-throughput real-time quantitative polymerase chain reaction system to be installed in the Department of Genetics is a powerful analytical instrument which researchers will use to explore gene expression and genetic variation for hundreds of genes in cell and tissue samples from people, animals, plants and microbes. "This is an important investment in post-genomics research aimed at understanding the molecular underpinnings of complex biological systems and identifying new biotechnology targets," says **Prof Zander Myburg**.



Dr Tjaart Krüger



Prof Chris Theron



Prof Zander Myburg

ACGT secures substantial funding for new initiatives

During the past year, the African Centre for Gene Technologies (ACGT), based at the Hatfield Experimental Farm, played an instrumental role in setting up new initiatives funded by international bodies and government.

The ACGT is an inter-institutional collaborative biotechnology initiative involving science councils and universities in the Gauteng region. It includes UP, CSIR, ARC, and the University of Johannesburg and the University of the Witwatersrand.

International funding was secured from the Carnegie Corporation of New York as well as the African, Caribbean and Pacific Group of States of the European Union (ACP-EU). Government

funding was secured from the Department of Science and Technology.

The Carnegie Corporation-funded initiative involves the CSIR, UP, Wits and entities in Namibia, Malawi and Tanzania; and trains the next cadre of academics active in Natural Products research in Southern Africa. The ACGT led a competitive proposal for funding and \$1.2 million was secured for the 2014 to 2016 period (R12.8 million).

The ACP-EU initiative deals with informed decision making around Genetically Modified Organisms; and involves, over and above the ACGT partners, universities in Denmark, Zimbabwe and Namibia. The Centre led the proposal and funding has been secured to the value of EUR868 000 (R12.6



Dr John Becker (Director of the ACGT)

million). In addition, the DST is co-funding the ACP-EU action. The action is to the benefit of all SADC countries.

The ACGT also worked closely with a team from the CSIR, Wits and the DST to establish a national Biocatalysis initiative, funded to the tune of R15 million over a three year period.

The Centre is continually exploring new opportunities for collaboration for the partnership members in the field of biotechnology.

Expert appointed to lead Insurance and Actuarial Science



Ms Marli Venter

A seasoned and experienced actuary who also has an excellent academic record was appointed as the new Head of the Department of Insurance and Actuarial Science in the Faculty of Natural and Agricultural Sciences, from January 2014. Prof Anton Ströh, Dean of the Faculty, was the Acting Head for the past twelve years.

Prior to accepting this position at the University of Pretoria, Ms Marli Venter was a senior actuary at ABSA and served in managerial positions within the actuarial industry for more than ten years. In this capacity she managed vibrant teams of junior actuaries and statisticians in high level teams, under complex circumstances of product development. In addition, she ensured sustainable risk management within the division. She was also recognised for her high level of expertise within the actuarial profession by the Actuarial Society and served on the curriculum committee to ensure that quality curricula are implemented at universities.

She has been involved with the Department of Insurance and Actuarial Science for many years and lectured courses at specialised levels to the University's honours students in Life Insurance and Investments. She was appointed by the Actuarial Society to set the professional examinations for these courses at a national level.

Ms Venter completed a BSc degree in 1987 and an honours degree in 1988 in Mathematical Statistics, at the former Rand Afrikaans University. Subsequently, she completed a BCom (Honours) in Actuarial Sciences at the University of Cape Town in 1989. She enhanced her academic qualifications while working in the actuarial industry and obtained an MBA degree at the University of the Witwatersrand, as well as a Postgraduate certificate in Higher Education (2008) at the University of Pretoria.

Since 1994 Ms Venter has been a professional member of both the Faculty of Actuaries (FFA), Scotland, and the Actuarial Society of South Africa (FASSA).

"As the Head of the Department I would like to see the Department playing an important role in supporting the University's vision to be a leading research intensive university in Africa. Furthermore to be recognised internationally for its quality, relevance and impact, and for developing people, creating knowledge and making a difference locally and globally."

Ms Venter will also strive to get the Department recognised, both locally and internationally, as will be indicated by the demand for our graduates as first choice candidates by potential employers. In addition she will strive to create a demand for our expertise, both in terms of new research outputs, commissioned research in relevant areas, as well as other technical actuarial consulting.

Welcome to Prof Vinesh Maharaj

Prof Vinesh Maharaj, a natural product chemist who was trained in the discovery of new drug leads based on biodiversity samples, was recently appointed as a Professor in Chemistry in the Faculty of Natural and Agricultural Sciences.

Prior to his appointment at the University of Pretoria, he was the Technology Manager and Chief Scientist in Biosciences at the Council for Scientific and Industrial Research (CSIR).

Prof Maharaj completed his PhD in Chemistry in 1998 at the University of South Africa, his research topic being *Investigations into the structure and synthesis of a naturally occurring appetite suppressant from an indigenous plant species*. He completed his honours and master's degrees at the University of Pretoria.

His major areas of expertise include natural products chemistry, biological evaluation of extracts and natural ingredients in close collaboration with molecular biologists/biochemists/pharmacologists, isolation, structure elucidation of compounds, synthesis and biosynthesis.

Prof Maharaj's prior experience is also in natural products chemistry at the CSIR, specifically on isolation, structure elucidation and biosynthesis of Mycotoxin. Major responsibilities include the systematic investigation of 24 000 indigenous plants as part of a 10 year project, aimed at discovering drugs, nutraceuticals and cosmeceuticals from South Africa's indigenous plants, with a focus on HIV, malaria, TB, cancer and diabetes.

He was extensively involved in collaborative programmes with holders of indigenous knowledge, such as traditional health practitioners. Prof Maharaj also participated in the negotiations which led to the world famous benefit sharing agreement between the CSIR and the San people on the Hoodia plant. He is one of the main inventors on the CSIR owned patent, based on the discovery of a novel appetite suppressant from the Hoodia plant.

Prof Maharaj furthermore participated in the negotiations with the international pharmaceutical and food industry partners on the commercialisation of Hoodia and a natural sweetener, identified from an indigenous plant. Experience was gained as part of managing the South African component of the major international development program, in conjunction with Phytopharm plc, Pfizer Inc and Unilever, aimed at commercialising the CSIR discovery of the natural anti-obesity agent. The work included all aspects of the drug development process, excluding supervision of clinical trials.



Prof Vinesh Maharaj

New researcher in Biochemistry appointed

A graduate from the University of Cambridge, Dr Precious Motshwene, was recently appointed as a senior lecturer in the Department of Biochemistry in the Faculty of Natural and Agricultural Sciences.

Dr Motshwene teaches undergraduate and postgraduate courses, supervises master's and PhD students, and also conducts research on the structural biology of the innate immune system. He obtained his honours degree in Biochemistry, as well as his master's degree in Molecular and Cell Biology at the University of Cape Town.

After completing his PhD at the University of Cambridge in 2008, Dr Motshwene was a postdoctoral research associate at this University and was part of a team that received a BBSRC grant for four years. During this period, he also supervised two PhD students.

Dr Motshwene's research focuses on the immune system in human beings. In particular, he is working on the inborn (or "innate") immune system, which recognises and fights disease-causing bacteria, using proteins called toll-like receptors. Toll-like receptors are located in the cell membrane. This means that one part of the receptor is inside the cell (intracellular), one part is in the membrane, and a third part protrudes from the surface of the cell (extracellular). The extracellular part of a toll-like receptor will recognise parts of bacteria swimming past and send a signal across the membrane to the intracellular part to set off the alarm. In cells, this works by proteins binding to the receptor and being switched on themselves. These then bind to yet more proteins, switching them on as well. The first alarm is therefore amplified, starting an immune response. Dr Motshwene is currently investigating an adaptor protein, called MyD88, which is the first protein to bind the toll-like receptors. MyD88 binds to an enzyme called IRAK-4, forming a large complex, called the Myddosome. "We have investigated the Myddosome with various techniques. At the moment we are trying to understand the steps involved in forming this complex. I will be working on this project in the Department of Biochemistry, together with the group of Prof Wolf-Dieter Schubert."



Dr Precious Motshwene

Jandeli Niemand welcomed in Malaria Research Chair

Malaria has been identified as a strategic research area at the University of Pretoria. Based on the excellence of the research already conducted, UP was awarded a NRF/DST South African Research Chair in Sustainable Malaria Control. This Chair is located in the Department of Biochemistry.

The University recently appointed Dr Jandeli Niemand as lecturer to strengthen and support the Chair's research activities and to implement the prerequisite succession plan. The research programme focuses on biochemical and molecular aspects of malaria parasite biology leading to drug discovery for malaria control, as well as transmission blocking strategies. In this field, she has made contributions towards the understanding of biochemical and metabolic processes which are unique to the malaria parasite.

Furthermore, Dr Niemand has worked in the pharmaceutical industry and is knowledgeable regarding the phases of drug development and clinical trials in South Africa. Dr Niemand will be an integral member of the malaria research team. She will also initiate and lead complementary and closely aligned research projects related to malaria transmission blocking drug discovery. This will be based on an understanding of the underlying biochemistry and biology of the parasite. Additionally, she will be involved in the training of postgraduate students in leading-edge technologies, as well as teaching undergraduate and postgraduate courses in the Department of Biochemistry.



Dr Jandeli Niemand

Top international guest lecturer visits UP

The University's Centre for Microbial Ecology and Genomics (CMEG), led by Prof Don Cowan, hosted one of the world's most renowned researchers in the field of microbial plant polysaccharide degradation and bioconversion of plant biomass.

Prof Peter Biely, who is employed by the Slovak Academy of Sciences, is one of the most highly regarded scientists from Slovakia. He has been cited approximately 6 000 times and has published 210 articles and chapters. Prof Biely's research focuses on the interface between basic and applied research in the field of lignocellulose degradation, with an emphasis on the discovery and use of new biocatalysts which can be used in the break-down of complex carbohydrates.

During his visit to the University of Pretoria Prof Biely presented three lectures as guest speaker, specifically on the topic of microbial and enzymatic degradation of plant biomass. He also mentored a number of postgraduate researchers in CMEG. Furthermore he shared important information on combining metagenomics with microbial enzymology and biochemistry to discover new, industrially important biocatalysts occurring in nature. His stay also resulted in a joint review on microbial enzymes participating in the breakdown of plant polysaccharides.

Prof Biely's research forms the basis of applied research in the field. Applications of his research can be found in industries such as paper and pulp manufacturing, baking and agriculture.



Prof Peter Biely and Prof Don Cowan at CMEG.

New book challenges the popular interpretation of Physics

Prof Jan Boeyens, Extraordinary Professor at the University of Pretoria's (UP) Centre for the Advancement of Scholarship, took a revolutionary leap in physics with the launch of his latest book, *The Chemistry of Matter Waves*, at the Sci-Enza Auditorium.

Prof Boeyens says his new book reveals general principles which have been overlooked in the past. He explains that the book originated when he started losing trust in the way in which Physics is interpreted in this day and age. "The subject field often gets oversimplified. I believe it is high time for some change, to revisit how we understand Physics," says Prof Boeyens.

The quantum and relativity theories of physics are considered to underpin all of science in an absolute sense. This monograph argues against this proposition, primarily on the basis of the two theories' incompatibility, as well as certain untenable philosophical implications of the quantum model.

According to Prof Boeyens, the most worrisome aspect about quantum mechanics as a theory of Chemistry is its total inability, despite unsubstantiated claims to the contrary, to account for the fundamental concepts of electron spin, molecular structure, and the periodic table of the elements. Boeyens' new book proposes a remedy to all these defects by reformulating both theories as non-linear wave models in four-dimensional space-time.

Prof Boeyens obtained a DSc degree in Physical and Theoretical Chemistry (cum laude) from UP, while he conducted his postdoctoral studies at the universities of Stanford (California) and Sussex respectively.

Among the numerous awards that Prof Boeyens received during his academic career, are the South African Chemical Institute (SACI) Gold Medal in 1983,

the Ernst Oppenheimer Fellowship in 1984, the SAAcademy Havenga Prize in 1986, the Alexander von Humboldt Research Prize in 1993, and the Merck Medal in 2004 and UP's Centennial Leading Mind in 2008.

Prof Boeyens' new book, *The Chemistry of Matter Waves*, marks yet another milestone in his laudable career. A review of the book that featured on Amazon's website at the end of 2013, states that its outlook is a revolutionary one. Furthermore, it says that Boeyens' ability to approach both well-known and new scientific problems from an unconventional and at times, rather astonishing angle, by making use of very simple models, has yielded exceptional results. In his search for explanations of the observed periodicity in matter, he uncovered new relations, phenomena and applications of the number theory in nature, as well as new interpretations of nature.

Although this book targets an academic audience, Prof Boeyens is also currently working on presenting and explaining these complex ideas to a popular audience. "My aim is to finish a text book on the same subject for Science and Physics students within a year or so," he concluded.



Prof Jan Boeyens

Opportunity to meet Nobel Prize winner

Dr Mabel Mphahlele, a postdoctoral fellow in the Department of Chemistry was nominated by the Japan Society for the Promotion of Science to attend the prestigious sixth HOPE meeting with Nobel Laureates and other distinguished scientists, held in Tokyo, Japan earlier this year. The title 'HOPE' signifies the promise held for young scientists and optimism for a bright science and technology future in the Asia-Pacific and Africa region.

The topic of her research was 'One-Pot three component C-S coupling reactions for the synthesis of thioethers over highly active nanostructured CuO-WO_3 oxide catalyst'.

The National Research Foundation (NRF) invited the Innovation postdoctoral research fellows to forward their applications for the sixth HOPE meeting to the Japan Society for the Promotion of Science. Only two NRF funded fellows from South Africa were accepted to participate with other fellows, selected from countries around the Asia-Pacific region.

"It was an honour for me to represent South Africa and even more important, the University of Pretoria, at this prestigious meeting. I truly appreciate the opportunity given to expand my individual horizons by meeting with the Nobel Laureates, top world-level researchers and peers from diverse places and interacting with them through the meeting's various programmes. The highlight of my visit was the opportunity granted to me to speak to Prof Ei-ichi Negishi, the 2010 Nobel Prize winner for 'Palladium catalysed cross-coupling in organic syntheses'. I quoted numerous of his Negishi cross-coupling reactions during my PhD studies at the University of South Africa. I was touched by his humility and perseverance. Growing up in a less privileged community not only presented financial and academic challenges, but also helped him to realise the value of education," Dr Mphahlele said.

"The experience was a source of stimulation in advancing my future research and gave me an opportunity to find something new within myself. I look forward to marking new milestones in scientific advancement and expanding the frontiers of human knowledge. This was a good opportunity to showcase the University of Pretoria's Chemistry Department as a scientific research centre in its own right within the global scientific community."



Dr Mabel Mphahlele and the 2010 Chemistry Nobel Laureate winner Prof Ei-ichi Negishi.

SCITAL Forum discusses undergraduate reform



From left: Prof Marietjie Potgieter (Deputy Dean: Teaching and Learning, Faculty of Natural and Agricultural Sciences), Prof Ian Scott (UCT) and Dr Denyse Webbstock (CHE).

Two experts in education recently addressed members of the Science Teaching and Learning Forum of the Faculty of Natural and Agricultural Sciences (SCITAL) on the Council for Higher Education (CHE) proposal for undergraduate reform in South Africa.

Prof Ian Scott (University of Cape Town) and Dr Denyse Webbstock (CHE) hosted a panel discussion on the content of the CHE proposal. The guest speakers shared the implications of the proposal for maths and science and discussed the response of the tertiary community to the proposal, as it affects everyone involved in teaching undergraduate programmes.

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.

First SENCER symposium hosted at Faculty

The first ever Science Education for New Civic Engagements and Responsibilities (SENCER) symposium was hosted early this year in the Faculty of Natural and Agricultural Sciences. The founders of the Programme, Prof David Burns, Professor at Harrisburg University and Director of the National Centre for Science and Civic Engagement (Washington, USA) and Prof Karen Oates, Dean of Arts and Sciences Worcester Polytechnic (Massachusetts, USA) was the guest speakers during the seminar.

Prof Garon Smith, Chemistry Department, University of Montana-Misoula, USA and a SENCER alumnus also delivered an address on *Effective teaching in large introductory Chemistry classes*.

SENCER is a faculty empowerment and curricular reform programme, designed to improve tertiary science education and boasts evidence of better retention of information and enjoyment of science by students. It was designed for scientists; those primarily trained as laboratory researchers during their PhD degrees but who end up in careers that require expertise in both teaching and research. SENCER advocates teaching science through the doorway or lens of an unsolved social problem that can be solved by scientific ways of knowing; for more information visit www.sencer.net.



From left: Prof Marietjie Potgieter (Deputy Dean: Faculty of Natural and Agricultural Sciences), Ms Bianca Verlinden (Department of Biochemistry), Prof Karen Oats (SENCER), Prof Garon Smith, Prof Debra Meyer (Head: Department of Biochemistry), Prof David Burns and Ms Lungi Sithole (Department of Biochemistry)

How can space assist in addressing socioeconomic challenges?

Addressing socioeconomic challenges through space was the topic of a recent open lecture presented at the Department of Geography, Geoinformatics and Meteorology. The lecture was a collaborative effort by the University of Pretoria, the South African National Space Agency (SANSA) and the German Aerospace Center (DLR). Dr Sandile Malinga (Chief Executive Officer: SANSA) and Prof Dr-Ing Johann-Dietrich Wörner (Chairman of the Executive Board: DLR) was the guest speakers.



Front: Dr Lee-Anne McKinnell (Managing Director: SANSA Space Science) **Back, from left:** Mr Martin S Owuor (Political Second Secretary: Kenia High Commission), Prof Hannes Rautenbach (Head: Department of Geography, Geoinformatics and Meteorology), Dr Jane Olwoch (Managing Director: SANSA Earth Observation), Dr Sandile Malinga (SANSA), Prof Dr-Ing Johann-Dietrich Wörner (DLR) and Dr Joel Botai (Department of Geography, Geoinformatics and Meteorology).

First joint workshop on Theoretical and Mathematical Epidemiology

A joint Unisa and University of Pretoria Workshop on Theoretical and Mathematical Epidemiology took place in March at the Science Campus, University of South Africa, Florida.

The Theoretical and Mathematical Epidemiology Workshop was the first in a series of three workshops to be held annually over the next three years. The objective of the workshop was to train a pool of local expertise, able to identify adequate responses to new and older forms of diseases – such as tuberculosis, HIV/AIDS and other communicable diseases – which pose a massive threat to development for South Africa and further afield. For this first meeting, participants were able to build mathematical models for epidemiological processes, perform qualitative, analytical and computational analysis, and validate their models.

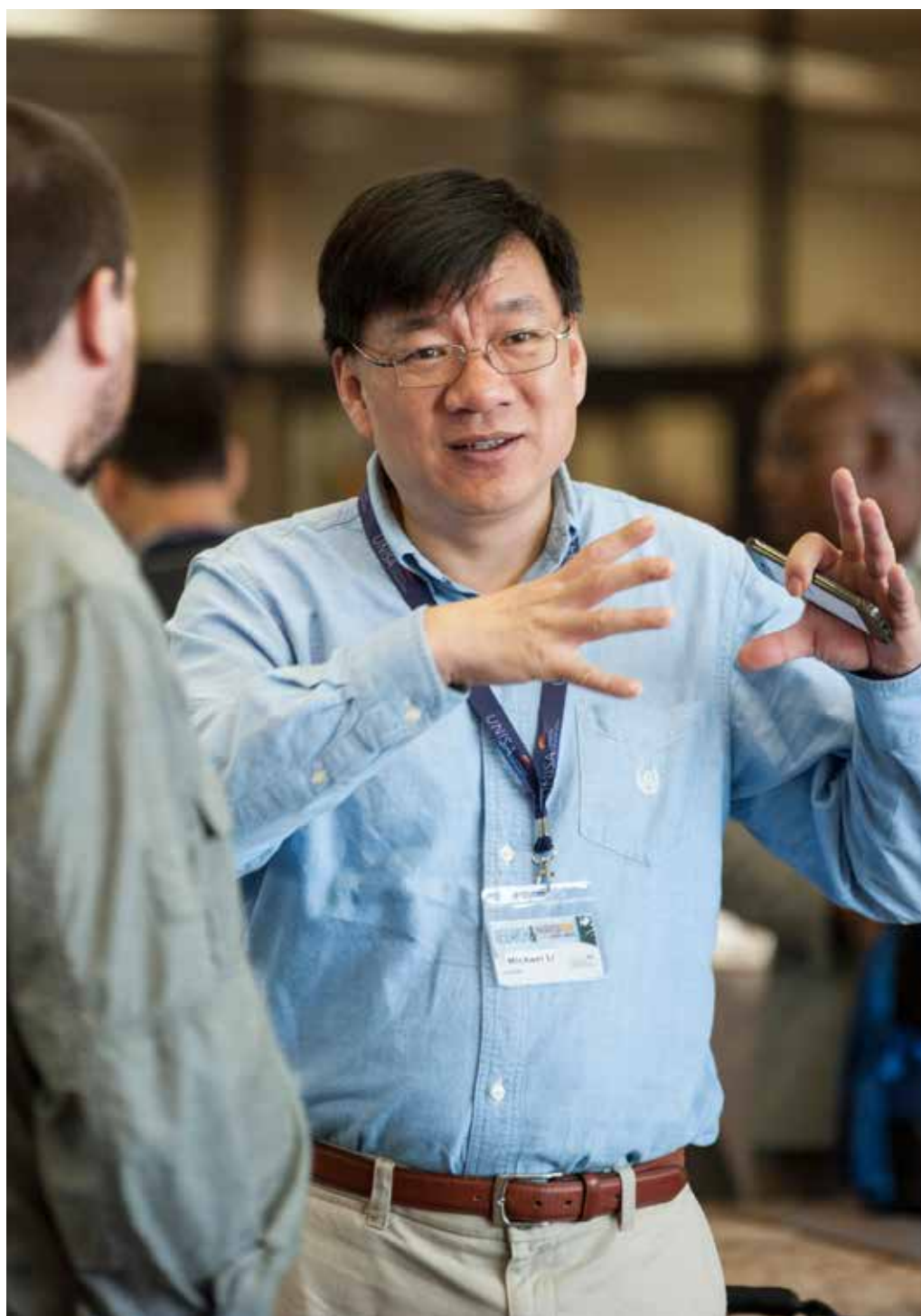
The workshop was funded by Prof Mamokgethi Phakeng (Vice-Principal: Research and Innovation, Unisa) and Prof Jean Lubuma (DST/

NRF SARCHI Chair in Mathematical Models and Methods in Bioengineering and Biosciences, University of Pretoria).

International speakers participating in this year's workshop included Julien Arino (University of Manitoba, Canada), Anuj Mubayi (Northeastern

Illinois University, Chicago, USA), Michael Li (Mathematical and Statistical Sciences, University of Alberta, Canada) and Pauline van den Driessche (University of Victoria, Canada).

The next workshop in 2015 will be hosted by the University of Pretoria.



Michael Li



Pauline van den Driessche

Actuarial students made Department proud



Werner Pansegrouw and Prof Anton Ströh (Dean: Faculty of Natural and Agricultural Sciences)

Werner Pansegrouw made the Department of Insurance and Actuarial Science proud when he was awarded the Vice-Chancellor and Principal's Medal for Excellent Undergraduate Academic Achievement as the best student in the Faculty of Natural and Agricultural Sciences.

Werner received his BSc degree in Actuarial and Financial Mathematics during the April graduation ceremonies, with a weighted average performance of 92% over his three years of

study. He also received the Outsurance Prize for the most promising Actuarial and Financial Management graduate.

Brendon Thorpe, who also graduated on the same day as Werner, with an honours degree in Actuarial Science, scooped up many awards. He received the PPS Prize for the most promising Actuarial Science graduate, Prudential Prize for the best student in Actuarial Mathematics the Momentum Group Prize for the best student in

Life Insurance as well as the Discovery Holdings Prize for the best honours research project.

The excellent academic achievements of the students in the Department of Insurance and Actuarial Science are also reflected in the ranking on the Dean's Merit List (for students with an average of 75% and above). A total of 14 students from the Department are on the Top 30 on this list, and five of them are ranked among the Top 10.

Geoinformatics student wins prestigious Isibalo Award

Stefan de Bruin, a BSc (Hons)(Geo-informatics) student from the Department of Geography, Geoinformatics and Meteorology (GGM) in the Faculty of Natural and Agricultural Sciences was awarded first prize in the category Best Student Project at the first annual Isibalo Award Evening in December 2013.

This award stems from the recently introduced Isibalo User Group Symposiums at which users of statistical data from Stats SA were invited to make presentations on how they were using official statistics in evidence-based decision making. Stefan's prize is sponsored by African Bank and included an all-expenses-paid trip to attend the African Symposium on Statistical Development (ASSD) in Gaborone in 2014.

The aim of Stefan's project, conducted under the supervision of Ms Sanet Eksteen, was to establish a methodology for measuring how fortunate a community is in terms of what they perceive as being important, versus what they receive from government organisations. The perceptions of what respondents consider important were determined using a list of predefined goods and services. The best statistical method to calculate a fortunate index was identified and evaluated using various statistical methods. All data sets for this project were captured and provided by Stats SA. The Department of GGM and the Centre for Geoinformation Science at the University of Pretoria would like to thank Stats SA, SAS, ESRI South Africa and African Bank for providing the student an opportunity to take part in this event.



Stefan de Bruin

Future scientists awarded as outstanding achievers

"This is probably the biggest concentration of IQ in Pretoria right now," Prof Zander Myburg smilingly said at the Annual Top Achievers Function for students of the Faculty of Natural and Agricultural Sciences on 8 May 2014.

Prof Myburg, who holds the Chair in Forest Genomics and Biotechnology in the Forestry and Agricultural Institute and who is a professor in the Department of Genetics, was the guest speaker and shared some lessons and successes of his academic career. "You must have passion for what you do, and you must surround yourself with like-minded people – fellow students who share your passion and your vision, people who will grow with you and eventually become your academic family. It is also important to have a balanced life and make time for your loved ones and family."

Prof Myburg not only developed significant new capacity for forestry genomics and biotechnology in South Africa. His and his team's article on the Eucalyptus genome was recently published in the very prestigious journal, *Nature*. Brendon Thorpe scooped up the most awards at the event. He received the PPS Prize for the most promising Actuarial Science graduate, the Prudential Prize

for the best student in Actuarial Mathematics, the Momentum Group Prize for the best student in Life Insurance, as well as the Discovery Holdings Prize for the best honours research project.

Lukas Radman de Soto received three prizes at the event: the Department of Physics Prize for the best first-year student in Physics, the Jan F Cilliers Book Prize for the best first-year student in Geology, as well as the Department of Chemistry Prize for the best first-year student in Chemistry.

Werner Pansegrouw not only received the Outsurance Prize for the most promising Actuarial and Financial Management graduate, but he was also awarded the Vice-Chancellor and Principal's Medal for Excellent Undergraduate Academic Achievement as the best student in the Faculty of Natural and Agricultural Sciences. He obtained his BSc degree in Actuarial and Financial Mathematics in April, with a weighted average performance of 92% over his three years of study.

This year's Function for Outstanding Achievers was even more special than the previous occasions. The Dean's Merit List was announced (the list includes students with an average of more

than 75%) and the Top 30 undergraduate students on this list (with averages of 85% and more) were also acknowledged at this event. The Dean also specially mentioned all the candidates who received their doctoral degrees during the recent autumn graduation ceremony and announced that they will also be included in the Dean's Merit List.



Brendon Thorpe and Ms Marli Venter (Head: Department of Insurance and Actuarial Science).

Young researchers participate in shaping future African food security policies

Three PhD students and a postdoctoral fellow from the Institute for Food, Nutrition and Well-being (IFNuW) participated in the Comprehensive African Agriculture Development Programme (CAADP) Partnership Platform at the International Conference Centre (ICC) in Durban during March 2014.

The theme of the event was *Year of Agriculture and Food Security in Africa* and it marked the 10th anniversary of the adoption of the CAADP. The event was organised around ten work streams. Prof Sheryl Hendriks, Director of the IFNuW, was tasked to facilitate the work stream on Food Security and Nutrition. The outputs of the meeting provided the basis for discussions at the recent African Union Commission (AUC) Joint Conference of Ministers. They adopted a declaration, outlining concrete goals, targets and associated commitments for the next decade. This declaration was signed at the June 2014 Summit of the African Union.

The AUC CAADP Coordinator, Boaz Keizire welcomed the contribution of the young researchers, stating: "You belong here; the CAADP needs youth, because you are the future." Youth comprises nearly 30 percent of the world's population. For sustainability of any project, involvement of the youth is critical in development decision-making and in the implementation of programmes such as the CAADP.

The four young researchers were invited to provide support to the event that offered them a unique learning experience, expanded their knowledge, and provided a holistic picture of contemporary challenges faced by Africa governments and farmers.

"It is a privilege to be part of the process that will define the future of African development". "This meeting was really a learning curve – there was just so much to absorb from the pool of experts from all over the world". "Can't imagine being at such an event with the Chairperson of African Union Commission, Ms Nkosazana Dlamini-Zuma; shaking hands with the AUC Commissioner for Agriculture and Rural Development herself; interacting with the master minds behind the CAADP initiative; and interacting with the leaders of international organisations, among others, FAO, IMWI, NEPAD, AU, USAID". These were only some of the comments made by the excited students."



From left: Ms Tima Munthali, Dr Njabu Mngidi and Ms Eliza Mkandawire.

Event managers in the making at UP

When final-year culinary arts students complete their Bachelor's degrees in Consumer Science (Hospitality Management) in the Faculty of Natural and Agricultural Sciences they are sufficiently trained and experienced to handle almost any event. As part of the management component of the degree, each student is required to plan and manage a function for a real, paying client.

Students have the opportunity to experience the daily trials and tribulations of an event planner first-hand and to get to know the stressful situation behind the scenes, a situation which is in stark contrast to the image of a professionally attired, unflappable paragon of time, budget and personnel management.

The reality is that event planners often have to deal with requests from guests and clients that range from being mildly quirky to off-the-bat crazy, starting from the initial interview to long after the event has come and gone.

"Over the past five or six years the final-year Hospitality Management students have had their fair share of strange requests and the attendant dramas that come standard with every function," Mr Hennie Fisher, lecturer of the course, says. "These students have managed some events that they can be truly proud of, ranging from pre-packed lunch packs for 600 rugby supporters at the nearby Loftus stadium, to intimate and elegant luncheons for the Principal, Prof Cheryl de la Rey, and foreign dignitaries at Kya Rosa. The exposure and experience gained through these events are invaluable and students who have listed them on their CVs report that the practical experience thus gained was what most impressed their prospective employers.'



Final-year Culinary Arts students

The event manager in charge of each event also has to schedule his or her classmates to act as kitchen managers, dining-room managers, pantry managers, and so on. Each of these roles plays a pivotal part in running the event on time, within budget and to the high-quality standards that clients expect. The event manager oversees the menu design, the costing of all expenses, as well as the adherence to and reconciliation of the budget. Junior students also assist with some of the groundwork, such as waiting tables and cleaning. The aim is to ensure that students will experience all aspects that a trained, experienced event manager in the real world will deal with every day.

At the end of March, Glenfiddich Whisky hosted a food and whisky pairing dinner of particularly high quality at the eat@UP restaurant in the Old Agriculture Building. Seventy guests were treated to a gourmet four-course meal in which each of the different courses were carefully conceptualised to complement a specific whisky from this famous Scottish brand. This event provided students with an opportunity to liaise with prospective clients, and at the same time to enjoy a private whisky tasting beforehand. They were made aware of the complexities and finer nuances of individual whiskies, which they had to keep in mind when developing a course to match each whisky.

While certain occasions are arranged by private clients, some events are also open to the public. Eat@UP does not function as an à la carte restaurant, but can be booked for any day or evening, for groups of guests, ranging from 12 to 200 for a set menu. Students prepare individual menus for every function and, if it is during class time, menus can even be designed to fit the occasion.

Interested parties can contact Mrs Raine Smit of the Department of Consumer Science at raine.smit@up.ac.za for more information.



One of the plated desserts

Women in Computing – UP staff and students inspire girls

Sci-Enza, the science centre at the University of Pretoria (UP), was selected to receive a WeTech Seed Fund Grant to support its *ICT: Girls who dare to be there!* project in Pretoria.

The project aims to expose girls and women to careers, opportunities, role models and the newest trends in Information Technology (IT), computing and technology related fields. Basic computer skills training for secondary school learners from underprivileged schools will also form part of this initiative. This project is one of 17 projects in Africa selected by **Women Enhancing Technology** (WeTech), with the generous support of lead partner Google. These projects will receive grants of \$2,000 to \$20,000 to support their impressive work to involve more women and girls in computer science related opportunities.

Sci-Enza kicked off the grant activities with a Women in Information Communication Technology (ICT) Role-model Day in May, at the Mae Jemison US Science Reading Room on the UP Mamelodi Campus.

Bright-eyed girls from various high schools in the township soaked up information shared by the three inspirational female role models, who spoke about their passion for technology and computing.

Eleanor Harding, a creative strategist, games designer and final year UP multimedia student inspired the girls with her story about how she campaigned to have IT presented as subject at her former high school. She has won several design competitions and travelled to Singapore and the USA as part of her awards package. Her most recent game, Orbit, won the South African National Finals of the Microsoft Imagine Cup.

Learners enjoyed the lively presentation by Jade Abbot, a software engineer, UP Computer Science master's student and musician. She spoke about how one should do what you love, keep on learning new things and not be afraid to

try IT and programming. Her current research focuses on ant and bee inspired models to control robot swarms.

Tendani Mawela, an Informatics lecturer and PhD student at UP, shared how she wanted to become a medical doctor, until she realised she couldn't stand the sight of blood. She emphasised the importance of working hard at school, not being lazy, and of reading and learning new things to become successful in whatever you do. Her current research focusses on information and communication technologies within government.

Presentations were followed by a lively discussion session, where the learners could further pick the brains of the three passionate speakers. Each girl received an ICT resource pack with information about entry requirements to study at various institutions, news about trends in technology and a sweet treat. Lerato Mokwena, a 17 year old learner from Gatang Secondary School who attended the event said: I was very inspired by what I heard from the IT workers and I would love to be just like them one day." Another attendee, Lebogang Senong, a 16 year old learner from Lehlabile Secondary School said that she will be adding IT to her career choices list.

"We are delighted with the outcome of the Role-model day. Girls from underprivileged areas rarely consider computing or technology as viable career choices. ICT is such an exciting field at the moments and just about every career nowadays use technology and computing to some extent. We are looking forward to introducing girls and women to opportunities within this field, with the support of the WeTech grant," said Irene Schoeman, science communicator and *ICT: Girls who dare to be there!* project leader from Sci-Enza.

Sci-Enza is the oldest interactive science centre in South Africa and aims to make science accessible to learners of all ages, in a fun and entertaining way and by doing so, raise science awareness.



Tendani Mawela with some of learners interested in IT.



Jade Abbot sharing her knowledge of computer software.

Crypto Giants visit South African Reserve Bank

The Crypto Giants is an undergraduate mathematicians' initiative which has as members young, enthusiastic, diverse and mathematically-minded individuals who are passionate about the complex properties of numbers, as well as Mathematics as a whole and its application in daily life. They are embarking on a problem-solving journey by addressing various mathematical problems and research projects, which will help them to enhance their mathematical skills, and analytical thinking processes, and at the same time discovering different approaches to problems at hand.

The program is structured to prepare students for honours-level Mathematics, and they are expected to present literature reviews on individual projects to the group and to present their own examples, where applicable.

In March the Crypto Giants visited the South African Reserve Bank (SARB) College, where they attended presentations on the application of Mathematics in the financial world. The aim of the trip was to expose the students to

an environment where Mathematics is applied in our everyday lives. The applications of Mathematics are numerous, but none as intriguing and alluring as the financial applications of Mathematics. The students were presented with lectures on Applied Mathematics by various persons: Financial Markets by Ziets Botha, Financial Risk Management by Puben Govender, and Econometric Modelling by Melvin Khomo.

They learnt about the main functions of the Reserve Bank and acquired a better understanding of the required mathematical skills needed in the day-to-day running of the bank. They also learnt about the different models that are used in pricing securities, such as government bonds and other investments. The group was afforded the opportunity to ask questions on the types of careers they could pursue as mathematicians in the banking environment.

Although the experience at the bank was short, students experienced the visit as very fruitful and would like to thank their enthusiastic and passionate hosts.



Students with hosts from the South African Reserve Bank

NATHouse students active on campus and in community

All in a day's work... Reaching out to disadvantaged communities, being tutors to fellow students and also assisting at career exhibitions ...

These are just a few of the activities in which NATHouse, the official student house of the Faculty of Natural and Agricultural Sciences are involved.

The main focus area of the Faculty House is the academic well-being of students. In November 2013 NATHouse hosted a Tutor Day during which they invited lecturers of selected modules to assist students with their preparation for examinations. These sessions provided students with an opportunity revise sections of the work they found problematic perusing a previous exam paper together with the lecturer. In addition, the sessions offered students an extra boost of confidence needed when writing their examination.

According to Boiketlo Mphahlele from NATHouse, "one very important and beneficial relationship in students' academic journey is with the Faculty's student advisors. The past semester we worked with the student advisors to have sessions on time management, study techniques and exam preparation, to name a few. The student advisors are available to all students in the Faculty and students can make personal appointments with them."

Academic events can also prove to be fun! The Department of Mathematics and Applied Mathematics hosted a Maths Quiz Evening at Oom Gert's restaurant. NATHouse also participated and their team's theme was *Mathematicians in Corporate*. The evening was filled with mathematical logic, guesstimates, snacking and puzzled looks at your team mates. Students at all academic levels felt challenged, reminding everyone how intriguing mathematics can be.

NATHouse not only takes care of the students in the Faculty, they also reach out to disadvantaged communities. During May they hosted a motivational talk for the top 30 learners of Reitumetse Secondary School. Two students and representatives from JuniorTukkie spoke to the learners, explaining all about JuniorTukkie, becoming a university student, and giving them few words of encouragement. This year, NATHouse also participated in the Faculty's career exhibitions at various schools in Gauteng. "It is important that we help ensure that there is a steady stream of new scientists coming to the University after us," Boiketlo emphasised.

Kgomotso Children's Centre is one of the biggest community outreach projects of the year. Through funding from the Faculty and the Student Representative Council Project Pools Fund, NATHouse was able to extend the facilities of the Centre, to provide new roofing, as well as painting the entire Centre. The Centre provides a space where children can spend time after school, receiving assistance with school work, participates in fun group activities and are provided with a meal.

In December 2013, NATHouse also visited Danville House of Lights. Every year this home is decorated with Christmas lights to gather gifts for those less fortunate. NATHouse, with assistance from students, donated some goodies such as colouring in books, crayons and children's toys.

NATHouse is currently driving a project to encourage all students with Chemistry kits, which they no longer use, to please donate them to us. We shall be distributing these to schools with science laboratories to enhance learning. Please drop off the kits at the Agricultural Annex Room 2-8, or email katlego.segole@gmail.com to arrange collection.

To stay up-to-date with the latest NATHouse information and events, follow NATHouse on Twitter and Facebook.



Kgomotso Children's Centre is one of NATHouse biggest community outreach projects.



NATHouse members participating in the Mathematics quiz evening.