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NAS made meaningful contributions in fight against COVID-19

Although the past year has really been tough and filled with uncertainty after COVID-19 hit the world, the Faculty of Natural and Agricultural Sciences (NAS) tackled the challenges head on.

As the pandemic requires new approaches to business and especially to teaching, learning and research in the higher education environment, staff from NAS really showed their steel.

There are a few examples of how our researchers made meaningful contributions in the fight against COVID-19. A team from the Department of Statistics, in collaboration with other international universities, developed what was believed to be the first interactive app in the country that provided real-time data on COVID-19 using R-Shiny (a statistical software package) in April this year. The team that worked on the dashboard includes Prof Andriëtte Bekker and Dr Johan Ferreira from UP, and Prof Mohammad Arashi and Dr Mahdi Salehi, who are from the Iranian institutions Shahrood University of Technology and the University of Neyshabur respectively.

...continues on page 3.

In this edition:

Achievements	4
Awards	26
PhD news	42
Student achievements	45
Research	58
Grants and collaborations	80
New appointments	86
Renewals and reappointments	93
Goodbye to deputy deans	97
In memoriam	99

This beautiful image was captured by Dr Marietjie Oosthuizen, a postdoctoral researcher in the Department of Zoology and Entomology. It was shortlisted in this year's Wilderness Safaris Photographic Competition and was also entered in the People's Choice category.



Message from the Dean

No one can deny that 2020 was a tough year. We have had to adapt at short notice, and we have had to become comfortable with new ways of living, and conducting our business. We discovered new challenges that a home office and new work routines bring to the family home, and we became experts on where to click to “raise your hand” on the various virtual meeting platforms. Children, partners and pets made impromptu appearances in our virtual meetings, and we have had to learn the hard way that virtual meetings need not be as long as in-person meetings.

But thanks to the extraordinary efforts of our students and staff, we also have a large number of achievements to celebrate, and that is what this newsletter is all about.

Our staff and postgraduate students were recognised by a number of national and international bodies, for their excellence, impact and innovation. The Academy of Sciences of South Africa, the Mandela Rhodes Foundation, the South African Chemical Institute, the African Academy of Sciences, the SA Akademie vir Wetenskap en Kuns, the National Research Foundation, the National Science and Technology Forum, the Global Young Academy, the National Geographic Society, the Royal Society, ABSA and ESRI are but a few of the organisations that recognised NAS excellence in 2020. Our partnerships with industry remain as strong as ever, with substantial investment in research by York Timbers, and the Hans Merensky Foundation.

Research highlights include findings on microbiomes, ancient human diseases, whales, hummingbird survival, radio astronomy, renewable fuels, immunity in humans, pandemic mapping, life on a subantarctic island, the role of trees in grasslands, and novel mosquito repellents.



Prof Barend Erasmus

We cannot recognise these achievements, without also extending our condolences to the family and friends of the three staff members that passed away in the last year.

The year also brought a few new faces to NAS, and I am excited to see how Profs Belinda Reyers and Lindiwe Sibanda will take sustainability and food systems research, respectively, forward at UP.

I wish all our students and staff a well-deserved rest over the festive season. Travel safely, and if each of us do our part to adhere to the guidelines to limit the spread of COVID-19, we will make 2021 a lot better for everyone.



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...continued from page 1.

Another example is a UP alumnus Daniel Ndimu and his business partner Dineo Lioma, who have developed a ground-breaking COVID-19 test kit that will provide results in just over an hour. The CapeBio-SARS-CoV-2 RT-PCR Kit boasts improved efficiency, sensitivity and specificity. Ndimu graduated with a MSc degree in Biochemistry (Structural Biology) in 2016. The test kit can be used to detect SARS-CoV-2 in specimens extracted from throat swabs, nasal swabs, washes and aspirates, and from bronchoalveolar lavage fluid (fluid extracted from the lungs).

Prof Cobus Visagie and Dr Neriman Yilmaz, both mycologists at the Forestry and Agricultural Biotechnology Institute (FABI), have launched the FABI Fun Project to take a closer look at the fungal diversity found in and around the institute when many begin to return to laboratories and offices. The public, both locally and abroad, are invited to participate in this initiative. The public is welcome to send pictures or mouldy items and FABI will preserve the strains in their fungal collection. If they find new species, they will describe it and name it after the person who sent the strain to them.

Another aspect considered by NAS researchers was the possible effect that forecasted deaths due to COVID-19 might have on groundwater. Prof Matthys Dippenaar from the Department of Geology has appealed to municipalities to monitor groundwater close to cemeteries if high volumes of COVID-19-related deaths realises. Apart from ensuring there are enough facilities, an equally important consideration is to ensure that death and burials occur safely, given the highly infectious nature of the SARS-CoV-2 virus.

On a nutritional level, research by Prof Naushad Emmabux from the Department of Consumer and Food Sciences showed that high-fibre foods might help to fight against COVID-19, being beneficial effects against viral infection. A healthy gut microbial diversity can prevent anti-viral effects and intestinal dysbiosis. Thus a healthy, balanced diet with the inclusion of functional foods such as plant dietary fibre found in vegetables and fruits, non-digestible oligosaccharides consisting of wholegrains, and fermented foods that are rich in probiotics could help us to strengthen our immune system to act against viral infections.

The Department of Mathematics and Applied Mathematics also joined in the efforts against COVID-19 and put NAS on the map with an article by Dr Salisu

Garba, Prof Jean Lubuma and Prof Berge Tsanou on the **modelling of both the transmission dynamics of the COVID-19 pandemic in South Africa** and its control through non-pharmaceutical interventions such as social distancing and lockdown. Published in *Mathematical Biosciences*, one of the top journals in the field, the paper is among the top five of the most downloaded articles from **this prestigious journal in the last 90 days**. With NAS focusing on multidisciplinary and interdisciplinary research, Prof Lubuma also presented the results at one of the National Department of Health Knowledge Hub Webinars, attended by more than 200 medical doctors, with Prof Roumen Angelov and Dr Garba as panellists. Further contributions on mathematical aspects of the outbreak of COVID-19 are available on the dedicated website **UP Biomath Response 2 Covid-19**.

Prof Barend Erasmus, Dean of the Faculty of Natural and Agricultural Sciences, praised staff for all the extra hard work they put in the past year. He also boasted with the fact that, despite COVID-19, third stream income in NAS during 2020 was almost the same as the previous year, before COVID-19. "This is a tremendous effort, and it reflects the value of long term, meaningful industry partnerships during difficult times. It was not just a question of existing partners who continued to invest, but thanks to institutional and faculty efforts, a number of new funders saw the UP value proposition, and came on board."

"The Faculty of Natural and Agricultural Sciences is ready for 2021 and the challenges it will bring. We will continue to use the challenges the pandemic brings to reimagine how higher education could function and flourish. The resulting innovation in teaching, learning and research will help us to increase our societal relevance," Prof Erasmus concludes.



Three esteemed NAS researchers elected to ASSAf

Three internationally renowned researchers from the University of Pretoria (UP)'s Faculty of Natural and Agricultural Sciences (NAS), Prof Roumen Anguelov (Department of Mathematics and Applied Mathematics), Prof Andre Ganswindt (Mammal Research Institute) and Prof Sheryl Hendriks (Department of Agricultural Economics, Extension and Rural Development) have been elected to the Academy of Science of South Africa (ASSAf).



Prof Roumen Anguelov is the Head of the Department of Mathematics and Applied Mathematics since 2013 and his current research is mainly on Biomathematics, an interdisciplinary area comprising applications of mathematical methods and models to biological sciences as well as new mathematical constructs and theory.

"Thank you to the Academy for electing me to become one of its members. This is a much appreciated recognition as well as opportunity to be a bigger part of science in South Africa," Prof Anguelov said when asked for comment on this achievement.

He is the Founder and Editor-in-Chief of the international journal *BIOMATH* established in 2012 and member of numerous national and international societies. Prof Anguelov is also a regular referee for international mathematics journals and currently has a B-2 rating from the National Research Foundation (NRF). His Scopus h-index is 12 and he received UP Academic Achievers Awards in 2013, 2016 and 2020.



Prof Andre Ganswindt is the Director of the Mammal Research Institute (MRI) since 2017 and studies behavioural endocrinology in wildlife and domestic animals, to address proximate and ultimate questions concerning regulative endocrine mechanisms that in combination with other factors, like social or ecological changes, influence reproductive function and responses to stressors.

"I feel a great debt of gratitude for all the support and mentorship I received along the way and hope to live up to expectations going forward," Prof Ganswindt commented on his election to ASSAf.

He holds a B2-rating from the NRF and has published 124 peer-reviewed articles (WoS h-index: 20). Prof Ganswindt is a member of many national and international societies and is currently the Vice-President of the Zoological Society of Southern Africa and the Chair of the International Society for Wildlife Endocrinology. He established the Endocrine Research Laboratory at UP eleven years ago which is now a well-respected research platform, broadening the horizon for wildlife endocrine research in Africa, while at the same time reinforces the discipline as a valuable part for reproductive science, animal welfare, and wildlife conservation biology.



Prof Sheryl Hendriks, Head of the Department of Agricultural Economics, Extension and Rural Development) and Founding Director of the UP Institute for Food, Nutrition and Well-being is a food security policy expert with extensive experience in policy analysis and programme design. Her research focuses on food security and nutrition policy analysis and monitoring and evaluation of food security at the household, national and global information system level. She teaches food security policy analysis, monitoring, and evaluation.

She is actively engaged in high-level global food security policy think tanks and panels as well as being influential in food security and nutrition policy circles in Africa. Some of these engagements include serving two terms on the UN Committee on World Food Security's High-Level Panel of Experts on Food Security and Nutrition and as a current member of the Montpellier Malabo Panel. Prof Hendriks currently has a C-rating from the NRF.

Prof Hendriks also shared her sentiments on being elected to such a prestigious association. "It is a great honour to be admitted as a member of ASSAf, which offers opportunities to directly contribute to shaping South Africa's policy on topics related to food security and hunger based on sound evidence from research and engagement in international discussions on these topics," Prof Hendriks concluded.





Dr Mlonyeni the first-ever Mandela Rhodes alumnus appointed to Board of Trustees

Dr Osmond Mlonyeni

Dr Osmond Mlonyeni, Project Manager at Future Africa, an institute based at the University of Pretoria (UP), has made history by becoming the first-ever alumnus of the Mandela Rhodes Foundation (MRF) to be appointed as a trustee of the Foundation.

Dr Mlonyeni acknowledged his appointment as “an honour and privilege to be invited to serve the MRF in this capacity. Considered in light of the recent appointment of CEO Judy Sikuza, it also illustrates the MRF’s confidence in the emerging forest of leaders among Mandela Rhodes Alumni. At a societal level, this decision is a clarion call to act with intention to harness Africa’s youth dividend to realise its full potential. I am humbled and look forward to this journey of service, growth, learning and transformational leadership in practice.”

As Project Manager at Future Africa, he is in part responsible for partnerships and programmes for innovation that include serving on the leadership team for Innovation Africa. Dr Mlonyeni is also a non-executive director on the boards of two state enterprises, the Gauteng Enterprise Propeller and the Innovation Hub Management Company.

Dr Mlonyeni was a South African Mandela Rhodes Scholar in the class of 2009. He reflected on how the scholarship enriched his life, saying that it has been a catalyst to many subsequent achievements.

“However, more importantly, the reflections I made about the scholarship after my year-in-residence (class of 2009) have been crystallised by the passage of time and thus remain relevant. My sentiments then were that I had the opportunity to learn from and with peers, to constructively interact with a diversity of schools of thought, and to draw from the insight of the MRF family. The MRF is more than just a scholarship. The MRF has been a guardian, mentor, educator, reconciler and a hub for visionaries. It has reinforced

the importance of a shared vision, enriched my understanding of dedication, taught me the important role that objective reflection plays, in correction and renewal, and planted a seed for shared responsibility towards humanity,” Dr Mlonyeni concluded.

The Chair of the MRF Board of Trustees, Prof Njabulo S Ndebele, commended Osmond and said: “He is the first person from the next generation of leaders to join the Board of Trustees. As an alumnus of the Mandela Rhodes Scholarship, he has a deep understanding of the Foundation’s values and the impact it can have in the lives of its scholars. Dr Mlonyeni is both very accomplished and exceptionally wise, and has an impressive set of skills and experiences that will add tremendous value to the Board.”

Previously a research assistant, doctoral candidate and postdoctoral fellow at the Forestry and Agricultural Biotechnology Institute (FABI), his research focused on understanding the role of diversity in the management of an invasive woodwasp pest. Dr Mlonyeni has published in international peer-reviewed journals and presented at international and national conferences. In addition, he has contributed to public discourse via presentations, interviews and panel discussions to highlight the value and relevance of research for the advancement of knowledge and the benefit of society.

Some of his achievements include the UP honorary colours for Academics and Leadership, being a member of the Golden Key Society, Top 3 student presenter at the Commonwealth Science Conference in 2017, and a Horst Köhler Fellow for the 65th Lindau Nobel Laureate Meeting.

Dr Mlonyeni holds the degrees BSc in Human Genetics, BSc (Hons) in Genetics, and MSc in Genetics (with distinction) obtained as a Mandela Rhodes Scholar, as well as a PhD in Genetics. He obtained all of his qualifications at the University of Pretoria.

Prof Christian Pirk elected as AAS Fellow

Prof Christian Pirk, leader of the **Social Insects Research Group (SIRG)** in the Department of Zoology and Entomology was recently elected as a Fellow of the African Academy of Sciences (AAS).

When asked to comment on this achievement, Prof Pirk said: 'It is a great honour to be elected to the African Academy and to receive recognition for my work, which would not have been possible without an international network of collaborators. I hope this will allow me to build a wider research network, especially in Africa, in an endeavour to benefit my students and colleagues in their search for African answers to global questions. What made my election even more special, was the fact that it happened in a year in which three of my PhD students from three different African countries will be graduating from UP.'

He explained that he was particularly interested in the reproductive division of labour in social insects – especially honeybees – and the potential resulting conflicts between members of an insect colony, and in how these conflicts are resolved. In this context, his research is focused on the effect of nutrition on reproduction and – in a broader context – the nutritional requirements of honeybees as a superorganism. The research conducted by the SIRG on the effect of pesticides on the well-being of bees contributed to the first comprehensive report on neonicotinoids in the African agricultural context, which was published by the InterAcademy Partnership under the leadership of the Academy of Science of South Africa (ASSAf) and the Leopoldina (German Academy). The other focus is

on the chemical ecology of social insects and disease vectors, for example mosquitoes or flies, especially on the fascinating ability of Cape honeybees to reproduce even in the presence of the queen by smelling like her. Research in this field was initiated by Prof Crewe, who mentored Prof Pirk when he first arrived at UP as a postdoctoral fellow. Over the years, this research has contributed to making their laboratory one of the two leading laboratories in Africa in the field of chemical ecology.

Prof Pirk has received a C1 rating from the National Research Foundation (NRF) and has an h-index of 29. He has also received a Publons Peer Review Award for being in the top 1% in the field of plant and animal sciences from 2017 to 2019.

The AAS is a non-aligned, non-political, non-profit Pan-African organisation whose vision is to see lives on the African continent transformed through science. The AAS fellowship includes individuals who have reached the highest level of excellence in their fields of expertise and have contributed to the advancement of those fields on the African continent. AAS Fellows are elected by members of the AAS by following a rigorous review process based on the candidates' achievements, which include their publication records, innovations, leadership roles and contributions to society.

Prof Christian Pirk





Prof Thulani Makhalanyane

UP and partners awarded EU grant to study South Atlantic microbiomes

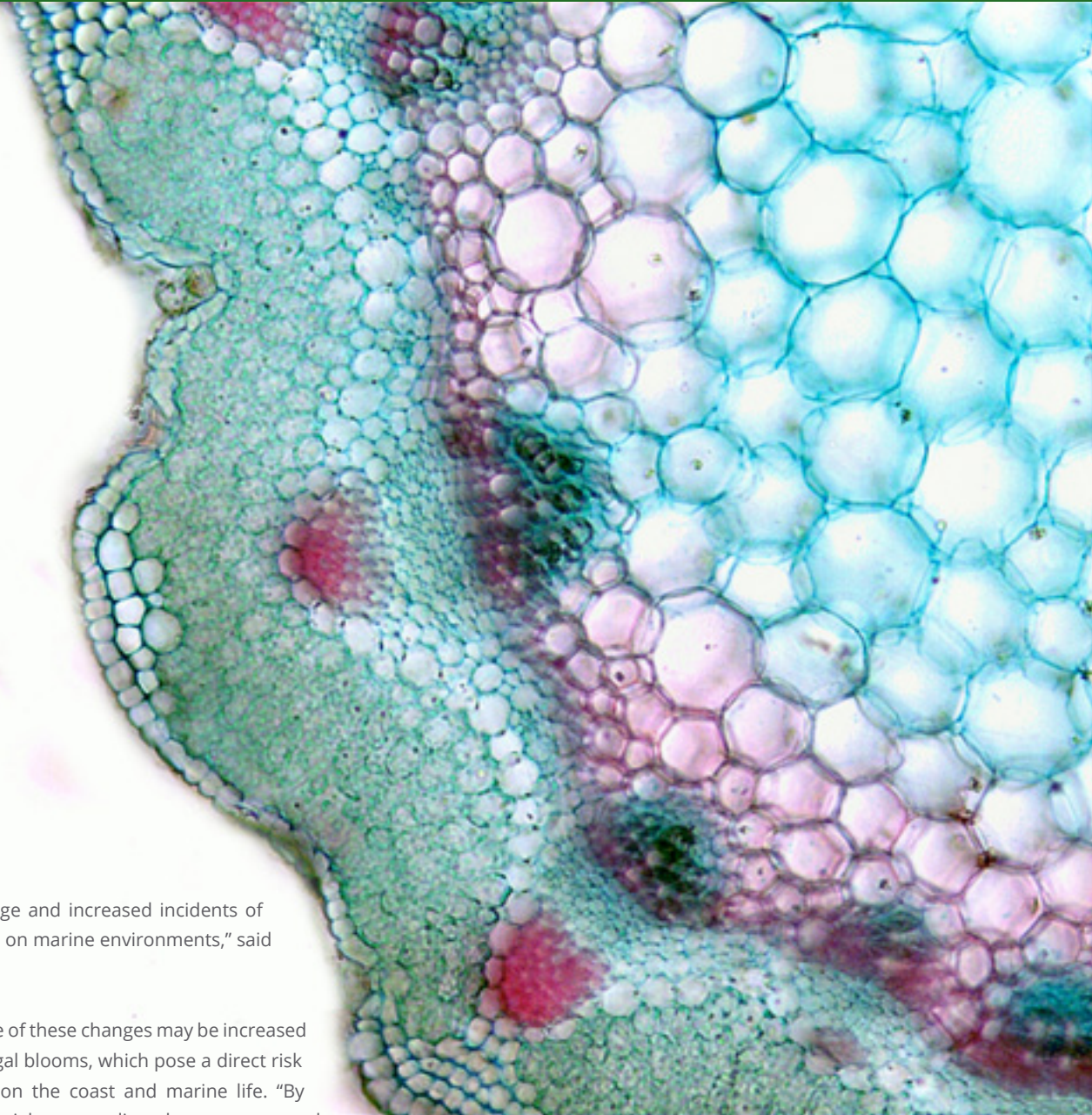
The University of Pretoria (UP) is part of a consortium that has been awarded €11 million (about R 216 million) to study the microbiomes in the South Atlantic Ocean.

The Atlantic ECOsystems assessment, forecasting and sustainability (AtlantECO) initiative involves 36 partners from the European Union, Brazil and South Africa. The consortium is coordinated by the Stazione Zoologica Anton Dohrn in Italy (a marine biological research station where scientists and students from all over the world can perform their research on fresh material or even living marine organisms). Other partners are from the European Molecular Biology Laboratory, the University of Bern, the University of Liverpool and other leading institutions.

The Microbiome Research Group at UP, led by Professor Thulani Makhalanyane of the Centre for Microbial Ecology and Genomics, Department of Biochemistry, Genetics and Microbiology, is a lead partner of AtlantECO. The term microbiome is used to

collectively describe microorganisms (that is bacteria, fungi, archaea and viruses), their genomes and their habitats. These microbiomes are found everywhere including in human guts, in soils and the oceans. Prof Makhalanyane explained that “Microbiomes are complex and difficult to study in their natural environments. One of the reasons is that they are abundant and may be in the order of millions within a 1ml of seawater. The scale of this complexity is increased in the oceans due to the four-dimensional structure and the fact that these microbiomes are continually interacting”.

The oceans absorb carbon dioxide produced through human activities, provide food and other essential ecosystem services. Microbiomes are important mediators of these processes and, through their ability to break down complex molecules, cycle important elements such as carbon and nitrogen throughout the oceans. “However, we lack a clear understanding of the ways in which climate change may alter the ability of microbiomes to provide these services. For instance, we lack a clear understanding regarding the



effects of climate change and increased incidents of oil and plastic pollution on marine environments,” said Prof Makhalanyane.

A possible consequence of these changes may be increased incidents of harmful algal blooms, which pose a direct risk to communities living on the coast and marine life. “By providing important insights regarding the structure and function of microbiomes in the South Atlantic, AtlantECO will provide a baseline allowing us to improve our predictions on the impacts of climate change,” he explained.

“We can think of the Southern Ocean as the proverbial engine room for key parts of the world’s climate. Surprisingly, there are many gaps in our knowledge of such an important part of the earth system, and the AtlantECO project will make a meaningful contribution to plug some of these gaps, specifically for the South Atlantic” said Professor Barend Erasmus, Dean of the Faculty of Natural and Agricultural Sciences at UP. “UP’s part of the work is really novel, by looking at global level consequences of microbiome dynamics. The consortium of researchers realised that big problems need big teams with big ambitions, and they managed to source the funding to get it done.”

This initiative aims to develop and apply new technologies to understand microbial communities and their ecosystem services in the Atlantic Ocean. Key technological innovations include the development of high-resolution imaging to better visualize marine microbiomes. The project also aims to develop genetic sensors and tests which may be used in aquaculture facilities to monitor hazards,

predict and mitigate risks. “Together, the results from this project will provide new insights regarding the effects of climate change on marine ecosystems,” said Prof Makhalanyane.

Dr Stephan Pesant, Co-Principal Investigator of AtlantECO said “It is our hope that this project will provide substantial improvements in our understanding, and serve as a means for connecting the African, South American and European researchers.” He added “We hope to communicate our scientific outputs to the public, in hopes of improving ocean literacy and advocacy for the South Atlantic.”

AtlantECO is part of a series of projects funded as part of the Belem agreement signed by South Africa, Brazil and the EU. The Belem agreement aims to promote and facilitate human capital development and scientific exchange and encourages cooperation in several research areas. These areas research on climate variability, food security, understanding the effects of pollutants and polar research on the Atlantic and Southern Ocean.

The project will run over 48 months.

Three NAS scientists awarded FLAIR international fellowships

The African Academy of Sciences and the Royal Society, supported by the UK's Global Challenges Research Fund, recently announced the second group of recipients of the Future Leaders African Independent Research (FLAIR) fellowship.

This is awarded to outstanding early-career African scientists whose research focuses on the needs of the continent. Three scientists from the Forestry and Agricultural Biotechnology Institute (FABI) in the Faculty of Natural and Agricultural Sciences (NAS) received the fellowship. They are Prof Cobus Visagie, Dr Esther Muema and Dr Gudrun Dittrich-Schröder.

Prof Visagie, Associate Professor at FABI, said that this is the funding he needs "to really expand and establish my research in the agricultural space". His work is on fungi that produce mycotoxins, one of the biggest threats to African food security.

Mycotoxin contamination of food and feed pose serious threats to human and animal health in Africa, and often leads to death. According to the Food and Agricultural Organisation, 25% of crops are contaminated with fungi and mycotoxins. This leaves a high percentage of Africans, mostly from the poorest communities, as well as animals at high risk. Prof Visagie's project aims to expand, document and disseminate our understanding of the diversity of mycotoxigenic fungi and mycotoxins in food and feed across South Africa.

Dr Muema is a postdoctoral fellow in the division of Microbiology in the Department of Biochemistry, Genetics and Microbiology. "As an early-career soil scientist, I see the FLAIR fellowship as a golden opportunity to establish myself, and contribute towards Africa's food security and sustainable development," she said. "The enablement to also include master's students in my project will assist me in growing my career as I contribute to human capital development."

Chickpeas not only provide nutrition, but also use passenger bacteria, rhizobia, to lock nitrogen into soils, which are weathered and infertile in parts of South Africa. Dr Muema aims to identify local species of rhizobia to better understand their interaction with chickpeas, leading

eventually to enhanced crop production and soil fertility. The aim of this project is to identify the diversity of native soil rhizobia that are compatible with chickpeas in different agro-ecological zones in South Africa.

Dr Dittrich-Schröder is also a postdoctoral fellow at FABI and the Department of Zoology and Entomology. She will lead investigations into the potential of CRISPR/Cas9 gene editing tools to manage invasive insect pests in agriculture and forestry. This fellowship allows her to work on cutting-edge research that addresses challenges on the continent.

The agricultural and forestry sectors are critical for future food security. It is also drivers of the economy and critically linked to jobs. But pests and diseases are the biggest threats to these sectors. Current control measures cannot keep pace with the increase in pests and diseases. However, CRISPR/Cas9 gene editing provides a revolutionary method to control pest species. Specific areas in the genome of an insect can be targeted using CRISPR/Cas9 and by using gene drive, the inheritance, and prevalence as a result, of this edited gene in pest populations may be promoted. Dr Dittrich-Schröder will be using insect species from forestry and agriculture to develop and apply these tools.

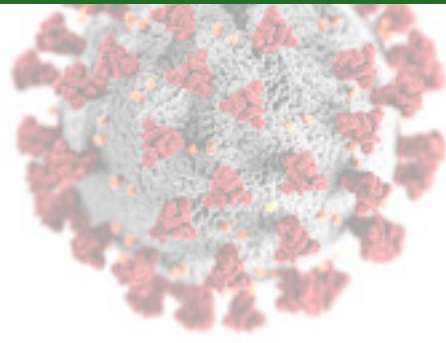
"These are three outstanding young researchers," said Prof Bernard Slippers, Director of FABI. "We are delighted with the awards and are very proud of them. I have no doubt that the fellowships will provide a significant boost to the next phase of their careers. The fellowships are not only very prestigious, but also generous in terms of the support, networks and training it offers. We are passionate about the mentorship and development of young researchers in FABI and will do everything we can to support them."



From top: Prof Cobus Visagie, Dr Esther Muema and Dr Gudrun Dittrich-Schröder.



Daniel Ndim and Dineo Lioma



Fighting coronavirus: UP alumnus codevelops ground-breaking COVID-19 test kit

University of Pretoria (UP) alumnus Daniel Ndim and business partner Dineo Lioma have developed a ground-breaking COVID-19 test kit that will provide results in just over an hour. The CapeBio-SARS-CoV-2 RT-PCR Kit boasts improved efficiency, sensitivity and specificity.

"SARS-CoV-2 is a single-strand RNA virus that was identified as the causative agent of COVID-19 disease infection," explains Ndim, who graduated from UP with an MSc degree in Biochemistry (Structural Biology) in 2016. "The kit is used for the in vitro detection of SARS-CoV-2 RNA in specimens from patients who are suspected of having COVID-19. The test kit can be used to detect SARS-CoV-2 in specimens extracted from throat swabs, nasal swabs, washes and aspirates, and from bronchoalveolar lavage fluid (fluid extracted from the lungs)."

Ndim is the founding CEO of CapeBio Technologies, a dynamic applied genomics company that sources, develops and manufactures molecular biology reagents, enzymes and kits sourced from indigenous African microbial hotspots.

Ndim says he and Lioma are aware that South Africa and Africa relies heavily on imported test kits, such as those used to test for TB, HIV and other diseases. They understood that this would be the case for COVID-19 testing, and decided to create a local solution.

"With the production of our COVID-19 test kits, we hope to help provide more localised access to testing solutions for the continent's health care systems," says Lioma. "Our passion is to develop technologies that radically solve health care challenges in Africa and to build a world-leading biotechnology company."

"Our current kits are developed in-house," adds Ndim. "CapeBio Technologies is developing other disruptive innovations with its research and development partners. Given the current circumstances, we hope to respond to the South African demand for COVID-19 test kits, and later provide Africa and the rest of the world with it."

The Bloemfontein-born scientist has been the recipient of multiple awards and scholarships for excellence in academia, social responsibility, leadership and entrepreneurial initiatives. He is a Mandela Rhodes Foundation scholar (class of 2015), a Brightest Young Minds alumnus, and was nominated for the Standard Bank Rising Star Award by the Council for Scientific and Industrial Research. Ndim is also a fellow of the Allan Gray Orbis Foundation. He attributes some of his success to his former lecturer and supervisor Prof Wolf-Dieter Schubert, who remains Ndim's scientific mentor to this day.

CapeBio Technologies expects to launch the test kits shortly and sales will commence once the South African Health Products Regulatory Authority permit has been obtained. Kits will be supplied to both public and private pathology labs, and any other labs involved in COVID-19 testing, once distribution has been approved by the National Health Laboratory Services.

NRF awards Prof Jean Lubuma an A2-rating

Prof Jean M-S Lubuma, former Dean of the Faculty of Natural and Agricultural Sciences (NAS), at the University of Pretoria (UP) was recently awarded an A2-rating by the National Research Foundation (NRF).

"I am very excited to receive this A-rating; it means a lot to me, especially because it coincides with the end of both my deanship tenure and formal employment at 65. But, this is no coincidence; I worked very hard and went through all the NRF steps of rating, starting more than 20 years ago as a C3-rated researcher," Prof Lubuma said when asked how he feels about this exceptional achievement.

Prof Lubuma was the Dean of NAS from March 2015 to September 2019 and is now an Emeritus Professor in the Department of Mathematics and Applied Mathematics.

"This NRF rating is the acknowledgement of my research that now came full circle." Prof Lubuma explains that a big part of the research that amounted to this rating is the work on the Nonstandard Finite Difference (NSFD) Method, which he started two decades ago at the former Vista University's Mamelodi Campus. "It was a historically disadvantaged university where conditions to do research were difficult, and only undergraduate programmes were presented in science. This rating reflects some scores on transformation in that something nice could

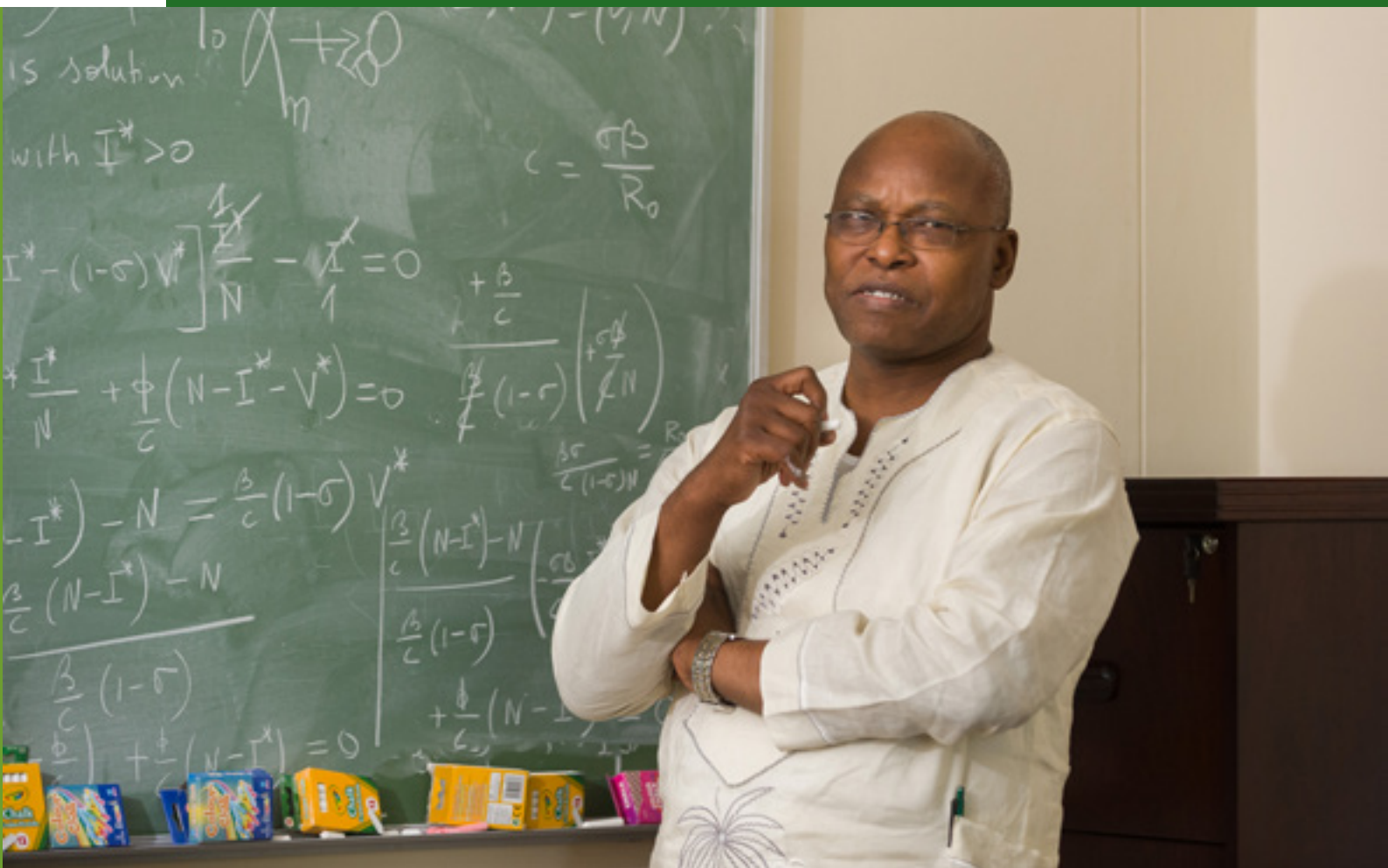
come from Vista. I have high respect for my collaborators and students and this rating is a recognition for the level of work that we have been doing over the past years."

This rating is also acknowledgement for the Department of Mathematics and Applied Mathematics to confirm that UP is number one in mathematics and computer science in South Africa according to the CWTS Leiden Rankings.

Prof Lubuma believes that part of his secret to being a successful researcher is his love for mathematics. "I am passionate about mathematics and I don't do mathematics randomly. It is my life. My success can also be attributed to the fact that I am blessed to work with good collaborators and students."

"From 2013 to 2015, when I was the founding Chair Holder of the DST/NRF SARCHI Chair in Mathematical Models and Methods in Bioengineering and Biosciences, my focus was to unify the analytical, modelling and computational power of mathematics with experimental investigations to elucidate biological processes that result in particular observed phenomena. This again links back to my research field of NSFD method, which is a powerful tool to address complex problems of the society within the United Nations Sustainable Development Goals (SDGs)."

"It was not easy to achieve an A-rating while being dean of such a high-profile and diverse faculty. I was the SARCHI Chair holder



Prof Jean Lubuma

when I had to decide to apply for the deanship. I had a serious dilemma. If I become dean, I would die scientifically – it could not be both. If I do not apply now, I would never be a dean in my life as I was at four years from retirement. After careful consideration, I decided to apply, with a strong commitment to be a good dean and to flourish scientifically.

“How did I manage? By applying strict time management and working at least 12 hours daily, including saying goodbye to weekends. It was important for me to be very focused on my research – focusing on the marriage between mathematics and biology, with its ramifications on SDGs. I had to sacrifice many things in many aspects of my life in the past five years to make time for my research. My wife, Passy, also gave me endless support to do my best. Above all, I was relying on our Lord Jesus Christ, not doing this on my own – He guides me: it is Opus Dei.”

Prof Lubuma received his PhD from the Université Catholique de Louvain in Belgium in 1985 and was a Postdoctoral Fellow at the Abdus-Salam International Centre for Theoretical Physics (ICTP) in Italy. He also served as Head of the Department of Mathematics and Applied Mathematics at UP from 2004 to 2013.

His research trajectory is aligned with Joel Cohen’s well-known

statement: “Mathematics is Biology’s next microscope, only better; Biology is Mathematics’ next Physics, only better”. After completion of his PhD thesis and for many years, he worked on partial differential equations models in physics and engineering. Shortly after joining the former Vista University in 1996, his research focus shifted to the mathematical modelling of biological processes.

Prof Lubuma has published extensively in prestigious journals, contributed to major conferences in the field and delivered several keynote addresses on topics that lie at the intersection of mathematical modelling of real-life situations and a spectrum of mathematical specialisations, broadly located within analysis, such as distributions, dynamical systems, partial differential equations, integral equations and numerical analysis.

Prof Lubuma has received several awards and recognitions. These include the Bulgarian Academy of Sciences Sign of Honour in 2013 and the South African Mathematical Society Award for Research Distinction in 2011, which are the highest conferrable research recognitions of these institutions. Prof Lubuma is a Fellow of the African Academy of Sciences and a member of the Academy of Science of South Africa. The University of Pretoria consistently recognised Prof Lubuma as an Exceptional Academic Achiever from 2007 until his retirement in 2019.

Y-rated researchers

Young researchers (40 years or younger), who have held the doctorate or equivalent qualification for less than five years at the time of application, and who are recognised as having the potential to establish themselves as researchers within a five-year period after evaluation, based on their performance and productivity as researchers during their doctoral studies and/or early postdoctoral careers.

Dr FD Babalola (Agriculture Economics, Extension and Rural Development)

Dr I Barnes (FABI)

Dr Biggs (Mathematics and Applied Mathematics)

Dr JK Bishop (Zoology and Entomology)

Dr V Coetzee (Genetics)

Dr JK Dangbegnon (Physics)

Prof PJN de Bruyn (Zoology and Entomology)

Dr de Vos (Genetics)

Dr AJ de Waal (Statistics)

Prof RP Deane (Physics)

Dr MA Dippenaar (Geology)

Dr AT Duong (Genetics/FABI)

Dr IN Fabris-Rotelli (Statistics)

Dr S Garba (Mathematics and Applied Mathematics)

Dr M Greve (Plant Science)

Dr MS Gwizdala (Physics)

Dr NS Haussmann (Geography, Geoinformatics and Meteorology)

Prof TT Hlatshwayo (Physics)

Dr BP Hurley (FABI)

Dr E Kikianty (Mathematics and Applied Mathematics)

Prof TPJ Krüger (Physics)

Prof PC le Roux (Plant Science)

Dr MS Marais (Mathematics and Applied Mathematics)

Dr JMMN Marx-Pienaar (Consumer and Food Sciences)

Dr HJM Messerschmidt (Mathematics and Applied Mathematics)

Dr DY Momodu (Physics)

Dr S Naidoo (Genetics)

Dr J Niemand (Biochemistry)

Dr CJ Oosthuizen (Zoology and Entomology)

Dr JB Ramond (Genetics)

Dr PA Razafimandimby (Mathematics and Applied Mathematics)

Dr AMP Rothman (Consumer and Food Sciences)

Dr TE Tshikalange (Plant Science)

Dr NA van der Merwe (Genetics)

Dr AJ van Zyl (Mathematics and Applied Mathematics)

Dr EGR Vermeulen (Zoology and Entomology)

Dr AA Yusuf (Zoology and Entomology)

P-rated researchers

These are young researchers (normally younger than 35 years of age), who have held a doctorate or equivalent qualification for less than five years at the time of application. They demonstrated exceptional potential in their published doctoral work and/or their research outputs in their early postdoctoral careers, that they are considered likely to become future international leaders in their field. Also known as the NRF President's Award.

Prof TP Makhalanyane (Genetics)

Prof E Mizrahi (Genetics)

Prof CM Visagie (FABI)

UP well-represented on SAAFoST executive

Two professors from the Department of Food and Consumer Sciences at the University of Pretoria, Prof Elna Buys and Prof Riëtte de Kock, is currently the President-elect and Vice-President of the South African Association for Food Science and Technology (SAAFoST).

Prof Elna Buys is President-elect (2019-2021) and will become President at the biennial conference in 2021 to serve a term until 2023, while Prof De Kock is the current Vice President from 2019 to 2021.

Prof Buys is full of praise for SAAFoST. "My first ever conference that I attended was a SAAFoST conference at the CSIR, where I presented research from my MSc degree. This opened a new world to me. It fascinated me and contributed greatly to pursue a career as a scientist. I am passionate that every young postgraduate student must get the chance to present at a conference. SAAFoST is the backbone of all food science professionals in South Africa, with very strong international links. The organisation is the platform for interaction between young food science professionals and those that have benefited from being members for an extended period."

She also acknowledges that, "to be selected as President Elect, was actually a surprise and a great honour. To be able to represent SAAFoST at the highest level is a daunting task, but one that I am looking forward to. I believe change is the name of the game and this is what I will hope to achieve. Every organisation must keep up with the

times and be relevant to all that belong to it. My first task is to lead the Scientific Committee for the 2021 virtual S A A F o S T Conference, and it is going to be a great event," Prof Buys says.



Prof Riëtte de Kock



Prof Elna Buys

Prof Buys has been leading the Department of Food Science at UP since 2012 and was appointed as the head of the newly established Department of Consumer and Food Sciences in November 2017. Her research has focused on understanding the effect of food processing on the phenotypic and genotypic characteristics of spoilage and pathogenic bacteria, with a particular interest in dairy and meat. "With the expertise my research group has attained over time, we are now involved in international collaborative research determining disease burden, risk factors, sources and transmission routes for food borne pathogens," she notes.

Prof Riëtte de Kock is an associate professor. Her research focuses on the optimisation of the sensory properties of foods that contribute to the nutrition status and wellbeing of consumers in sub-Saharan Africa. This includes food product development to meet the demands of a growing, more urbanised African population, and the exploration of Africa's biodiverse food sources to make products that are not only nutritionally adequate, but also appealing and appetising.

SAAFoST is the national association of food science and technology and is concerned with advancing progress in this field. Academics, students and alumni from the Department of Consumer and Food Sciences at the University of Pretoria are active role players of the association and the broader food industry. De Kock mentions that "the food industry and its scientists have an important responsibility to inform and educate consumers about the food items that they buy and consume". She opted to serve on the executive of SAAFoST in order to represent and support the members of the food industry in these efforts.



From left: Dr Andi Wilson, Prof Brenda Wingfield, Vinola Danki and Dr Tuan Dong

FABI part of first-ever JoVE video shoot in Africa

Four members from the Forestry and Agricultural Biotechnology Institute (FABI), Vinolia Danki, Dr Tuan Duong, Dr Andi Wilson and Prof Brenda Wingfield, recently made history when they participated in the first-ever JoVE video shoot in Africa.

JoVE is an online open-access journal and producer and provider of science videos. Prof Wingfield and Dr Wilson were invited to write a publication detailing the CRISPR-Cas9-based fungal transformation system developed by Dr Wilson during her PhD studies. The video will be supported by the article text, which is already available online by [clicking here](#).

Dr Wilson and Prof Wingfield were joined in the making of the video by Dr Duong and Dr Danki. What they only learned just before the cameras started rolling was this was a first for Africa! Irvin Pamana was the videographer contracted for this event.

Prof Mizrachi elected to Global Young Academy

Prof Eshchar Mizrachi, an associate professor in the Department of Biochemistry, Genetics and Microbiology and the Forestry and Agricultural Biotechnology Institute (FABI), has recently been selected as a member of the Global Young Academy (GYA).

The Academy has a capped membership of 200, representing leading young academics from around the world and from all fields of science, arts and humanities. Prof Mizrachi has been elected to GYA from June 2020 until May 2025.

As Prof Bernard Slippers, Director of FABI and also a founding member of GYA, says: "Selection for the GYA is highly competitive, so we warmly congratulate Prof Mizrachi. It is thus highly prestigious, but also extremely influential, as the GYA acts as the voice of young scientists around the world and is often engaged by policy makers globally. I have no doubt that Prof Mizrachi will gain substantially from the engagement with the Academy, but also that he will make a significant contribution to it. We will support him in his engagement with the Academy as best we can. We are very proud of him."

Prof Mizrachi's research focuses on the modelling of wood formation and its evolution in land plants over the past 400 million years. This includes understanding genes and gene networks regulating cell patterning during wood development, as well as the biology determining how carbon is partitioned during the synthesis of polysaccharide (sugar polymers) such as cellulose and xylan, compared to lignin (a phenolic biopolymer).

Of notable contribution to the field is the recent publication of several papers by Prof Mizrachi, describing a new type of plastid proposed to be involved in wood formation – the xyloplast. Gene developmental networks involved in wood formation can be compared between different lineages of plants that have been separated for millions of years, possessing different growth patterning and wood chemistry traits. This provides a deeper understanding of aspects such as convergent evolution of certain traits, or components and subnetworks under strong selection in plant evolution.

In addition to producing publications in numerous high impact journals, Prof Mizrachi was recognised as an Academic Achiever by UP in 2018. He has received a P-rating from the NRF in 2019.

Prof Eshchar Mizrachi





Prof Teresa Coutino

Reflecting on 140-year history of Plant Pathology in South Africa

All too often, historical details of important structures or institutions are lost due to poor record keeping or a lack of care in preserving valuable documents.

This became evident when Profs Teresa Coutinho and Mike Wingfield embarked on discussions on the history of their chosen discipline, plant pathology. The stimulus for these discussions emerged from the United Nations declaring 2020 the International Year of Plant Health. They then set about the lofty task of compiling a book recording the 140-year history of Plant Pathology in South Africa to celebrate IYPH 2020. This book is now close to completion and it will be published soon by BRIZA.

Documenting the history of plant pathology in South Africa has highlighted important information relating to the health of plants in the country. It is all too easy to take for granted the health of plants and to forget their importance, not only in the more obvious matter of our food security, but also their crucial role in providing clean air and water on which our lives depend. The fact that species of plants have been wiped out by diseases, which in some cases have resulted in the deaths of millions of people, is commonly overlooked. The book on the history of plant pathology in South Africa vividly illustrates how plant diseases have challenged agriculture and forestry in the past. And it provides clear warnings that similar catastrophes are likely to occur in the future.

Compiling a book on the history of plant pathology in South Africa has required substantial support from plant pathology colleagues in this country and abroad. More than 50 local plant pathologists have provided information, illustrations and text used in the book. And the task has required delving into the archives of the Southern African Society for Plant Pathology, as well as personal interviews seeking to capture the many forgotten details of this important field of study. Many lessons have also been learned. Amongst the most important of these is that careful maintenance of historical records is often not given high priority and important information is lost forever. Such importance is aptly captured in the words of Theodore Roosevelt that “the more you know about the past, the better prepared you are for the future”.

Prof Mike Wingfield

Plant diseases have deeply shaped agriculture and forestry in South Africa. It will continue to do so in the future. Agents of plant disease (fungi, bacteria, viruses etc) emerge frequently and adapt to new environments unexpectedly. In most respects, it acts in the same way as human pathogens, which equally threaten our lives. Many lessons will be learned from the SARS-CoV-2 virus and the disease CoViD-19 that it causes. These are as relevant to human health as it is to the health of plants. And likewise, wisdom emerging from a reflection on the rich 140-year history of plant pathology in South Africa will hopefully contribute to a deep appreciation for plants and their health in the future.





UP part of winning bid for 50th International Groundwater Congress

South Africa is set to host the 50th congress of the International Association of Hydrogeologists (IAH) in Cape Town in 2023.

The bid was chaired by Prof Matthys Dippenaar, current President of the South African National Chapter of the IAH, congress chair for IAH2023, and Associate Professor of engineering geology and hydrogeology at the University of Pretoria (UP).

This was recently announced following a long bid process, paving the way for South Africa to host the third ever African congress of the IAH.

“With three years to arrange and host what is undoubtedly the most important annual groundwater congress, it places South African universities and groundwater research in the spotlight,” says Prof Dippenaar.

UP formally established its honours degree specialisation in hydrogeology in 2013, followed by research-based master’s and doctoral degrees in 2014. It offers one of only two formal BSc honours degrees 100% dedicated to the study of groundwater and formally named as such, with the other being a degree in Geohydrology at UFS.

This is an excellent opportunity for UP and South African hydrogeologists to showcase research and highlight advances and approaches in a country characterised by large agricultural groundwater abstraction, urban water supply subvention from groundwater, and highly affected by climatic extremes and water scarcity. The University’s current research focus on highly variable

flow through fractured rock and saprolite will attract international experts on the appropriate theme of ‘Groundwater: A Matter of Scale’, where solving these local-scale problems eventually contribute to solutions at catchment scale.

UP is sure to benefit by participating in the preparations and hosting of this congress and we look forward to having more of our postgraduate students participate three years from now.

Prof Matthys Dippenaar



Prof Forbes flies the UP chemistry flag (very) high

Prof Patricia Forbes, incumbent of the Rand Water Chemistry Research Chair in the Department of Chemistry, was not only recently elected to the Professional Standards Board (PSB) of the Royal Society of Chemistry (RSC), but has also been made a Fellow of the South African Chemical Institute (SACI).

Her list of impressive achievements does not end there. Prof Forbes was also awarded the prestigious Chromatographer of the Year 2019 award by the Chromatography Division of SACI.

This is the first time that a member from outside the United Kingdom has participated in the PSB, which serves to advise the RSC Council on strategic developments in professional and employment practices. The RSC is over 175 years old and has more than 54 000 members from around the world. Prof Forbes said that her involvement in the management structure of this prestigious society “is exciting and will allow me to contribute in a tangible manner to shaping the future of

the chemical sciences. Chemistry is vital in our everyday lives and provides an important facet towards solving many global challenges, including environmental pollution, energy production and the need for novel pharmaceuticals to treat medical conditions”.

Prof Forbes has been acknowledged locally, as she was made a SACI Fellow for her strong leadership and excellence in the profession of chemistry, as well as for her volunteer service to the chemical community (there is currently a total of 38 fellows of SACI).

It is no coincidence that she won the prestigious Chromatographer of the Year award for 2019. She leads an extremely dynamic research group dealing with various environmental monitoring challenges. Chromatography is an important analytical technique used to separate the chemical components of complex samples in order for them to be correctly identified and quantified. The award is in recognition of both her research publications on applications of new chromatographic techniques to challenging environmental monitoring problems, and for her contributions to promote chromatography in South Africa.

Prof Forbes has a passion for teaching the next generation of chemists and she believes in encouraging students to develop an understanding of key fundamental concepts via active and inquiry-based learning. To this end she developed an educational spectrophotometer (called the SpecUP), which students can assemble from a kit and then use to generate analytically useful results. Prof Forbes was the recipient of the Chemical Education award of the South African Chemical Institute in 2014 for this project, which has been rolled out to numerous institutions throughout Africa. The SpecUP project was awarded the prestigious international Wharton QS Reimagine Education Award for Presence Learning in 2015 and she received the University of Pretoria Teaching Excellence and Innovation Laureate award in 2016.



Prof Patricia Forbes



Prof Paxie Chirwa

Big year for forestry at UP

Not only did the Forestry Programme at the University of Pretoria (UP) celebrate ten years in 2020, but Prof Paxie Chirwa, the incumbent of the South African Forestry Companies Limited (SAFCOL) Forestry Chair, co-edited a book on the Miombo Woodlands.

The Forestry Programme at UP started in earnest in late 2009 when Prof Paxie Chirwa joined the Faculty of Natural and Agricultural Sciences, and a Forestry Chair was established with funding from SAFCOL.

Unlike programmes at other institutions in South Africa, the forestry programme at UP only caters for postgraduate students at the **master's and doctoral levels**. In addition, the programme offers a taught MSc Forest Management and Environment through the Centre for Environmental Studies. This programme has been popular with students from other disciplines than forestry, including Geography and Environmental Sciences.

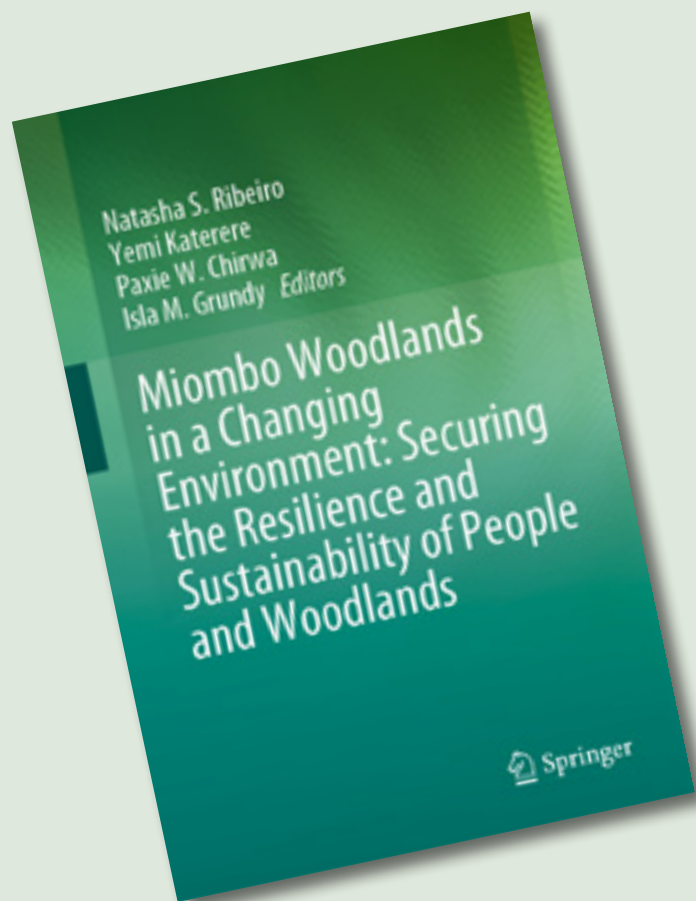
According to Prof Chirwa, "The forestry programme has been especially successful in harnessing collaborative research with other university institutions, especially in Africa and some European institutions. The Chair has also collaborated with scientists in the forestry industry in South Africa in building capacity in research, where many staff from industry have worked on their research or management programmes to earn their master's degrees or PhDs. These include SAPPI, Mondi, Merensky, York, SAFCOL, among others. In research, the programme has benefited from funding from the National Research Foundation (NRF), and internationally, from the African Forest Forum, MasterCard Foundations, AU/EU Mobility Funding, Borlaug Higher Education for Agricultural Research and Development (BHEARD), DAAD, etc."

Apart from local students, the programme is very popular internationally with many students from the SADC region, East and West Africa. For example, in the 2019/20 Academic year, 16 students have graduated including 10 PhDs and 6 MSc. Most PhDs (80%) are international due to low enrolment of local students and the high attrition rate of local students. However, for master's, out of the six students, three were local students.

Prof Chirwa added that the forestry programme through its postgraduate research has contributed to research in many parts of Africa in areas of forest ecology and management, socioecological, social forestry, agroforestry, forest engineering, among others. In terms of research outputs, in the last ten years, over 80 papers and 15 book chapters **have been published** with more than 45 postgraduate students graduating.

In terms of contribution to the forestry industry and Africa in general, some of the graduate students are currently forest general managers in South Africa, while others are in management positions in governments both in South Africa and in other parts of Africa. The SAFCOL Forestry Chair is actively also involved in the advisory on the implementation of the South African Agroforestry Strategy.

We look forward to the continued growth of the programme with active involvement of the forestry industry, and other stakeholders in South Africa and beyond.



The book *Miombo Woodlands in a Changing Environment: Securing the Resilience and Sustainability of People and Woodlands* offers a socioecological management and policy analysis of the Miombo ecosystem in the global change context.

Editors: Ribeiro, N., Katerere, Y., Chirwa, P., Grundy, I. (Eds.)

About the book:

Based on work by the Miombo Network in southern Africa, this book helps decision-makers and general readers alike improve their understanding of the socio-ecology of the Miombo woodlands across southern Africa. It also highlights the importance of and the need for further research on the unique Miombo ecology and its link with economic development. One major challenge facing these woodlands is the influence that direct (both natural and anthropogenic) and indirect drivers of change, as well as interactions between these, have had over the centuries. As such, the book explores the socio-economic and ecological interactions that occur in these woodlands and discusses the need for further research to provide a better understanding of these interactions.

Drawing on data and information from numerous studies conducted in the last 20 years, the book presents a comparative analysis of policy changes and management experiences in the countries concerned. It also addresses issues of global climate change, since they have an impact on Miombo ecosystem management and restoration, and provides future projections based on an assessment of how climate change has affected the Miombo woodlands in the past.

Dr Kalaba elected as AEASA president

Dr Mmatlou Kalaba, senior lecturer in the Department of Agricultural Economics, Extension and Rural Development and a Director of the Bureau for Food and Agricultural Policy (BFAP), was elected as president of the Agricultural Economics Association of South Africa (AEASA) in October 2019. His term will end in September 2021. AEASA is a professional organisation for agricultural economists in South Africa and was established in 1961.

Dr Kalaba stated that the real importance of his appointment lies in the fact that many people derive inspiration from his position. He added: 'Several young economists and students mentioned the meaning of my presidency to them. And this took me back to when and how I was introduced to the Association. It happened when I attended a conference to receive an award for best final-year

student, and my interest in the Association developed from there. Over time I observed the activities of the people who served the Association and who I looked up to as role models, and it became a predetermined path for me to follow. If my presidency can inspire others to follow in my footsteps - that is the legacy I would be happy to leave behind.'

Dr Kalaba explained his role as AEASA president as follows: 'With regard to my role and responsibilities, I hope to continue transforming and advancing the interests of AEASA. In an association that has existed for almost 60 years, there is much to celebrate and also much to overcome. Both within the South African society and internationally, we aim to promote the standing of the Association while also paying attention to discipline, contributions to policy, agribusiness and the generation of ideas. I would also like to encourage younger South Africans to join the discipline of agricultural economics. The COVID-19 pandemic has forced the world to change in many ways and new ideas and innovations are required to address current and future challenges. Since the people whose quality of life will be determined by the outcomes of the decisions taken today are those belonging to the younger generation, it is vital that they contribute towards decision-making and solution-seeking platforms. AEASA offers some of those platforms.'

Dr Kalaba is also a member of the Management Committee of the Centre of Excellence (CoE) for Food Security, a director of the Bureau for Food and Agricultural Policy (BFAP) and a member of the of Limpopo Provincial Government's Premier's Economic Growth Advisory Council (PEGAC). He participated in South African trade negotiations, in particular with the Southern African Development Community (SADC), and contributed to economic partnership agreements (EPA) with the European Union (EU). He has also worked extensively in the SADC region, focusing on issues such as capacity building, trade policy analysis and the development of trade databases.

He specialises in international trade, agricultural policy analysis and climate change issues affecting agriculture, and has published extensively on these topics. He is also a regular contributor to, and commentator on economic and agricultural economic current affairs on television and radio, and in the printed and electronic media.



Dr Mmatlou Kalaba

Young Scientist collaborations initiated virtually

Dr Inger Fabris-Rotelli from the Department of Statistics was selected as a South African BRICS Young Scientist to attend the **5th BRICS Young Scientist Forum in Chelyabinsk, Russia, from 21 to 25 September 2020**. The selection was done by the Department of Science and Innovation in conjunction with the Academy of Science of South Africa.

This forum brings together innovative young scientists from Brazil, Russia, India, China and South Africa, and Russia was the last of the five countries to have a turn to act as host. Unfortunately, due to the COVID-19 pandemic, the participants could not attend the forum, hosted by the South Ural State University, in person. The Russian hosts presented a superb virtual conference via the Zoom platform, making use of a professional production team and studio effects and including an online quiz and tours to various laboratories on their campus. It was huge effort on their part and a thoroughly worthwhile experience for the participants.

The forum focused on three themes for 2020, namely ecology, materials science and artificial intelligence (AI). Dr Fabris-Rotelli was selected in the AI stream on account of her research on image processing and spatial statistics. She presented a talk titled 'Spatial statistics in biostatistics: sampling for rabies vaccination coverage in Tanzania'. Her research involves the development of a spatial sampling scheme of rural houses to facilitate the vaccination of dogs and cats in order to achieve herd immunity for rabies. This is a realistic implementation, compared to the existing approaches deemed by the World Health Organization to be inefficient and financially burdensome. Rabies is 100% fatal and there is no immediate treatment for the disease. It remains endemic in Tanzania and still occurs in areas of South Africa. Her report on her research was accepted for publication in *Environmental and Ecological Statistics* in 2020.

The participants were in their theme Zoom room for the duration of the forum and even though only virtual contact was made, they became well acquainted. According to Dr Fabris-Rotelli, the forum offered several advantages, the first being that it was unique in the sense that all the participants were young researchers who were still developing their research fields and groups. This allowed for honest, non-judgmental discussions and openness to collaboration after the event. Another advantage of the Zoom platform is that it allows for chat discussions and the initiation of discussions one would not usually start at a standard face-to-face conference. In fact, in their presentations, all the participants included the option to collaborate and invited everyone to join in. It was an excellent opportunity to start cross-country research collaborations and expand knowledge.

Dr Fabris-Rotelli stated that the forum had highlighted the potential of South African researchers and universities and the fact that South Africa is not lagging behind in respect of ability. We work hard and are passionate. Young scientists in South Africa should be encouraged to be brave and aim high. They should work hard at mastering science, talk about science and create awareness of its importance.



Dr Inger Fabris-Rotelli

SA Akademie vir Wetenskap en Kuns awards Prof Bernard Slippers

Prof Bernard Slippers, professor in the Department of Biochemistry, Genetics and Microbiology, Director of the Forestry and Agricultural Biotechnology Institute (FABI) and Founder of the Future Africa Institute is the recipient of the prestigious Haverkamp Prize for Life Sciences from the SA Akademie vir Wetenskap en Kuns (South African Academy for Science and Art).

"Too often we separate the arts and sciences, and it is delightful to see such a breadth of human creativity represented. The Academy is years ahead of its time in this regard, having done this for many years. I feel very honoured and thankful to receive the Haverkamp Prize and I am excited to be able to share the Academy's list of prize winners this year with such highly respected scientists and artists, and congratulate them all," Prof Slippers said about receiving this award.

He also added: "I am deeply thankful for all the opportunities that the Prize represent, all the people involved and all the wonderful memories. It is such a privilege to be able to live one's passion through science; and even more so to be able to do it in a supportive environment such as FABI, and with talented and passionate friends and colleagues around the world. The award motivates me to invest even more in the support and mentorship of a next generation of scientists. We need many more scientists on the continent to help ensure our global competitiveness, as well as the safety of our society and environment."

Prof Slippers' research focuses on the ecology and evolution of insects and micro-organisms that affect tree health, and the development of tools to mitigate its impact. He has received wide recognition for his research – among others, a president's award. Besides his research interests, he has a passion for science development and the role of science in the broader society. Concerning this, he is a founding member of the Global Young Academy (GYA) in 2010 and the South African Young Academy of Science (SAYAS).



Prof Bernard Slippers



Prof Mike Wingfield won NSTF award

Prof Mike Wingfield, founding Director of UP's **Forestry, Agriculture and Biotechnology Institute (FABI)** from 1998 to 2017 won the Special Annual Theme Award: Plant Health at this year's National Science and Technology Forum (NSTF)-South32 Awards.

The awards ceremony was held online due to the COVID-19 lockdown. Known as the "Science Oscars" of South Africa, these awards are the most comprehensive and sought-after national awards of their kind in the country. They recognise outstanding contributions to science, engineering and technology (SET), as well as innovation by SET-related professionals and organisations. The theme for this year's awards was Plant Health, in recognition of the 2020 International Year of Plant Health as declared by the United Nations.

Prof Wingfield, also advisor to the UP Executive, won the Special Annual Theme Award: Plant Health. He has spent 35 years doing research on plant health. His focus is on disease and insect pest problems affecting the health of trees and woody plants. "My research has mostly been conducted in a university environment and is therefore closely linked to postgraduate student education, where I have advised or co-advised some 100 PhD students on projects pertaining to plant health," he said.

"Receiving the award in the United Nations International Year of Plant Health (IYPH-2020) is particularly gratifying. I have spent my entire career working as a plant pathologist/entomologist and am increasingly concerned about the health of plants globally. The world's plants are deeply threatened by pests and pathogens and also by human activities, including those that are leading to climate change."



Prof Mike Wingfield

Prof Wingfield added, "We easily forget that we depend deeply on plants, not only for the food that we eat but for our water supplies and the air that we breathe. The SARS CoV-2 pandemic that is ravaging our world provides us with a vivid example of the havoc that an invasive alien pathogen can create, and how plants can be affected in a similar way."

Prof Meyer, Head of the **Department of Mechanical and Aeronautical Engineering**, and Chair of UP's **School of Engineering** in the **Faculty of Engineering, Built Environment and Information Technology**, won the male category of the Engineering Research Capacity Development Award.

UP Vice-Chancellor and Principal Prof Tawana Kupe congratulated the winners. "UP is proud of you. Thank you for your hard work and commitment to making a tangible difference in the world. Your work helps us to be the leading producer of research in the country. Thank you for producing cutting-edge research that matters nationally and internationally."

National Geographic Society profiles NAS researcher who traces ancient human diseases

Dr Riaan Rifkin, a Research Fellow in the Faculty of Natural and Agricultural Sciences, was honoured with a profile in a recent edition of *National Geographic Society* for his work on tracing the DNA of ancient human diseases.

The National Geographic Society funds his research at the Centre for Microbial Ecology and Genomics (CMEG) at UP. Spending time in cave sites, searching for ancient DNA in sediments and human remains, is part of Dr Rifkin's daily routine. He is looking for clues concerning the past prevalence of common and novel human diseases. He wants to find out "which diseases plagued ancient humans, and which of these were taken to Europe and Asia as our ancestors left Africa to populate these regions. Our ancestors knew how overcome illnesses at that time," he says.

Rifkin is a bioarcheologist at CMEG, which is housed in the Department of Biochemistry, Genetics and Microbiology at the University of Pretoria. He holds a master's degree in prehistoric rock art from the Rock Art Research Institute at the University of the Witwatersrand, as well as a PhD from its Institute for Human Evolution.

"My research focused on the use of red ochre – a soft clay-based earth pigment – by ancient southern Africans going back 100 000 years, and what this might tell us about the cognitive and social evolution of our species. While ancient humans likely used red ochre as a symbolic body cosmetic, our experiments have shown that this also proved to be a very good sunscreen, insect repellent, and animal hide tanning ingredient," he explains.

Ancient humans using red ochre powder for these purposes were already very 'modern' at least 100 000 years ago, "before our species left Africa for Asia and Europe".

Based on his work with the Ovahimba in Namibia, where women use red ochre daily, he developed an interest in the possible influence of diseases in our African ancestors. "The Ovahimba informed me that the red ochre mixture also prevented them from being bitten by mosquitoes. As mosquitoes are important disease vectors still today – including Zika virus, West Nile virus, Chikungunya virus, dengue, and malaria – I started to gather information concerning ancient African diseases, and how these would have influenced the evolution of our species in Africa," he says.

As a bioarcheologist, he studies ancient disease organisms at a molecular (DNA) level and works in the field of molecular

archaeology. "My research at UP focuses on discovering ancient DNA from southern African archaeological sites, including sediments and human remains. The remains span the period from circa 75 000 to 1 500 years ago. My primary aim is to generate a sub-Saharan African disease baseline database that precedes the departure of *homo sapiens* from Africa after circa 75 000 years ago."

He recently secured funding for a five-year project through the Benjamin R Oppenheimer Trust, which awarded him a fellowship for his studies in molecular archaeology. The long-term objective of the fellowship is to contribute to alleviating the adverse influence of ancient re-emerging 'ancestral' diseases on contemporary humans.

But why study ancient diseases? And how can novel data about prehistoric pathogens benefit modern society? The impact of disease on prehistoric humans is illustrated by the fact that roughly two-thirds of modern-day hunter-gatherers, such as the Kalahari San and the Tanzanian Hadza, succumb to disease before reaching 15 years of age. Despite the fact that many of the approximately 400 recognised human pathogens had a profound influence on human evolutionary history, many are still implicated in the deaths of millions of people annually.

"So, even in our modern day and age, we are not immune against pathogens. Epidemics caused by Zika virus, avian influenza and even the *Yersinia pestis* bacterium – the causative agent of the 'black death' plague – still pester modern human society. But recognising which disease-causing pathogens were brought from Africa to the rest of the world, after our ancestors left the continent some 65 000 years ago, is a challenging venture," says Dr Rifkin.

This entails determining the evolutionary relationships between ancient African human populations and pathogenic and beneficial microbial species, and exploring the ways in which emerging 'ancestral' human diseases are expected to affect modern-day sub-Saharan African populations. The final step is producing policy guidelines for the integration of novel DNA information into epidemiological models about disease emergence and outbreak-response planning.

This involves integrating archaeology, molecular ecology and palaeo-epidemiology. While this innovative approach holds vast potential for interpreting past human lifestyles, it also holds great potential for predicting the emergence of new diseases.

As a bioarcheologist, Dr Riaan Rifkin studies ancient disease organisms at a molecular (DNA) level and works in the field of molecular archaeology, here with a Himba woman





Prof Wilhelm de Beer

Prof Wilhelm de Beer wins distinguished Forestry Award

Prof Wilhelm de Beer, a research leader and professor at the **Forestry and Agricultural Biotechnology Institute (FABI)** and the **Department of Biochemistry, Genetics and Microbiology**, was awarded this year's Distinguished Forestry Award by the **Southern African Institute of Forestry (SAIF)**.

The award recognises his substantial contribution and efforts in response to the invasion of the Polyphagous Shothole Borer (PSHB). His research focus is mycology, including fungi of bark and ambrosia beetles. He is one of the world leaders in this area of research, having published a book *Ophiostomatoid Fungi: Expanding Frontiers*, numerous book chapters and about 150 papers in scientific journals.

His expertise in bark and ambrosia beetles and its associated fungi has been extremely fortuitous, given the recent introduction and spread of the polyphagous shothole borer (PSHB), *Euwallacea fornicatus*. This beetle and its symbiotic fungi pose a serious threat to numerous trees in South Africa's urban and native forests, as well

as some fruit crops such as avocado. It is perhaps one of the most serious insect invasions in the history of our country.

Since the PSHB was first detected in South Africa in 2017, Prof De Beer and his team have worked tirelessly in response to this invasion. This has included numerous consultations and trips across the country to track the spread of this insect; increasing awareness of the PSHB through engaging with media, including newspapers, TV and radio; meetings with various stakeholders to provide information, including the public, municipalities and government; and initiating a number of research projects to address important questions for the management of this invasive pest.

The PSHB continues to pose a serious threat to urban and native forests in South Africa. However, it is clear that without the work of Prof De Beer and his team at FABI, the country would be in a far worse position.

For more information on the PSHB, [click here](#).

Mathematical statistician wins silver medal in Kaggle competition

Dr Hossein Masoumi Karakani, who was awarded a PhD in Mathematical Statistics by the Department of Statistics in October 2020, recently finished in the 129th place out of 2 618 teams registered globally when he took part in a Kaggle competition. He ended in the top 5% and won a silver medal.

Kaggle is the world's largest data science community and the most well-known competition platform for predictive modelling and data analytics, with at least one million registered users across the globe. It was founded in Melbourne, Australia in 2010 and was acquired by Google in 2017. This particular Research Prediction Competition was hosted by Kaggle in collaboration with the University of Liverpool's Institute of Ageing and Chronic Disease, and Dr Karakani became the first person from the Department of Statistics to win a medal in a Kaggle competition.

Competitors were provided with electric signals corresponding to ion channel data and were required to create an algorithm that could automatically identify the number of open channels at each time point. Ion channels are pore-forming proteins that are present in animals and plants and encode learning and memory, help fight infections, enable pain signals and stimulate muscle contractions.

When asked how he felt about this achievement, Dr Karakani commented: 'Receiving this prestigious award was a massive achievement. Rubbing shoulders with some of the smartest data scientists in the world will surely be a life-changing experience, especially for a young statistician like me. This competition showed me that I can make my mark in the hugely competitive world out there. Educational background plays a significant role in becoming a successful data scientist. During my time in the Department of Statistics, I mastered the art of programming and realised the importance of well-structured and documented code in applied statistics



Dr Hossein Masoumi Karakani

and real-world data science projects. Through hard work and determination I succeeded in honing my skills to become a successful statistician.'

Dr Karakani, who completed a BSc degree at the Allameh Tabataba'i University in Iran and an MSc at the University of Pretoria, is a knowledgeable statistician with teaching and research experience. As a data scientist at Knowledge Integration Dynamics (KID), he is currently involved in predictive analytics projects and plays a key role in delivering insights and implementing action-oriented solutions to complex business and technology problems.

His advice to would-be statisticians was: 'The decision to become a data scientist is similar to choosing a delicious starter from among a plethora of options in a restaurant. For anyone who dreams of a career in this field, I recommend the following: Get your fundamentals strong enough by mastering the theory; master statistics and probability – the bread and butter of the data science realm – participate in competitions to learn and pick up new skills, and make your GitHub profile alive and complete with end-to-end implementation, including documentation.'

NAS rewards best lecturers of 2020

Students' praise for their lecturers was the order of the day when the awards for Best First-year Lecturer and Best Lecturer for Senior Courses were made at the annual breakfast of the Faculty of Natural and Agricultural Sciences in November 2020.

Mr Gideon Brits from the Department of Mathematics and Applied Mathematics was selected as the best first-year lecturer, while Dr Vida van Staden from the Department of Biochemistry, Genetics and Microbiology was chosen as the best lecturer for senior courses.

Students were very vocal with their compliments for Mr Brits. One student commented: 'Mr Brits has been supportive from the very first test we wrote and was always prepared to stay on an extra 30 minutes to explain something that was not well understood. He was always early and ready to start the day, and his lecture slides were up to date and very informative.'

Another student remarked: 'Mr Brits always sacrificed at least 10 minutes of his time before or after lectures to share some words of wisdom. I always arrived a minute before the start of the lecture and would find him waiting at the door to ensure that all the students were present before commencing with the lesson. He is a very charismatic, helpful and approachable lecturer who is always well prepared and organised.'

Dr Van Staden was equally lauded for her commitment to her students: 'She always does her best to give her students all they need to excel. She responds to emails and queries



Mr Gideon Brits



Dr Vida van Staden

timeously and is always on top of her game. She presented the GTS 251 module with great poise and her team worked like a well-oiled machine. She's a BRILLIANT lecturer who never fails to ensure that all concepts are thoroughly discussed and understood. She is awesome!

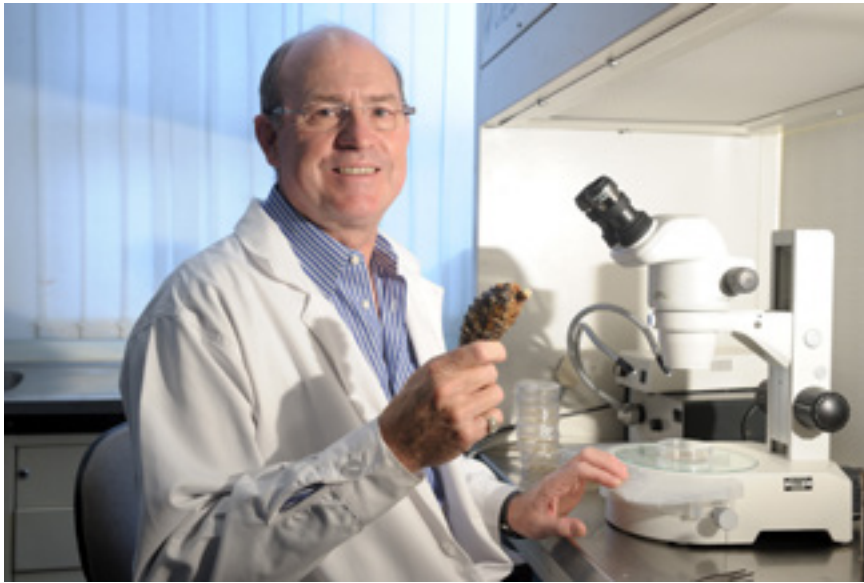
Her students also emphasised her commitment to teaching: 'Dr Van Staden is one of the most organised, dedicated and committed lecturers I have ever had. She is prepared to go the extra mile for all her students—even those who are no longer in her class. Her efforts motivate students to participate actively and excel. She is always approachable and respectful towards students and, as far as is possible, ensures that we are not disadvantaged in any way. She handled the move to online learning exceptionally well and made sure that we knew exactly what was expected of us and what we should do next.'

Mr Brits confessed that receiving the award had been a surprise and said: 'This was already the fourth year I was nominated and I did not expect to win as I work with smaller groups in the Extended Curriculum Programme (ECP) on the Mamelodi Campus. I am glad that my modest contributions to our ECP students make a difference in their lives and that my efforts to support teaching and learning do not go unnoticed. My eight years of experience as a high school teacher have taught me a few lessons that I also apply as lecturer: to always be on time, to always be prepared, to always be organised and to be friendly and approachable. Many students find themselves totally lost and overwhelmed in the tertiary environment. How we conduct ourselves as lecturers can contribute to creating a safe environment for optimal teaching and learning.'

As the recipient of the award for Best Lecturer for Senior Courses, Dr Van Staden said: 'I feel honoured to have received this award, and to be recognised by both the students and the Faculty. The teaching of genetics has been one of my passions for many years. It is an interesting subject to teach: on the one hand there are the core principles that underlie how life as we know it in all its diversity is maintained (which interests everyone), and on the other hand there are innovations and applications in genetics that drive cutting-edge research that is revolutionising all the life sciences (which also interests everyone). In our Department there is a culture of prioritising undergraduate teaching, and to a large extent our teaching success is the result of a group effort. I dedicate this award to all the staff members in the Division of Genetics who were involved in teaching this year and have truly gone above and beyond what was required or expected under unusual circumstances.'

The other persons nominated for the Best First-year Lecturer award were Mr JW Hurter, Mr Nick de Beer, Dr Ruaan Kellerman, Dr Carel Oosthuizen and Dr Harry Wiggins, and Dr Ruaan Kellerman, Dr Harry Wiggins, Prof Jacques Theron, Prof Jacque van der Waals and Prof Edward Webb were nominated for the award for Best Lecturer for Senior Courses.

Three NAS professors on 2020 list of world's most highly cited researchers

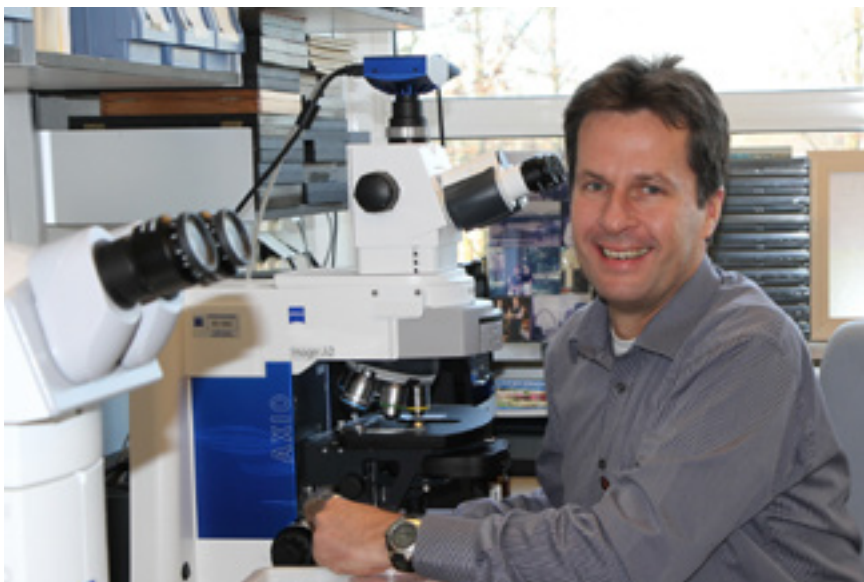


Three internationally renowned researchers from UP's Forestry and Agricultural Biotechnology Institute (FABI) in the Faculty of Natural and Agricultural Sciences, Profs Mike Wingfield, Pedro Crous and Yves van de Peer, have been included on the 2020 Web of Science list of the world's most highly cited researchers.

It is the fourth consecutive year that **Prof Wingfield**, Founding Director of the Institute, has been included on the **2020 Clarivate Web of Science Highly Cited Researchers list**

Prof Pedro Crous (Westerdijk Fungal Biodiversity Institute, the Netherlands) and **Prof Yves van de Peer** (Ghent University, Belgium), who hold adjunct positions at UP, is also on the list. This year's list includes nine academics that occupy permanent positions at South African universities.

This list, revised and published annually, recognises "scientists and social scientists who have demonstrated significant influence through publication of multiple papers, highly cited by their peers, during the last decade". Their highly cited publications rank in the top 1% by citations for field and year in the Web of Science.



Profs Mike Wingfield, Pedro Crous and Yves van de Peer

NAS researchers scoop up many Academic Achievers Awards

For the first time in the institution's history, the University of Pretoria (UP) held its annual Academic Achievers' Awards virtually. By no means, however, was the significance of this prestigious event dampened by what Vice-Chancellor and Principal Prof Tawana Kupe deems to have been "extraordinary circumstances".

"We have been celebrating UP's academic achievers for more than 20 years," Prof Kupe says. "This is the first year that the awards ceremony is taking place under extraordinary circumstances. The world is in the midst of the COVID-19 pandemic, and UP has not been left unscathed."

The awards are held to honour UP academics who have shone in their respective disciplines. This year, a total of 110 academics were acknowledged for being included on the list of the National Research Foundation (NRF)-rated scholars or for the outstanding work they had done over the past year.

Prof Kupe is a strong advocate of the crucial role that tertiary education institutions play in not only producing relevant, impactful research, but also in partnering with various sectors in society to address prevalent issues. During his opening address, the Vice-Chancellor highlighted how UP academics have added value in the response to the challenges brought about by COVID-19.

"Our staff and students have risen to the challenge with energy and passion to make a meaningful impact in the societies we live and operate in," he said.

The awards ceremony can be viewed [here](#).

Researchers from the Faculty of Natural and Agricultural Sciences (NAS) were on top of their game and walked away with many awards.

The NAS awardees are:

Vice-Chancellor's Book Award

Prof Robin Crewe and Prof Robin Moritz for *The Dark Side of the Hive* (Zoology and Entomology)

Exceptional Academic Achievers

Prof Roumen Anguelov (Mathematics and Applied Mathematics)

Prof Dave Berger (Plant and Soil Sciences)

Prof Willem Landman (Geography, Geoinformatics and Meteorology)

Prof Fanus Venter (Biochemistry, Genetics and Microbiology)

Exceptional Young Researchers

Prof Roger Deane (Physics)

Dr Michal Gwizdala (Physics)

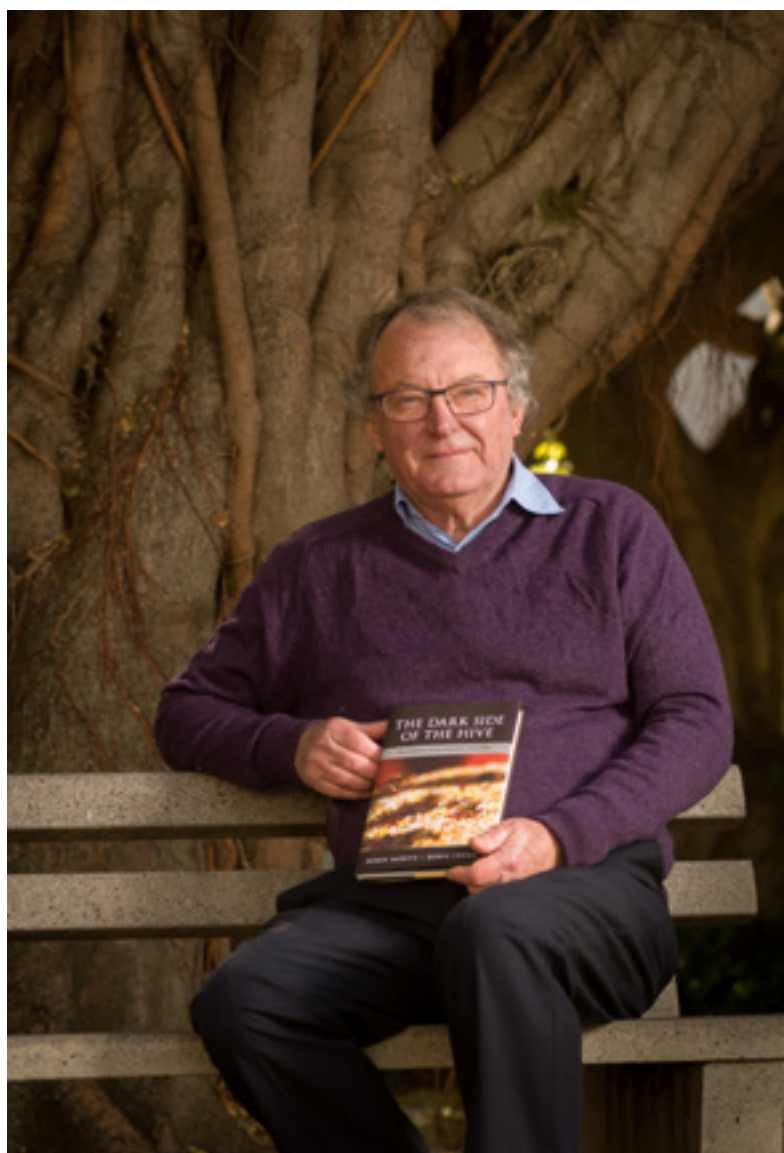
Excellent Supervisor's Award

Prof Don Cowan (Biochemistry, Genetics and Microbiology)

Teaching Excellence and Innovation Laureate Award

Dr Rory Biggs (Mathematics and Applied Mathematics)

Prof Robin Crewe





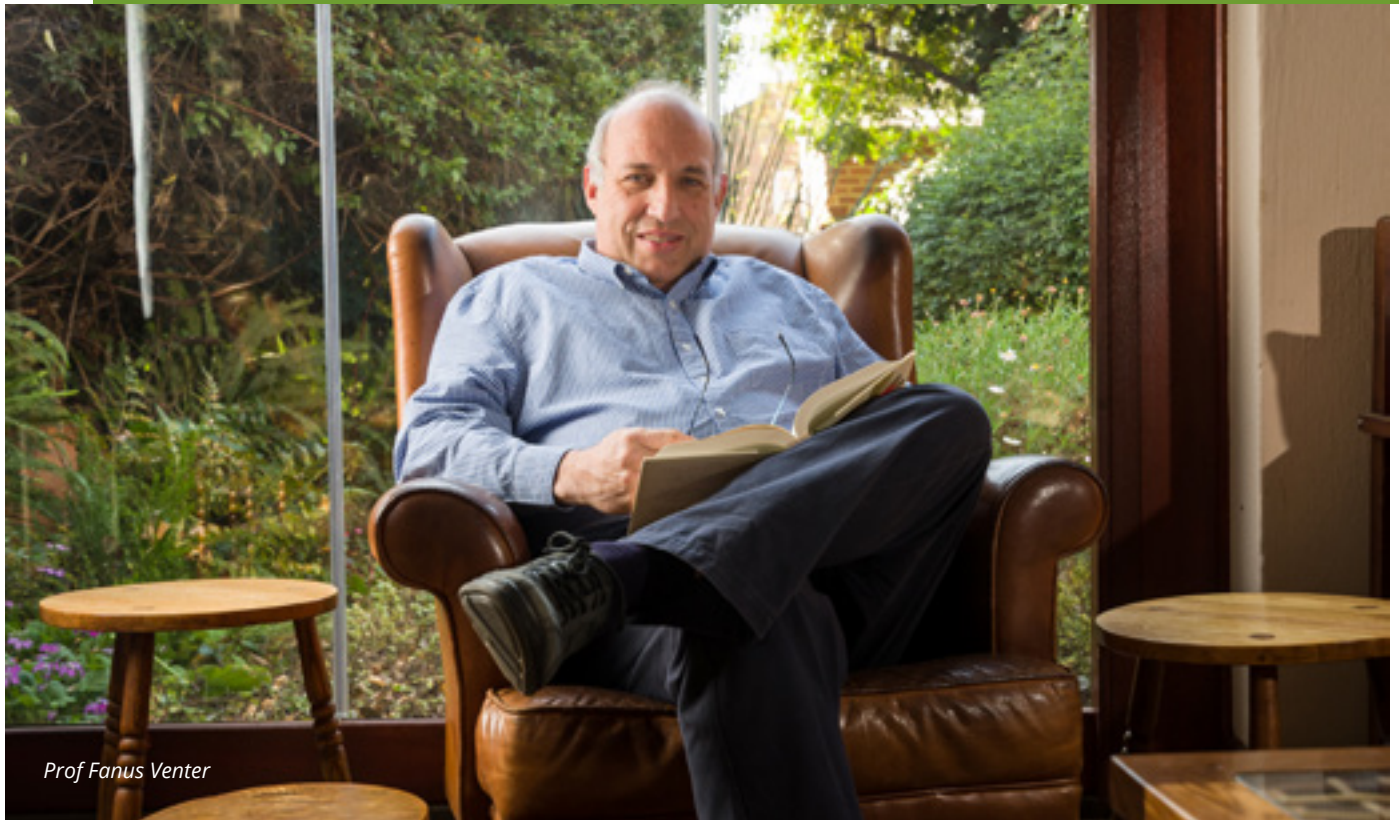
Prof Roumen Anguelov



Prof Dave Berger



Prof Willem Landman



Prof Fanus Venter

Prof Roger Deane

Dr Michal Gwizdala





Prof Don Cowan

Dr Rory Biggs



Dr Oosthuizen wins Population Ecology Young Author Award

Dr Chris Oosthuizen, an alumnus of the University of Pretoria (UP)'s Department of Zoology and Entomology and a research associate with UP's Marion Island Marine Mammal Programme (MIMMP), was recently awarded the Population Ecology Young Author Award. This award recognises early career authors of the best papers published in *Population Ecology*.

Dr Oosthuizen's award winning paper (<https://doi.org/10.1002/1438-390X.12015>) stems from his PhD thesis, supervised by Prof Nico de Bruyn with Profs Marthán Bester, Res Altwegg (UCT) and Marie Nevoux (France) as co-supervisors. He finalised the paper while he was an NRF Innovation postdoctoral fellow with Prof De Bruyn, the Principal Investigator of the MIMMP, which is a research programme of UP's Mammal Research Institute.



"This award highlights the collective efforts of those who have lead the MIMMP, and the nearly 100 field assistants who have walked the extra mile to collect demographic data on marine mammals at Marion Island," Dr Oosthuizen says. "Demographic research on long-lived animals requires long-term data. Our research would have been impossible without the support of funding bodies, and the dedicated work of MIMMP field assistants over a period of nearly 40 years."

The Mammal Research Institute formally commenced marine mammal research at Marion Island in 1973, and in 1983 Prof Bester established a long-term capture-mark-recapture study on southern elephant seals with success. Today, this study continues into its thirty-eighth consecutive year, and the dataset comprise nearly 20 000 individually known seals. The ongoing study is globally unique and renowned for its ability to tease apart questions about the population ecology of these large marine predators.

"The broad objective of my postgraduate and postdoctoral research at UP was to investigate how between-individual variation affects the life-history evolution and population demography of southern elephant seals and other long-lived species," Dr Oosthuizen explains.

"I considered the various investments in growth, reproduction and survivorship that individuals make, and how these life-history tactics correlate with each other. In long-lives species, the evolution of life history traits, and their influence on population dynamics, are strongly influenced by age effects. It is therefore of great interest to population ecologists to quantify accurately how life-history traits vary with age. This was easy to do with southern elephant seals at Marion Island, as all pups born at the island are uniquely marked with small identification tags, allowing researchers to track their reproduction performance and survival with age. But many other factors may also affect life-history trajectories, which present opportunity for selection. Incorporating such individual heterogeneity into our understanding of changes in life-history traits with age is an important goal in population and evolutionary ecology."

In the *Population Ecology* paper, Dr Oosthuizen and colleagues statistically accounted for unobserved or "hidden" demographic heterogeneity that exists between individuals. "We used finite mixture models to partition individual life-history trajectories into two classes that represent life-history tactics that differ from the mean trajectory of the population. This partitioning enabled us to show that individual heterogeneity governs the expression of trade-offs with first reproduction in elephant seals, with an immediate survival cost of first reproduction present among 'low quality' individuals only. This structured life-history differences among individual females from the same population would



Dr Chris Oosthuizen

have gone undetected had we not accounted for hidden demographic heterogeneity in our analyses", Dr Oosthuizen explains.

"We found that individuals that started to breed earlier in life survive and reproduce better than delayed breeders, which supports the hypothesis that recruitment age is an indicator of individual quality. Typically, these higher performing females also received better maternal care as pups, meaning that animals which start well continue to benefit from that advantage throughout their lives."

Dr Oosthuizen has been affiliated to the MIMMP since 2007, when he was a field assistant at Marion Island. Though he remains involved with the MIMMP, he started a new postdoctoral fellowship at the Marine Apex Predator Research Unit at Nelson Mandela University (NMU) earlier this year. His research at NMU investigates the foraging behaviour of krill-dependent Chinstrap penguin populations in the Antarctic Peninsula, and how these penguins might inform ecosystem-based fisheries management in this part of Antarctica.

Read more on the history and activities of UP's MIMMP at www.marionseals.com.

Announcement of the first Population Ecology Award - *Population Ecology*. <https://esj-journals.onlinelibrary.wiley.com/hub/journal/1438390x/homepage/pope-awards>

Two NAS professors 'nominees' for Nobel Peace Prize

Two professors from the Faculty of Natural and Agricultural Sciences (NAS), Prof Barend Erasmus (Dean of NAS) and Prof Emma Archer (Department of Geography, Geoinformatics and Meteorology), were 'nominees' in the 2020 Nobel Peace Prize, by virtue of their contributions to the Intergovernmental Platform on Science-Policy Advice on Biodiversity and Ecosystem Services (IPBES).

According to Prof Erasmus, "IPBES was a nominee and the challenge is that usually nominees are kept secret for 50 years, unless the nominator breaks protocol and announces the nomination, in support of a specific cause. This happened indeed this year."

Prof Archer has served as the co-chair for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services: Africa Assessment, while Prof Erasmus served as a Coordinating Lead Author on a chapter of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services: Land Degradation and Restoration Assessment.

In an article by [Zakri Abdul Hamid](#), ambassador and science adviser

to the Campaign for Nature, a former science adviser to the UN secretary-general, and founding chair of IPBES, Hamid mentions that the members of the biodiversity community were abuzz when the news broke in October that IPBES was being considered for this year's Nobel Peace Prize (NPP), nominated by a senior German government minister and others.

The World Food Programme (WFP) however won this category.

According to Hamid, there's a very good chance IPBES, which today is just eight years old, will be recognised in similar fashion one day. IPBES is the mechanism by which the world's most authoritative experts in biodiversity and ecosystem services inform decisions on policies and measures to conserve and sustainably use biodiversity, on which long-term human wellbeing and sustainable development depend.

IPBES is the intergovernmental body which assesses the state of biodiversity and of the ecosystem services it provides to society, in response to requests from decision makers.

Prof Emma Archer



Prof Barend Erasmus



Seite Makgai shares her PhD journey

“Doing my PhD under the supervision of Prof Andriëtte Bekker and Prof Mohammed Arashi was like participating in the popular TV show, *Amazing Race* – which means that you better run!” This is how Dr Seite Makgai, the first African female lecturer in the Department of Statistics at the University of Pretoria (UP) summarised her PhD journey.

“Prof Bekker, the Head of the Department of Statistics, has an eye for seeing the pit stop and Prof Arashi has a different view of what the pit stop looks like. They walk with you all the way and it was a journey that I have been privileged to be on with them,” Dr Makgai explained the analogy. Dr Jaco Visagie was her co-supervisor, with Extraordinary Prof De Waal as a regular advisor on her PhD.

Dr Makgai is a New Generation Academic Position (nGAP) lecturer who graduated during UP’s recent virtual graduation ceremonies with a PhD in Mathematical Statistics. She is still working with Prof Bekker and Prof Arashi on postdoctoral research in the Department.

“I did my undergraduate studies in Actuarial Sciences and then decided to continue my postgraduate studies in statistics. I enjoyed statistics on undergraduate level and saw the rare skill that statisticians have of developing mathematics that could answer specific research questions. Distributional theory is a field in statistics that focuses on building functions that explain and cater to research questions.

“The title of my thesis is ‘From Beta to Dirichlet Frontiers’, and it (the thesis) focuses on both theory and application. The beta and Dirichlet distributions form the basis/foundation of the theory. The beta distribution is a well-known distribution that is widely used in modelling proportions and probability outcomes. The Dirichlet distribution is a multivariate extension of the beta distribution. It is well known for modelling compositional datasets (such as the analysis of the proportions of coal quality, size and thickness towards coal production). It is also used in the world of topic and text modelling (obtaining a topic from analysing the proportion or number of words/text that appear on a document). The challenge here is that these distributions fail in modelling current world problems, where there are outliers or extreme cases.

“In this research, I developed two new models/classes of multivariate distributions that provide a new avenue of modelling a wide range of multivariate compositional data sets, particularly with outliers, specifically within environmental, medical, and social media sectors. I studied the behaviour of each class and presented their unique properties, such as particular parameter behaviour and dependence structures for member distributions belonging to these classes. In addition, a new model testing technique was also designed to evaluate the performance of multivariate models such as these. The research contribution, which originated from the univariate domain and now encompasses the multivariate domain, fulfils the necessity for flexible multivariate distributions that enables practitioners



Dr Seite Makgai

to model a wide range of multivariate data sets. The interesting part of research is seeing the numbers tell a story for each data set, so I enjoyed the process of linking the application results to the developed theory,” Dr Makgai explained her research.

When asked if she would advise anyone to do a PhD, Dr Makgai declined, her reason being: “I would tell anyone to follow their internal compass of where they should be and to grow wherever they are placed in life. However, if the prospect of a PhD shows up, then I would say take on the challenge.”

She is elated about finishing her PhD, saying: “I am not shocked, but I am surprised that I made it the way I did to the end of this journey. It has not sunk in yet since this year came with its surprises. The person that I was during undergrad studies would have never believed the possibility of graduating with a PhD. Obtaining a PhD gave me another pair of eyes. It taught me the importance of continuing with learning, finding interest in what is around you and most importantly, finding solid solutions to problems,” Dr Makgai elaborated.

She is the first in her family to obtain a PhD, but not the first doctor. “My sister is a medical doctor, as well as a medical researcher for pharmaceutical companies. My parents were very much into history and the arts, which is different from what their children turned out to pursue,” she concluded sharing her experience of her PhD journey.

Surine Viljoen – a master of African coffees

Many people cannot start their day without a decent cup of coffee. However, for Surine Viljoen, Chief Executive Officer of Tribeca Coffee Company, coffee is much more than a kick-start to her busy day. She is an industry specialist and is passionate about African coffees.

Viljoen graduated with an MSc in Food Science during the recent Spring graduation ceremonies of the University of Pretoria. Her studies focused on determining the effect of selected growing regions in Africa on the sensory and physicochemical characteristics of the coffee beverage. She used coffee grown commercially in Brazil as benchmark.

According to Viljoen, “coffee is an extraordinary product and it elicits passion and compassion in a world-wide industry. So much goes into the cup we drink as part of our daily routine. A few years ago, I set a personal goal for myself to achieve an MSc degree, not only to improve my own scientific knowledge and understanding of coffee and its sensory aspects, but also to engage in a global network of academic professionals researching every detail of the product. As an industry professional, a large part of my daily routine involves evaluating the sensory aspects of coffee and this has truly inspired a love for African coffees.”

Explaining her research, she says: “Information on the sensory profiles of coffees from African origins was very limited and I wanted to describe the subtle sensory differences of the coffees from Ethiopia, Zimbabwe, Malawi and Rwanda, to name a few. The knowledge could improve the marketing of these coffees, but also optimise quality along the value chain.”

She enjoys working with coffee and is fortunate to have access to remarkable coffees. “I must admit that I got discouraged on several occasions while doing my MSc. During my studies, I had to cope with a very demanding full-time work schedule, as well as with the arrival of my two children. I often felt overwhelmed and exhausted. However, in the end success was inevitable due to my love and passion for coffee, encouragement from my family, and support from the University and my supervisor (Prof Riëtte de Kock from the Department of Consumer and Food Science).

As she reflects back on her studies, she emphasised that it was well worth the time and effort. “I will always be grateful for the guidance and encouragement I received from UP and from my family.”



Surine Viljoen

PhD study may help to prevent malnutrition in children in Africa

Completing his PhD degree in Food Science at the University of Pretoria (UP) was not only a momentous occasion for Dr James Makame, but it may also make a positive difference in the lives of children suffering from malnutrition.

Dr Makame, who is currently a postdoctoral fellow in the Department of Consumer and Food Sciences in the Faculty of Natural and Agricultural Sciences, graduated with his PhD during the recent virtual spring graduation ceremonies. His research topic was 'The eating quality of infant foods – perhaps the missing link for solving child malnutrition in Africa'.

"Child malnutrition continues to rise in African communities and one of the reasons is that many African infants are started on more solid foods during the complementary feeding period. Such foods in many instances do cause some feeding difficulties for infants because of its limited oral processing (chewing and swallowing) capabilities. During this period, growth problems often begin to show, indicating that the quality of foods could be an important contributing factor. In Africa, most children depend on traditional foods, consisting of porridges prepared from maize, sorghum, millet, or cassava. The challenge of complementary food's quality sparked the beginning of an exciting academic journey for me," Dr Makame explained the reason for his research focus.

Supervised by Prof Riëtte de Kock and Prof Naushad Emmambux, internationally renowned researchers from the Department of Consumer and Food Sciences, he explored the relationship between the quality of African indigenous complementary porridges and the nutritional outcomes in infants and young children.

"Using the tools of rheology and sensory science, my study revealed that most African indigenous infant porridges based on crops such as maize, sorghum and cassava, if prepared/cooked at the solids content (flour rate) necessary to provide adequate energy and protein for healthy growth, were not optimally suitable for baby feeding. The porridges had inappropriate oral texture quality, being too thick, sticky, slimy, and not easy to swallow. Infants are unable to chew and successfully process too thick foods. As a result, mothers prepare very thin porridges that infants can easily consume, but such porridges have very limited nutrient content. This may lead to protein-energy malnutrition," Dr Makame summarised how the findings of his PhD advance scholarship on child nutrition, and might help to shape policy for better food security among African children.

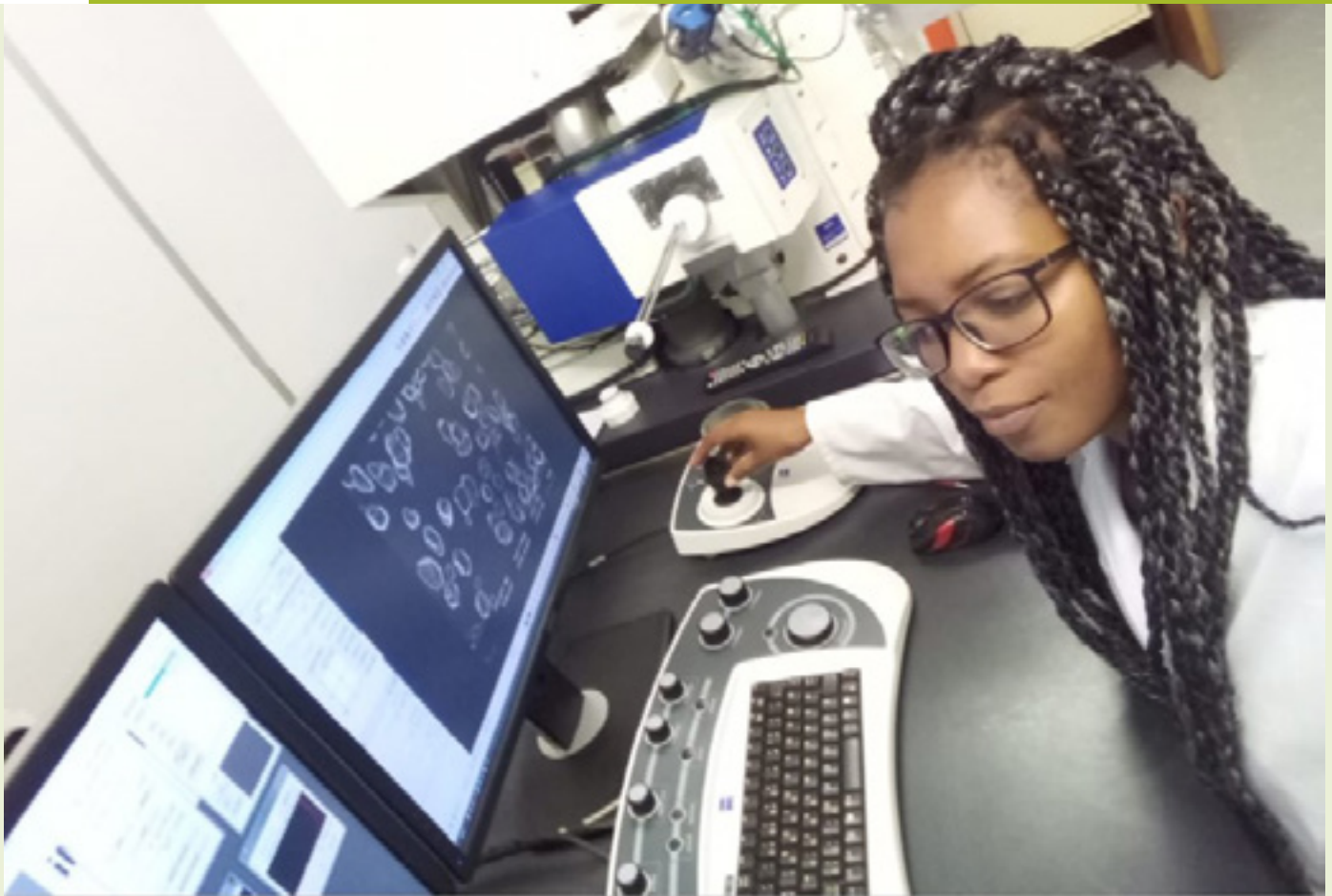
"Graduating with my doctoral degree in Food Science (Food Chemistry and Sensory Science) gave me such a positive pride in myself, my networks (social and academic), my family and children, my mentors and my research leaders. Having trained first as a science educator

at the University of Zimbabwe, and taught a few years prior to enrolling for Food Science undergraduate degree, I have always loved science and I knew I would achieve something noteworthy. However, I never imagined it would mean getting this far, and would be such a phenomenal achievement," said an elated Dr Makame when asked about how he feels about achieving his PhD.

"It meant inspiring families in my community and my networks, especially the young, to say that your destiny in life must never be defined by your present station in life and the limitations resulting from your circumstances. God has a way of holding our hands and graciously taking us in the direction of our aspirations and accomplishments, one step at a time, and with amazing faithfulness. Embedded in this euphoria though, is a deeper sense of understanding and appreciation that I could not have done it right, all by myself. Each PhD journey is unique for each person, and every success story is like a tip of the iceberg,"



Dr James Makame



Dr Clarity R. Mapengo

Food scientist strives to improve people's lives

"My parents taught me that the most significant achievement in life is not just attaining education or science, but rather making that education or science contribute towards improving lives." These are the wise words of Dr Clarity Ropafadzo Mapengo, who recently graduated with a PhD in Food Science at the University of Pretoria.

"Living in communities threatened by a diet-related non-communicable disease like obesity and type II diabetes, we are often compelled to shy away from our staple meals (pap) in the attempt to stay healthy. In the process of attaining my PhD in Food Science, I managed to show the potential of green technology in improving the nutritional quality of starchy foods such as maize meal, so that its consumption does not promote diseases like obesity and type 2 diabetes," Dr Mapengo explains her research topic.

Her PhD research study, titled 'Nutritional, structural and functional properties of infrared heat-moisture treated maize starch and maize meal with added stearic acid', proved that infrared energy could be used to make starch less digestible and promote satiety.

Being raised by educated and supportive parents, Dr Mapengo admits: "I have always been overambitious and explored my bounds. Two and a half years ago, I chose to start my PhD in Food Science, and this journey has been more than fulfilling. I am proud to have dreamt, I am pleased to have persevered, and I am proud to have been tenacious," she explains.

"The moment of Clarity that my parents had almost three decades ago when they brought me into this world has been affirmed. I am proud to have lived up to their expectations. This journey has been rewarding on both an academic and a personal level," Dr Mapengo shared her inspiration for her success.

"I am here today; as an inspiration to the young generation, to prove that destiny is simply a dream that one commits to. I am grateful to my academic mentors Prof Naushad Emmambux and Prof Sinha Ray from UP's Department of Consumer and Food Sciences and CSIR's National Centre for Nano-Structured Materials, respectively," she concludes.

Dr Mapengo continues her journey as a postdoctoral researcher in the Department of Consumer and Food Sciences at UP, working on developing functional foods and food ingredients using indigenous grains.

Master's student in chemistry won SACI James Moir Medal

Wiehan Rudolph, a master's student in analytical and natural product chemistry, was recently awarded the James Moir Medal. The South African Chemical Institute (SACI) annually awards this medal to the best BScHons student in chemistry, and to be eligible for the award, students must have achieved a minimum final pass mark of 75%.

Wiehan, who is doing his MSc under the supervision of Dr Tim Laurens and Prof Vinesh Maharaj from the Department of Chemistry, said: 'It is a great honour for me to receive this award. It gives me great joy to know that I am considered by SACI to be a top-tier student. This award inspires me to continue my endeavours towards completing my postgraduate studies to the best of my ability. I wish to thank SACI and all those that have made this award and my receiving it a reality.'

Wiehan completed both his undergraduate degree and honours cum laude at UP. He is no stranger to accolades, having won the Department of Chemistry Prize two years in a row as the best first-year and second-year BSc chemistry student. In his third year he won the Merck Prize for the best third-year BSc analytical chemistry student, and he continued this winning streak in his honours year by scooping up the Bruker Prize for the best BScHons physical chemistry student.

His master's research project focuses on poisonous plants that have found great importance in medicine from before the time of Shakespeare. According to Wiehan, 'they have also made their mark in agriculture as a common cause of death in livestock. Inappropriate use of these plants, intentionally or not, has also caused many fatalities in humans. Confirming this to be the cause of death in an individual or an animal, however, proves to be difficult. Linking observed symptoms to the possibility of poisoning with plants is not always possible as physicians rely on the information of the patient's possible consumption of poisonous plants. In the case of livestock, stomach contents and organ tissue need to be examined to confirm ingestion of the plant.'

He further explains that 'the research will focus on developing a single, validated analytical method for the detection of plant-based toxins in body fluids, such as blood and urine, based on mass-spectrometric analysis. Such a method will improve the diagnostic ability of hospitals and veterinarians when they are confronted with cases of poisoning, since rapid, accurate diagnosis of poisoning is vital. Accurate and reliable concentration assessments of poisons in both humans and animals are of vital importance to establish a more definitive cause of illness or death.'

Wiehan also completed a mentorship programme under the supervision of Dr JB Laurens at the Business Enterprises@UP Forensic Toxicology Laboratory and was a laboratory demonstrator at the UP-Stellenbosch University Community Outreach Initiative event in 2018 and 2019 under supervision of Prof Marilé Landman at UP's Department of Chemistry.

Wiehan Rudolph



PhD student wins writing competition

Quentin Guignard, a PhD student in the Department of Zoology and Entomology, recently won a writing competition held in conjunction with the **DST-NRF Centre of Excellence in Tree Health Biotechnology** (CTHB) and **The Conversation Africa**. His cash prize of R30 000 will enable him to attend an international conference of his choice. The judges ruled on the length of the articles, their relevance to the public and their accessibility to readers who are not scientists, which meant that they had to explain the scientific principles simply without using subject-specific jargon.

When interviewed to find out how he felt about winning this prize, Quentin said: 'Winning this competition was proof to me that other people can be interested in what I am doing. I do not like overcomplicating things, but as scientists we are so afraid of not being accurate enough that we tend to lose people's attention when we talk to them. We don't find the right words or the right way to explain to them that what we do is both exciting and important. This competition offered me an opportunity to find an easy way to pique people's interest in what I am doing and to show how enthusiastic I am about it.'

He added that in his opinion it is very important that scientists communicate their knowledge to the public in order to increase general knowledge, raise awareness of problems – including ethical

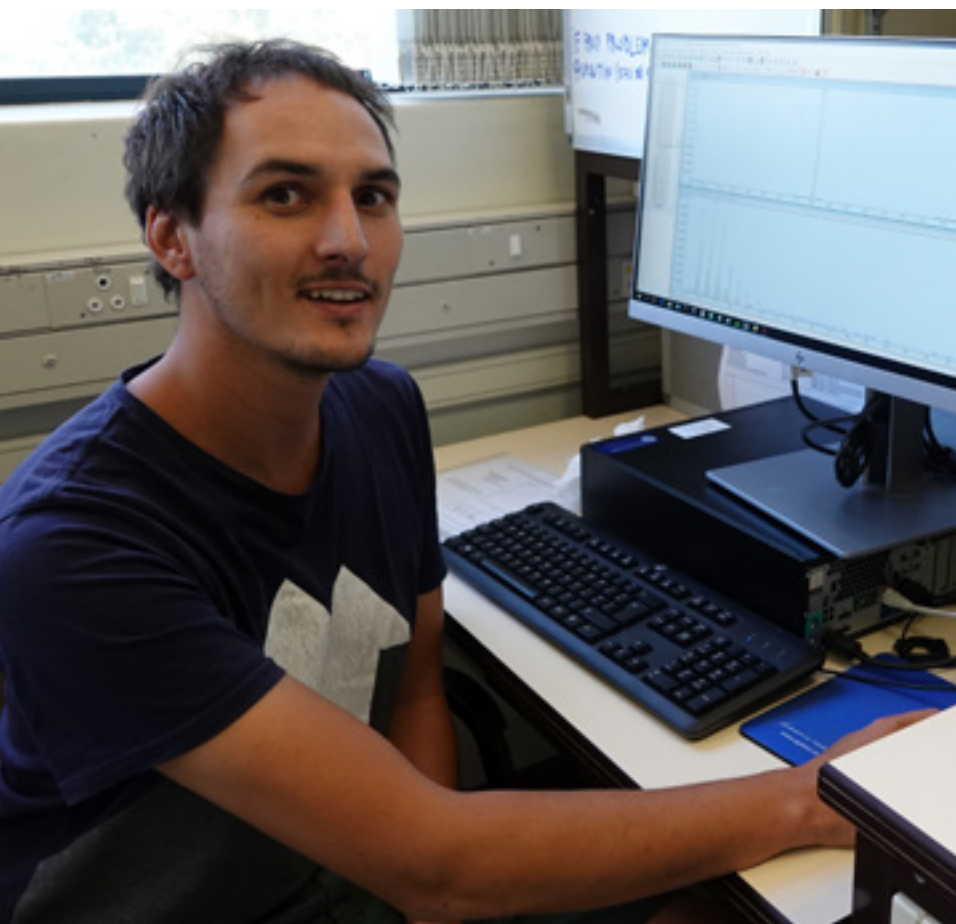
and health issues – and, in the case of his particular field of research, awareness of new ecological and economic threats. Effective communication of facts is also one of the best ways to fight the dissemination of misinformation and fake news.

The competition was open to PhD students and postdoctoral fellows in the Forestry and Agricultural Biotechnology Institute (FABI) and required the writing of an article on their research. Quentin's prize-winning article will be published on *The Conversation*, an online platform that gives a journalistic spin to articles written by academics from institutions worldwide. Interested mainstream media then publish those articles as they appear on the various platforms.

Quentin's PhD research (supervised by Prof Bernard Slippers and Dr Jeremy Allison) focuses on *Sirex noctilio*, a wood wasp pest that has been introduced into the southern hemisphere (including South Africa) and kills pine trees in plantations. 'I am focusing on two aspects: visual and chemical ecology. Visual ecology is the study of the colours this insect can see, while chemical ecology focuses on the odours that *S. noctilio* can smell. Insects that want to mate typically communicate via visual cues and attractive odours called pheromones. I intend to understand how this attraction works, and to discover attractive pheromones and/or colours. The knowledge thus gained could be used to create an environmentally friendly trap, specifically designed to catch this species and help foresters to protect their trees,' he explained.

Quentin has completed two master's degrees with distinction: one in biology, diversity and environment at the University of Grenoble (2014), and the other in chemical ecology at University of Lorient (France) (2016). In 2019 he received the award for the best PhD presentation at the annual general meeting of the Department of Zoology and Entomology, as well as a Young Entomologist travel grant from the Entomological Society of Southern Africa.

Quentin's article will soon be published online to reach a global readership.



Quentin Guignard

MSc student attends international Plant Breeders congress

Ms **Ingrid Marais**, an MSc Biotechnology student in the Molecular Plant Pathogen Interactions research group in the Forestry and Agricultural Biotechnology Institute (FABI) and the Department of Plant and Soil Sciences, was recently selected to attend the **National Association of Plant Breeders (NAPB)** annual meeting.

The meeting was hosted by the University of Nebraska, Lincoln, USA (<https://napb2020.unl.edu/>). She was selected for full attendance sponsorship by the **South African Plant Breeders Association (SAPBA)**.

According to Ms Marais, she found this conference very informative and enriching. "As a student from a biotech background, this meeting broadened my knowledge on the current and future trends within the plant breeding field. I could take away from the stories and experiences some of the speakers shared on their career paths. I am very thankful to have been given this opportunity and I would like to sincerely thank SAPBA."

Highlights of the meeting were discussions on ethics within breeding and commercialisation of products, gene editing regulations in the USA, and the potential that gene editing has for African orphan crops, such as cassava. Breeding programmes on lesser known plants such as hops, hemp and ryegrass were also covered, as well as breeding for quality traits such as popcorn and wheat nutritional quality.

Ms Marais' research involves development of an RNA-based fungicide against a maize pathogen. In March 2020 she took the lead of a FABI/Department of Plant and Soil Sciences postgraduate student committee in coordinating a Corteva AgriScience-sponsored mini-symposium at the 13th Southern African Plant Breeding Symposium. This was held at UP's Future Africa campus, and was one of the last in-person events before the COVID19 lockdown.



Ms Ingrid Marais



Johannes Christoff Joubert

NAS students made it to SA semi-finals of FameLab science communication competition

Two students from the Faculty of Natural and Agricultural Sciences (NAS), Johannes Joubert and Joséphine Queffelec, have made it to the semi-finals of the South African leg of **FameLab**, one of the biggest science communication competitions in the world.

The competition is open to anyone aged 21 to 35 working in or studying technology, engineering, medicine, biology, chemistry, physics or maths. According to Darryl Herron, a PhD candidate at UP's **Forestry and Agricultural Biotechnology Institute (FABI)** who co-ordinated the heat at UP, the competition was brought to South Africa by the British Council. The Council has partnered with the South African Agency for Technology Advancement and Jive Media Africa to "give young scientists the tools to explain their research to a general audience in three minutes".

Herron said that by participating in the FameLab competition students help to demystify science for the public and inspire young people to become scientists. Several universities participated in the 19/20 heats and the winner will represent South Africa at the

FameLab International final in the UK. At UP, 31 master's and PhD students competed in the plant health-focused heat. A day before, they attended a science communication workshop run by Jive Media Africa which illustrated the main factors underlying good speaking and how to tell a good story.

Joubert, who won the heat, will be starting his PhD degree in **Zoology** this year. He told the audience that the point of his research for his MSc Zoology degree was to find out what attracted particular beetles to certain leaves, and what drove them away from others.

"My work focuses on identifying the constitutive Eucalyptus defence compounds, which mediate the host preference of *Gonipterus sp. n. 2* (the Eucalyptus snout beetle). In a Eucalyptus plantation, many different genotypes of Eucalyptus trees are planted, and these beetles will feed on the leaves of certain genotypes while disregarding the others surrounding it."

He had only three minutes to explain his research, so there was



Joséphine Queffelec

no time to speak of the tests he conducted. "So, I focused on the beetle, describing it as a monster, detailing damages and losses that this beetle causes, and how my research could help combat this monster. I used a jar of live beetles as my prop to contrast how I described them, showing that this horrible monster was in fact a tiny and somewhat cute beetle, but despite its friendly appearance it was still a devastating monster."

Joubert pointed out that scientists speak in the "language of science, which is precise, analytical, detail-oriented and very boring to the general public, which leaves us talking only to our peers, thus alienating the general public".

"They don't understand our message, and they don't see how it can help them or how they can help it."

If scientists could speak in the common language of simple terms, "we could demonstrate our message and how it can help people, get public interest, help our research, and reduce the tension between scientists and the public", he explained.

Winning the heat "was a massive surprise, as there were so many amazing speakers there", he said.

Queffelec was a runner-up in the heat. Her PhD research focuses on an invasive species of wasp that is causing damage in pine plantations across South Africa. "My project aims at answering questions such

as: Why do we find more males than females in the field? How do males and females find and chose each other before mating? Can we help control the wasp by tampering with reproduction?"

In her presentation, she talked about how objects such as shoes, plants and wooden souvenirs can transport deadly bacteria, fungi and insects around the globe. Explaining how these objects can have an impact on forests, she likened them with murder weapons as the species they transport can kill trees once they arrive in a new environment.

She said she entered the FameLab competition to learn about science communication and "to encourage people to take care of our forests".

"Forests are an important economic and cultural resource that needs to be guarded and protected. A lot of people do not realise the impact they can have on forests but are ready to take the extra step to protect forests once they know how."

Herron, a 2018 national FameLab finalist himself, said: "Johannes and Josephine will join many other young and talented researchers who have been sharing their science stories over the past few months. They will battle it out using their science communication skills for a chance to represent South Africa in the UK. South Africa won the competition back in 2017, and 2020 could very well be our year once more."



Nomzamo Magano

Master's student in Food Science wins prestigious Brian Koeppen scholarship

Nomzamo Magano, a master's degree student in Food Science recently received the Brian Koeppen Memorial Scholarship from the South African Association of Food Science and Technology (SAAFoS^T).

This scholarship, based on academic excellence, is in honour of the late Prof Brian Koeppen, who headed Stellenbosch University's Department of Food Science until 1980. Only one MSc student at a South African university that offers degrees in Food Science or Food Technology is eligible for this scholarship annually.

"I feel honoured to be recognised by SAAFoS^T, and I am also deeply grateful to the Department of Consumer and Food Sciences for having me nominated for this prestigious award. This good news came at a perfect time for me and I feel truly blessed," Magano said when asked how she felt about receiving this award.

With her research, Magano aims to understand how consumers' attitudes towards health and pleasure aspects of food in general influence their perception of the sensory properties (the appearance, texture, smell and taste) of gluten-free bread. She is supervised by Prof Riëtte de Kock and Prof Gerrie du Rand, two renowned researchers in the fields of sensory and consumer science at UP's Department of Consumer and Food Sciences.

Her research forms part of an international **LEAP Agri-funded project called NUTRIFOODS**. The project focuses on the use of climate-smart gluten-free

crops (particularly sorghum, cowpeas and cassava) to produce nutrient-rich bakery products for Africa and Europe. Increased use of these climate-smart crops, instead of wheat, could benefit local economies in Africa and contribute to sustainability and food security. Climate-smart crops such as sorghum, millets, cowpeas and cassava grow well in the dry and hot climate of some parts of Africa.

According to Magano, "it is particularly exciting to be part of an international project with partners from the Netherlands, Finland, Kenya, South Africa and Uganda". She plans to use the award for a training course, study visit or to attend an academic conference. The scholarship will greatly assist her in the pursuit of her career plans. It has also inspired her to keep working hard and to continue to contribute to research that is for the greater good of Africa.

If you are interested in participating in research studies about the food choice attitudes of consumers, please make sure to sign up to the **UP Consumer database**.



Clockwise from left: Nicole Philips, Elré Sauerman, Anél de Villiers and Serena Joubert.

Four NAS students feature in Absa Gradstar 2020 Top 100

Four of the 19 students from the University of Pretoria that have made it into this year's Gradstar Top 100, are from the Faculty of Natural and Agricultural Sciences.

They are Nicole Philips (BSc Actuarial and Financial Mathematics), Elré Sauerman (BSc Genetics double major in biochemistry), Anél de Villiers (Consumer Science: Clothing Retail Management), and Serena Joubert (BSc Biochemistry).

UP dominated this year's Absa Gradstar Top 100 with 19 students making it onto the list, the most of any institution. Vashel Naidoo, a fourth-year BCom LLB student at UP's Faculty of Law, made it into the awards' Top 10 of the Finest.

GradStar is a programme that recognises the top 100 students across the country, based on leadership qualities and readiness for the workplace. Annually, university careers centres from across the country are contacted to market the GradStar programme to their students, ensuring representation from all disciplines. The Gradstar Awards also connect top students with potential employers. This affords employers an opportunity to develop long-lasting relationships with the top talent in the country.

This event is the culmination of a stringent selection process that filters through more than 8 000 students to find the top 100 students who not only excel academically, but also show strong leadership skills. After a rigorous four-phase judging process, students are first selected to be in the top 500, then the top 100. Then, during a full-day workshop with representatives from companies who are prospective employers, the top 100 are given the opportunity to showcase who they are and to impress the sponsors. Representatives from the companies then narrow down the top 100 to the Top 10 of the Finest in South Africa.





“Malaria research is very close to my heart”

It was only after University of Pretoria (UP) graduate Takalani Makhanthisa began her postgraduate studies in entomology that she realised that more than half of South Africa's cases of malaria occur in the Vhembe District in Limpopo, her home. Now Makhanthisa hopes her research towards her master's degree, focusing on malaria and other vector-borne diseases, will help make a real difference in the lives of those in her community.

Makhanthisa, who works with the University of Pretoria Institute for Sustainable Malaria Control, graduated recently during a ceremony held virtually because of COVID-19 lockdown restrictions. Her BSc degree in genetics and honours degree in biochemistry at UP also focused on malaria-related projects.

“Growing up, I was aware of malaria, but I did not know that it was affecting so many people from my district until I got to varsity and started reading more about it [at postgraduate level]. I was also made aware of its burden when I visited relatives in malaria-endemic villages. I would hear stories of family members' neighbours who had passed on because of malaria. It is devastating for families to lose their loved ones to malaria,” she says.

She was also told of many learners in villages who miss school after contracting malaria. Her uncle contracted the disease and was hospitalised for a long time. “It took some time before the family could figure out what disease he had because they initially thought it was flu, but it just got worse. I think it is important for people to be educated about malaria, its symptoms and preventative measures such as bed nets,” she adds.

Makhanthisa, who obtained her master's degree with a distinction, says about 60% of South Africa's malaria cases occur in the Vhembe District of Limpopo. “Malaria research is very close to my heart, knowing that the district that I come from is burdened by this disease.”

During the course of her studies, she realised that most malaria-endemic villages in the Vhembe District have lots of livestock, “so I decided to investigate the malaria and vector-borne disease strategy, because I thought this would be feasible in the region”.

She was awarded the Dr Sylvia Meek Scholarship for Entomology in 2018 by the Malaria Consortium, in memory of its cofounder Dr Sylvia Meek, who was a leading international scientist in the fight against vector-borne diseases, particularly malaria. “This is a very prestigious scholarship and I am very fortunate to have been one of five scholars to have been awarded it. Two were from Thailand, two from Nigeria, and then there was me,” says Makhanthisa.

The scholarship was established to ensure future generations of entomologist continue Dr Meek's legacy. “I am grateful for such a great opportunity. I was also a bit overwhelmed, because I knew I had to do very well and be an example to future scholars,” she notes.

Supervised by Dr Heike Lutermann from UP's Department of Zoology and Entomology in the Faculty of Natural and Agricultural Science and Prof Leo Braack from Mahidol University in Thailand, Makhanthisa investigated the effectiveness of a possible outdoor malaria vector control strategy: cattle-administered endectocides. “The current malaria control strategies of bed nets and residual spraying are indoor strategies and do not protect people from malaria when they are outdoors. There is a need for development and implementation of an outdoor malaria control strategy,” she explains.

“My findings propose that cattle/livestock-administered endectocides could potentially be used as an outdoor malaria control strategy if used strategically. This strategy might work in malaria-endemic regions such as the Vhembe District in Limpopo, where there are high livestock numbers.”

Endectocides are drugs already used to treat parasites such as ticks and worms in livestock and which, Makhanthisa says, have been found to be effective against the survival and egg production of malaria mosquitoes. “Treating cattle and other livestock with these drugs in malaria-endemic regions might help reduce malaria-vector mosquitoes, and could potentially be implemented as a control strategy.”

She explains that field studies investigating these drugs are limited, and much research is required before the strategy can be implemented. “To the best of my knowledge, this was the first study in South Africa to investigate the use of cattle-administered endectocides. Such studies have been conducted only in a few other countries.”

Makhanthisa is pleased to have completed her master's degree and is grateful for the doors it has opened. “We are getting the first manuscript ready for publication and I am excited about it,” she says, smiling. She has registered for a PhD in medical entomology after being awarded another international scholarship by EcoHealth Alliance, an environmental non-profit organisation dedicated to protecting wildlife and public health from disease.

Takalani Makhanthisa



First annual Animal Science Feedlot Challenge at NAS

Ready, set, feed!

The University of Pretoria's Department of Animal Science hosted its first annual UP-Agric Feedlot Challenge this year.

Sixty-four final-year BScAgric Animal Science students were divided into 10 teams and each team was tasked to manage and care for 12 cattle for 130 days. The feedlot challenge commenced in February 2020 and was concluded in June with an 'On-the-hoof' competition. The teams were also afforded the chance to compete in the South African Meat Industry Company's and Agri Expo's national carcass competition.

Agri Gauteng and Vleissentraal Bosveld approached Prof Edward Webb, Deputy Dean for Research and Postgraduate Studies and also a former Head of the Department of Animal Science, with

this initiative. It was an opportunity which could not be turned down. The Faculty of Natural and Agricultural Sciences approved the Department of Animal Science's proposal as a core practical training component in the final year of the BScAgric Animal Science degree programme. The final-year module, Large Stock Nutrition and Management, teaches all the different aspects of feedlot management, while the Meat Science module focusses on meat production and aspects which influence meat quality. The UP-Agric Feedlot Challenge complements these modules perfectly and provides an in-depth study of the whole farm-to-fork process. It also meets the University of Pretoria's hybrid learning approach perfectly.

The 120 cattle, all of different breed types, were sourced by Vleissentraal Bosveld from different farmers, some of which are upcoming farmers. The teams had to manage the cattle according to feedlot practices such as processing their cattle, choosing between

different starter, grower, and finisher rations, deciding on adaptation and transition periods, when and how to pull a sick animal, and how often pens needed to be cleaned. All medicine, growth promotants, and beta-agonists were sponsored by MSD Animal Health. Veterinary advice and call-out services were provided pro bono by S & E Feedlot Consulting. King Price Insurance provided insurance coverage for the project, as well as RFID tags which are imperative for traceability. The rations were formulated and supplied by NUTRI Feeds. Advice on feedbunk management, which rations to choose, and adaptation and transition periods were provided by Dr Francois van de Vyfer and Melville Price of NUTRI Feeds. Johan Berg, of the South African Fatstock Judging Association, taught the students what to look for when choosing the best cattle to compete in the On-the-hoof competition.

The first annual UP-Agric Feedlot Challenge was greeted by many challenges. First, our country's animal auction sites were closed due to the foot-and-mouth outbreak. Then, two months into the challenge, we saw the country come to a standstill due to Covid 19. The students had worked so hard and so much had been invested in this project that we couldn't just call it a day. As the saying goes, "n boer maak 'n plan". Every month a third of the class was granted permission to work at the feedlot – that way the students continued to be involved in the project. Unfortunately, our aim to have farmers' days could not come to fruition. The idea behind the farmers' days was to invite farmers, especially upcoming farmers, to the feedlot to show and educate them on how to breed the ideal feedlot animal,

how to feed feedlot cattle to ensure maximum production, and what the most common metabolic conditions are. We hope to achieve this in 2021's UP-Agric Feedlot Challenge.

The On-the-hoof competition took place at Vleissentraal Bosveld's Onderstepoort auction site. Due to regulations set out by the government to curb the spread of COVID-19, the number of people to attend the On-the-hoof competition was limited. This competition was live-streamed and can be viewed at the following: <http://events.digitv.co.za/>. Cattle were judge according to different weight classifications, but the overall winners was team Connor & the Demeters, whose cattle were from upcoming farmers.

The cattle was slaughtered at Cavalier. Here, the national carcass competition took place and can also be viewed at <http://events.digitv.co.za/>. Again, team Connor & the Demeters produced the best carcass.

All profits from this project will go to creating a bursary for a needy University of Pretoria Animal Science student. The Department of Animal Sciences would like to thank all the sponsors and companies involved for the brilliant opportunity and the success of this project, despite it being a very challenging year.

Anyone who is interested to see the results and photos of the challenge is more than welcome to like our Facebook page, UP-Agric Feedlot Challenge.



*Azile Mdleleni*

Azile won 2020 ESRI Young Scholar Award

Azile Mdleleni, an honours student in Geoinformatics in the Department of Geography, Geoinformatics and Meteorology, was recently announced as the 2020 Environmental Systems Research Institute (ESRI) Young Scholar Award winner for her participatory Geographic Information System (GIS) PGIS project.

For her honours research project, Azile focused on the daily struggles of individuals who live in the informal settlement of Alaska, City of Tshwane.

PGIS is a method that aims to use local knowledge to map an area, and places an emphasis on community involvement. This allows for an open line of communication with the community and thus a better understanding of their needs. In this project, it was done through in-depth interviews with community members in order to identify and understand their daily struggles.

The result of the analysis was two visualisations (a web map and a story map), which were created to communicate the results of the interviews. The web map provided a detailed look at the daily struggles and could be used by community leaders when communicating with local governments and other stakeholders, such as non-profit organisations. The community members would have maps which they helped create, and their involvement in the process of decision-making could ultimately lead to empowerment.

The main outputs of Azile's project can be accessed here

<https://storymaps.arcgis.com/stories/c928b339a5bb429cbc445f2be803ed5f> (story map) and here

<https://uparcgis.maps.arcgis.com/apps/webappviewer/index.html?id=1ac9f86179e941ce818d2f08001d83dc> (web map).

NAS awards long service

We would like to congratulate the following staff members of the Faculty of Natural and Agricultural Sciences who recently received long-service awards from the University of Pretoria:

Staff member	Department
35 years' service	
Mrs AC Laubsher	Biochemistry, Genetics and Microbiology
Prof JL van Rooy	Geology
Mr RS Mudau	Plant and Soil Sciences
30 years' service	
Mr AM Rampora	Geology
Mr MJ Letswalo	Hatfield Experimental Farm
Ms MS Letsoalo	Hatfield Experimental Farm
Dr SM Millard	Statistics
25 years' service	
Prof E van Marle-Koster	Animal Science
Dr WC Fick	Biochemistry, Genetics and Microbiology
Mr J de Ridder	Biochemistry, Genetics and Microbiology
Mr D Bilankulu	Plant and Soil Sciences
Dr D Marais	Plant and Soil Sciences
Ms CM Barnard	Dean's Office
Prof NC Bennett	Zoology and Entomology
20 years' service	
Dr JB Stevens	Agricultural Economics, Extension and Rural Development
Mrs MM Dry	Chemistry
Prof DK Berger	Plant and Soil Sciences
Dr J Kleyn	Statistics
Mr H Buirski	Zoology and Entomology
Prof AD Bastos	Zoology and Entomology
15 years' service	
Dr C Visser	Animal Science
Prof LM Birkholtz	Biochemistry, Genetics and Microbiology
Prof S Naidoo	Biochemistry, Genetics and Microbiology

Staff member	Department
Prof B Slippers	FABI
Mrs E Pretorius	Geography, Geoinformatics and Meteorology
Mr MT Maenetja	Hatfield Experimental Farm
Mr PM Malatji	Hatfield Experimental Farm
Dr Quenton Kritzing	Plant and Soil Sciences
10 years' service	
Mrs Yvonne Samuels	Agricultural Economics, Extension and Rural Development
Prof SL Hendriks	Agricultural Economics, Extension and Rural Development
Dr N October	Chemistry
Dr DG Masiangoako	Chemistry
Mrs MB Meyer	Dean's Office
Dr NS Haussmann	Geography, Geoinformatics and Meteorology
Mr KK Letsoalo	Hatfield Experimental Farm
Mr TE Matuba	Main Experimental Farm
Mr PL Mhlakatshi	Main Experimental Farm
Dr M Labuschagne	Mathematics and Applied Mathematics
Dr DV Moubandjo	Mathematics and Applied Mathematics
Mr SB Khanye	Mathematics and Applied Mathematics
Prof M Chapwanya	Mathematics and Applied Mathematics
Dr SM Garba	Mathematics and Applied Mathematics
Prof TT Hlatshwayo	Physics
Prof CC Theron	Physics
Mrs IN Jiyane	Physics – Microscopy Laboratory
Prof BJ Vorster	Plant and Soil Sciences
Mr JDS Sampson	Plant and Soil Sciences
Miss MP Mpete	Plant and Soil Sciences
Prof PJN de Bruyn	Zoology and Entomology



Prof McKechnie part of fascinating study into the survival of hummingbirds



A professor of Zoology from the University of Pretoria's Faculty of Natural and Agricultural Sciences was part of a team that recently published a study that reveals that tiny hummingbirds living in the Andes Mountains in Peru drop their body temperature from 40°C to 3,3°C, near freezing point, to survive bitterly cold nights. "It is the lowest body temperature reported so far in any bird or non-hibernating mammal," says UP's Prof Andrew McKechnie.

Prof McKechnie, who is also the South African Research Chair in Conservation Physiology at the South African National Biodiversity Institute, is part of the scientific team that recently published its findings in the journal *Biology Letters*. He explains that these tiny nectar-feeders go into a state called "torpor" to save energy on bitterly cold nights.

"Torpor is the most effective means of energy conservation used by mammals and birds," he says. "It is a state of inactivity devoid of movement and with the purpose of reducing energy requirements either in the cold or in a very dry climate. The energy savings occur because the animal reduces its body temperature and metabolic rate far below normal levels."

The hummingbirds studied in the region live at an elevation of about 4 000 m. To survive the nights, they drop their body temperature, which is usually 40°C,

Prof Andrew McKechnie



Sparkling violetear, one of six species involved in the study

to extremely low values. Six species were studied, from the bronze-tailed comet (4,9 g) to the giant hummingbird (which is comparatively bigger, weighing in at 24 g). Most hummingbirds weigh between 3 g and 7 g.

While all the species lowered their body temperatures to different degrees, all dropped below 10°C at some point, according to Prof McKechnie. The black metaltail's (*Metallura phoebe*) temperature dropped to 3,3°C, which is close to freezing point. The previous record for birds was 4,3°C, recorded in the common poorwill, a North American nightjar.

Torpor is critical for the survival of these hummingbirds, because they are often unable to store enough energy during the day to last through the night. They feed on the nectar of flowers that grow in abundance, even at such high elevations. But, Prof McKechnie adds, the nectar is sometimes not very rich in energy. Some hummingbirds have to drink up to three or four times their own body mass each day to obtain sufficient energy. They also have very limited fat reserves.

Some of the birds remained in torpor for just three hours, while others remained in that state for up to 13 hours. To heat up again in the morning, or sometimes during the night, they start to shiver. "While shivering they generate a lot of heat internally," Prof McKechnie explains. "Their muscles contract rapidly. One sees them shivering, then suddenly their eyes open and they fly away." To get out of torpor, the hummingbird raises its temperature by 1,5°C a minute; this can take up to half an hour.

Hummingbirds also have extremely high heart rates of up to 1 200 beats a minute, but during torpor their heart rate can be as low as 50 to 80 beats a minute. While in torpor, they

are potentially vulnerable to predators, because they can't move at all. Many hummingbirds of the high Andes roost in caves, clinging to the walls in suspended animation, surviving in the most extraordinary way. Caves are just one of the known places they go at night; there is even evidence that some hummingbirds enter torpor while in their nests incubating eggs.

But how did the researchers manage to measure the body temperatures of these tiny birds at night?

The team caught 26 hummingbirds representing the six species with mist nets, and kept them in tents that were adapted to serve as aviaries. Each bird was kept for one or two nights at most. An extremely fine Teflon-coated thermocouple wire was inserted into the cloaca of each bird. The cloaca is the

bird's single opening for the urinary, digestive and reproductive tracts.

"About 30 minutes before dark, food was withheld and the birds were transferred into individual roosting enclosures so their temperatures could be measured," explains by Prof McKechnie. "The thermocouples were held in place by tiny pieces of tape secured to each bird's tail feathers."

Another novel finding to emerge from the study is that the six species varied substantially in terms of torpor depth and duration, despite experiencing the same weather conditions. These differences suggest evolved differences among these species, rather than torpor patterns being determined wholly by environmental conditions.

Hummingbirds were housed overnight in tents outfitted as make-shift aviaries



UP academics research the causes of elephant die-off in Botswana

Scientists from South Africa and Pakistan have pooled their expertise in an effort to understand why more than 350 elephants in Botswana have died in just two months.

The research team comprises Dr Shahan Azeem of the University of Veterinary and Animal Sciences in Lahore, Pakistan; Dr Roy Bengis, retired Chief State Veterinarian of the Kruger National Park; Prof

Rudi van Aarde, Emeritus Professor and Conservation Ecology Chair at the University of Pretoria's (UP) Department of Zoology and Entomology; and Prof Armanda Bastos, Head of the Department of Zoology and Entomology at UP and an affiliate of UP's Centre for Veterinary Wildlife Studies.

Their commentary – titled 'Mass die-off of African elephants in Botswana: pathogen, poison or a perfect storm?' – was recently



published in the *African Journal of Wildlife Research*. “The article attempts to identify possible causes of these deaths and is a result of Dr Azeem initiating the commentary out of concern that a similar event could affect Asian elephants,” says Prof Bastos.

Botswana has reported the death of 350 African elephants (*Loxodonta africana*) in just two months, sparking speculation among conservationists and the public around the cause. Carcasses were first found in the Okavango Panhandle region. There are now reports that these deaths could be attributed to a naturally occurring toxin, but there are no definite answers. The team has not been directly involved in the research into the deaths, with samples being tested by other scientists in Zimbabwe, the USA and at UP’s Faculty of Veterinary Science.

“The die-off in Botswana has broader implications, because elephant populations are heterogenous – some countries have many, whereas others have very few, and will not withstand the loss of so many animals,” Dr Azeem explains. “Without definite answers around the cause of these deaths, it is not clear whether mitigation is necessary or possible in Botswana, and it will not be possible to prevent future mass deaths.”

Although the loss of so many elephants is small in comparison to the total number of elephants in Botswana – which is estimated to be about 130 000 – Prof Van Aarde cautions that there is a risk of localised elephant extinction if a die-off of similar scale were to occur elsewhere. “This is because elephant numbers differ substantially by region, country and even within a country. More than 50% of African elephants occur in the southern Africa region.”

Prof Bastos explains that the elephant population in the Kruger National Park is about 20 000, whereas there are about 600 elephants in Addo Elephant National Park in the Eastern Cape. “A die-off of similar scale could be ‘absorbed’ in Kruger, but would be devastating for Addo. It is therefore urgent that the cause of the current die-off is identified, so that conservationists are better prepared, as it is the only way to prevent similar losses of susceptible elephants elsewhere.”

In the paper, the team observes that the death of the elephants in Botswana “was indiscriminate in line with their age and gender, while death for some was sudden, as elephants were found collapsed forward onto their chests, tusks in the ground, rather than on their sides”.

What distinguishes these deaths from past mortalities is that they occurred in an area that is inhabited by elephants, humans and livestock, rather than in a protected area, leading to initial speculation that direct human action was the cause. However, elephant carcasses were found with tusks intact and no other species were affected, making malicious poisoning and poaching unlikely. This led to suggestions in the media that either disease, environmental bio-intoxication or starvation could be to blame. All of this was considered by the researchers in their commentary, together with indirect human effects that are specific to the Seronga area. This area is artificially high in elephant densities due to fencing, as well as crops that concentrate elephants and rodents to the same area.

They point out that anthrax infection has been ruled out as the cause of death. “It is unlikely to be the cause of the current mass elephant die-offs, as clinical signs that are consistent with anthrax, including haemorrhagic discharge from body orifices, were not reported in these elephants,” Dr Bengis explains. “Furthermore, the carcasses of other species were not found during the outbreak.”



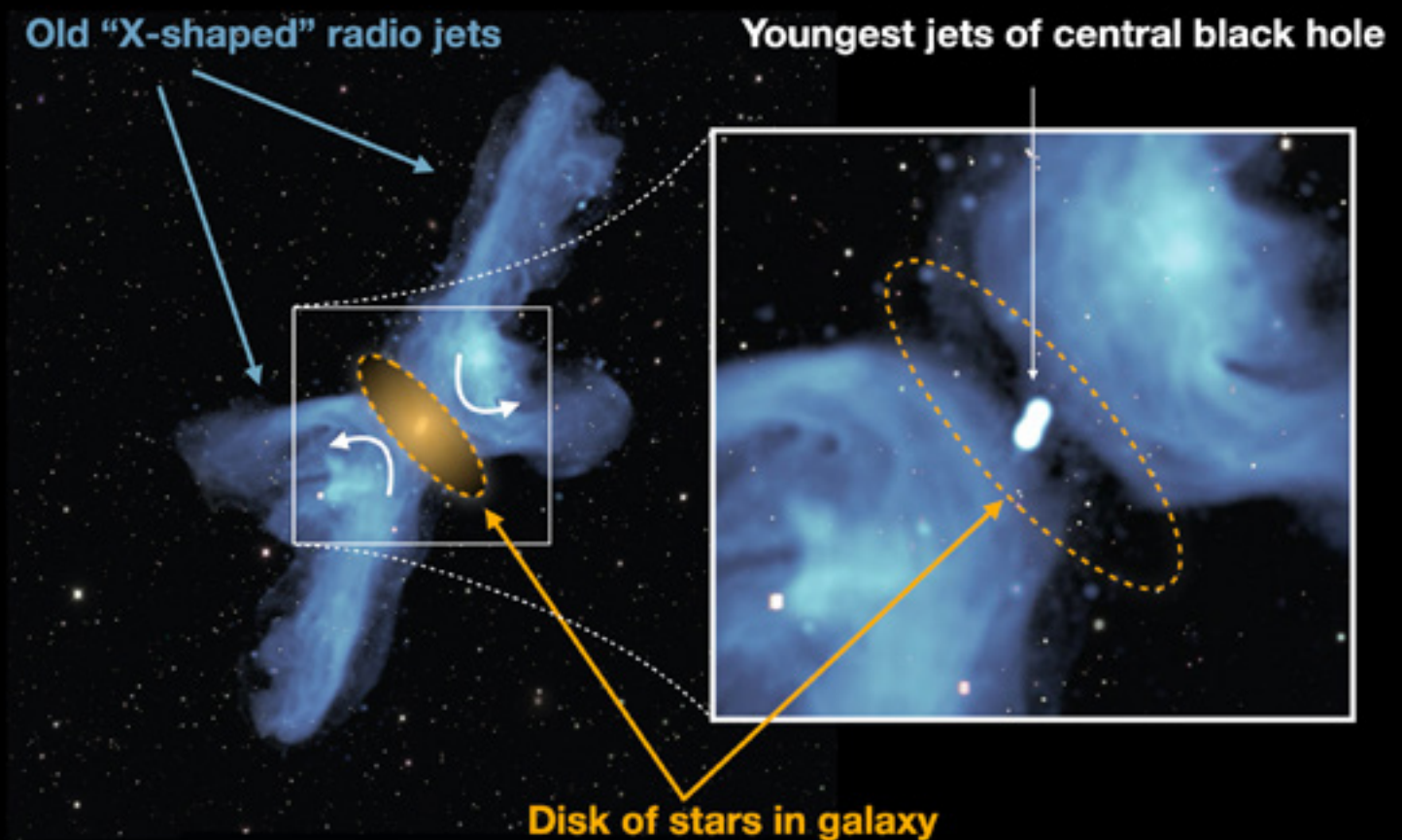
Prof Armanda Bastos

Starvation was also an unlikely cause, as northern Botswana experienced late heavy rains and bumper crops.

The team is calling for thorough and speedy epidemiological studies to explore disease transmission dynamics in local environmental settings, along with in-depth laboratory investigation. “We desperately need an answer to this so that we can recognise the ‘clues’ faster if there is a next time, identify appropriate preventative steps and implement these rapidly so that the loss is not on the scale seen in Botswana,” says the scientists.

They stress that local communities have an important role to play in rapid response to wildlife losses/crises. “Scientists cannot do this alone. The future of wildlife conservation relies on local community engagement and integration into conservation plans.” The team recommends that government and non-governmental organisations assist in investigating the deaths by working with local communities to find fresh carcasses for sampling and “to assist with sampling of possible reservoirs of infection, such as rodents and mosquitoes”.

Only once contributing factors to the cause of the mass death of Botswana’s elephants have been established, will it become clear whether this is a self-limiting, non-contagious/contagious agent, or an epidemic, they say.



UP part of team that solves mystery of X-shaped radio galaxies

A team of astronomers from South Africa and the USA has used the MeerKAT telescope to solve a longstanding puzzle in 'X'-shaped radio galaxies by observing a galaxy called PKS 2014-55 that's situated 800 million light years away from Earth. Previous studies of these unusual galaxies lacked the high-quality imaging provided by the MeerKAT telescope, which was inaugurated in 2018.

This study was carried out by a team from the **South African Radio Astronomy Observatory (SARAO)**, the **(US) National Radio Astronomy Observatory (NRAO)**, the **University of Pretoria**, and **Rhodes University**. The results **will be published** in the journal *Monthly Notices of the Royal Astronomical Society*.

Dr Kshitij Thorat, a postdoctoral fellow in the Department of Physics and second author of the paper, explains: "This galaxy is one of many with similar X-shaped morphologies carefully chosen to be studied in a MeerKAT observation campaign, which is aimed at solving the mystery of X-shaped radio galaxies. While other telescopes around the world hinted at this object's unusual morphology, it took the crystal-clear image quality of MeerKAT to reveal the underlying

physical causes. As a bonus, we have produced one of the most beautiful radio images I have ever seen."

The image shows two powerful jets of radio waves, indicated in blue colour, each extending 2,5 million light-years (comparable to the distance between the Milky Way and the Andromeda galaxy, our nearest major neighbour). At their centre are the youngest jets of a central black hole, surrounded by an oblong disk of stars. The detail provided in this radio image obtained with the MeerKAT telescope shows that its shape is best described as a "double boomerang".

Many galaxies far more active than the Milky Way have enormous twin jets of radio waves extending far into intergalactic space. Normally these go in opposite directions, coming from a massive black hole at the centre of the galaxy. However, a few are more complicated and appear to have four jets forming a mysterious 'X' on the sky.

Several possible explanations have been proposed to understand this phenomenon. These include changes in the direction of spin

of the black hole at the centre of the galaxy and its associated jets; or two separate black holes, each associated with a pair of jets; or a third explanation of material falling back into the galaxy being deflected into different directions, forming the other two arms of the 'X'.

The new MeerKAT observations of PKS 2014-55 strongly favour the third explanation, as they show material “turning the corner” as it flows back towards the host galaxy. The arms or wings of the X are “turned back” by the pressure of low-density intergalactic gas. As they flow back towards the central galaxy, they are deflected by its relatively high gas pressure into the shorter, horizontal, arms of the boomerang.

Prof Roger Deane, who leads the UP astronomy group and is a co-author of the study, says: “Here at the University of Pretoria, we’ve made a concerted effort over the past two years to build a team that is able to make important scientific discoveries with cutting-edge radio telescopes. The rapid growth we’ve seen is both gratifying and encouraging, particularly with the exquisite images the team is making with South Africa’s MeerKAT telescope, a precursor to the Square Kilometre Array.”

This study is part of an ongoing effort at the University of Pretoria to carry out systematic studies of X-shaped galaxies using next-generation telescopes like MeerKAT and techniques like machine

learning, which would find similar but more faraway objects in the universe.

The MeerKAT telescope array consists of 64 radio dishes located in the Karoo semi-desert in the Northern Cape province of South Africa. To make this image, computers combined over a petabyte of data (equivalent to over 100 000 MP3 audio files) from these antennas into a telescope 8 km in diameter.

Lead author William Cotton of the NRAO adds: “MeerKAT is one of a new generation of instruments whose power solves old puzzles even as it finds new ones – this galaxy shows features never seen before in this detail which are not fully understood.” Further research into these open questions is already underway.

Bernie Fanaroff, co-author of the study and former director of the SKA South Africa project that built MeerKAT, noted that MeerKAT was designed to be the best of its kind in the world. “It’s wonderful to see how its unique capabilities are contributing to resolving long-standing questions related to the evolution of galaxies.”

The authors of the study are William Cotton, Kshitij Thorat, Jim Condon, Bradley Frank, Gyula Józsa, Sarah White, Roger Deane, Nadeem Oozeer, Marcellin Atemkeng, Landman Bester, Bernie Fanaroff, Sydil Kupa, Oleg Smirnov, Tom Mauch, Vasaant Krishnan and Fernando Camilo.

Dr Kshitij Thorat



Prof Roger Deane



Statistics produces interactive app with real-time data on COVID-19 infections

A team from the University of Pretoria's (UP) Department of Statistics, in collaboration with other international universities, has developed what is believed to be the first interactive app in the country that provides real-time data on COVID-19 using R-Shiny (a statistical software package) in April this year.

The data for the dashboard is collated from the World Health Organization and the Centers for Disease Control and Prevention in the United States, via GitHub (an online repository on which worldometer.com also bases its information).

Prof Andriëtte Bekker, Head of the Department of Statistics, says the power of this app is two-fold. "It produces downloadable plots of COVID-19 counts, which includes the number of people infected, recovered, or those who have passed away. The user can sort this by country or continent." There is also an interactive setting whereby users can shift days since the first infection on a scale and see how the data has changed over time. In other words, the dashboard shifts power and autonomy to the user.

The team that worked on the dashboard includes Prof Bekker and Dr Johan Ferreira from UP, and Prof Mohammad Arashi and Dr Mahdi Salehi, who are from Iranian institutions Shahrood University of Technology and the University of Neyshabur respectively. Prof Arashi is also an Extraordinary Professor in UP's Department of Statistics, as well as the National Research Foundation (NRF) holder of the South African Research Chairs Initiative (SARCHI) Chair in Computational and Methodological Statistics. Dr Salehi is a postdoctoral fellow. Postgraduate students Foad Esmaeili from the University of Neyshabur and UP's Motala Frances, who is completing his honours degree in Mathematical Statistics, are also valuable contributors.

"The investment of this app is human capital," says Prof Bekker. "We are leveraging the joint intellectual capital of postgraduate students, postdoctoral fellows, and staff of UP, Shahrood University of Technology and the University of Neyshabur to develop and refine this dashboard. This also exemplifies what can be achieved with collaboration among universities."

Prof Andriëtte Bekker, Head of UP's Department of Statistics.





Dr Ferreira explains that the app was developed in statistical software R, which is free and open source and is based on the component (package) called “Shiny”, which creates real-time interactive web apps straight from R software. He says statistics has always been considered the premier discipline both in academic and daily life, as it helps make sense of data.

“We have tapped into this historic legacy of statistics to be vital in understanding and exploring the cause and effects of, in this case, epidemiological modelling: for example, Florence Nightingale was not only the founder of modern nursing, but applied statistical techniques to understand disease modelling of British soldiers during the Crimean war in the 1850s.”

The idea for the app was based on Motala Frances’s honours research, which was under the guidance of Dr Salehi and initially aimed at producing an interactive web-based app in the education sector. But due to the rapidly changing global environment of the past few weeks, the project was realigned into an interactive web-

based app for visualising and understanding data for any user based on COVID-19 data, says Prof Bekker. “This shows that necessity is the mother of invention, but in our case it was teamwork that realised this plan. However, Mr Motala and Dr Salehi worked tirelessly, and without them this would not have been possible.”

“Statistics has always had an indisputable legacy when it comes to data,” Prof Bekker adds. “And in this data-driven era, we are bombarded with data from news outlets, social media and the like. Our Department’s joint effort in this initiative aims to put the power of statistics at the users’ finger tips.”

UP’s Department of Statistics serves about 7 000 students in undergraduate programmes and more than 100 in postgraduate programmes annually. It is the biggest in the country. The Department has wide-ranging research interests that include biostatistics, and computational and methodological statistics.

Please click on this [link](#) for the dashboard.

2020 Annual Aerial Survey of southern right whales

While monitoring the South African population of southern right whales during the 41st Annual Aerial Survey conducted from 27 to 29 September 2020, the Whale Unit of UP's Mammal Research Institute made two significant findings.

First, the total of 136 southern right females and calves (68 pairs) and the 29 adults without calves (so-called unaccompanied adults) that were counted and photographed between Nature's Valley and Muizenberg were the second-lowest number of these whales recorded along our shores in October in the past 32 years. Second, the fact that this number is slightly lower than the 142 females with calves (71 pairs) counted between Hermanus and Witsand at the end of August this year, indicates that the female southern right whales continue to limit their time along our shores, which might harm the calves' chances of survival. The number of unaccompanied adults remained extremely low, as it has been since 2009.

Dr Els Vermeulen, Research Manager at the Whale Unit, gave the following explanation: 'In general, successful calving and migration in southern right whales rely on having an adequate body condition, and thus energy reserves, which is directly influenced by their feeding success. Therefore, a decrease in their feeding success might lie at the heart of these anomalous trends. This hypothesis is confirmed by new data, which indicates strong correlations between the prevalence of southern right whales along our shores and climate

conditions and fluctuations in food availability in the Southern Ocean. In fact, southern right whales have drastically changed their feeding locations in the past two decades. These findings point towards large-scale ecosystem changes in the Southern Ocean, which may be affecting several different top oceanic predators. Data further indicate that despite this shift, the changes may not be sufficient to ensure the maintenance of an adequate body condition, which will negatively impact the success of calving and migration.'

To receive regular updates on the status of the Whale Unit's southern right whale research, you can join their adopt-a-whale programme. Anyone can join the MRI Whale Unit community by symbolically adopting a whale and supporting whale research and conservation in South Africa. All funds raised go towards covering the cost of the Unit's fieldwork.

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Southern right whale breaching



Benefits of genomic selection for growth and wood quality traits in Eucalyptus trees

A PhD student in the Department of Biochemistry, Genetics and Microbiology and the Forestry and Agricultural Biotechnology Institute (FABI), Mr Mmoledi Mphahlele, developed a genomic selection model for *Eucalyptus grandis* (E.grandis) as part of his PhD studies.

This selection model was trained from 1 575 trees that were genotyped with the Eucalyptus (EUChip60K) single-nucleotide polymorphism (SNP) chip and phenotyped for growth and wood quality traits.

According to Mr Mphahlele, who is employed at Mondi Forests as a Eucalyptus research scientist focusing on research and innovation of breeding tools and strategies for the Tree Improvement Research Programme since 2009, the study highlights that, in order for tree breeders to implement genomic selection and realise these genetic gains per unit time in *E. grandis*, significant adjustments have to be made to integrate genomic selection into practical operational breeding operations. “My research demonstrates to tree breeders that genomic selection is a viable approach for molecular breeding of *E. grandis*, however it requires significant modification of operational breeding processes.”

“Eucalyptus species such as *E. grandis* are highly adaptable, fast-growing and produce wood of superior quality, making it a critical resource for the timber, pulp and paper industries, as well as emerging bioenergy, biochemical and biomaterial industries. Faster and more agile breeding approaches are needed to ensure the future sustainability of Eucalyptus plantation forestry and to meet the increasing demand for renewable carbon resources for the South African bio-economy. However, this is not easy with traditional tree breeding approaches, due to the long generation times of forest trees and the fact that many commercially important traits such as wood quality are only expressed at maturity,” he further explains.

Tree breeders can bypass these long breeding cycles with the use of genomic selection. Genomic selection predicts the genetic merit of individuals based on the aggregate of genome-wide DNA markers to obtain genome estimated breeding values of individual

trees in a breeding population. A main advantage of this tool is that tree breeders can estimate the breeding value of trees at seedling stage, when only genotypic information (for 10 000s of DNA markers) is available, while it would take many years to obtain trait measurements such as stem volume, density and wood quality. Genomic selection (GS) can substantially reduce breeding cycle times in forest trees compared to traditional breeding cycles. Practical implementation of genomic selection in tree breeding requires an assessment of significant drivers of genetic gains over time, which may differ among species and breeding objectives.

Mr Mmoledi Mphahlele



New study reveals mechanism for formation and discovery of fairy circles in Kalahari Desert



The hundreds of thousands of bare circular patches in the arid grasslands in the Namib Desert, commonly referred to as fairy circles, have puzzled the scientific community for decades. The fairy circles are mostly confined to a narrow strip, about 50 to 100 km inland from the Atlantic Ocean, which stretches down from southwestern Angola, through Namibia to north-western South Africa. However, a new study revealed that they even occur in South Africa, in the Kalahari Desert.

Prof Marion Meyer from the Department of Plant and Soil Sciences commenced in 2015 with a multidisciplinary study on the effect of toxic *Euphorbia* species (milk bushes) on fairy circle soil chemistry and water hydraulics, their germination inhibition and antimicrobial activity on rhizosphere bacteria, along with three BSc Hons students. The researchers also wanted to determine if these *Euphorbia* plants could give rise to the current spatial characteristics (pattern) of fairy circles and therefore compared their current spatial patterning with those of fairy circles in four areas of Namibia. These studies eventually led to the completion of master's degrees for three students: JW Hurter, Nicole Galt and Christiaan Schutte (also supervised by Prof Greg Breetzke of the Department of Geography, Geoinformatics and Meteorology).

The results of these studies were recently published in *BMC Ecology*, a Springer Nature journal ([click here for a link to the paper](#)). This multidisciplinary study provides soil chemical, phytochemical and GIS spatial patterning evidence that fairy circles of Namibia are caused by dead *Euphorbia* species. The researchers propose that the *Euphorbia* spp. colonised sandy plains when climatic conditions were more favourable in the past. Since sandy soils have low water-holding capacity and might facilitate the formation of a hydraulically connected landscape, these plants would have been under pressure for water and nutrient availability. When climatic conditions became less favourable, the lack of water and competition for nutrients would have resulted in increased competition between these plants and many would have died. The temperature increase in Namibia during the last two or three decades is roughly three times more than the global mean temperature increase reported for the 20th century. Several other authors showed that drastic temperature increases and drier conditions were present in southern Africa on a number of occasions during the last few centuries.

It is further proposed that the decomposition of dead plants and the sticky latex altered the chemical properties of the sand, which manifested in the hydrophobicity of fairy circle soil. Various other compounds also entered the soil from the decaying euphorbias, some of which posed phytotoxic or allelopathic



Prof Marion Meyer



(the inhibition of growth by substances released by another plant) and antimicrobial activity. Most of these compounds would probably have broken down in a relative short time, but the milky latex can adhere to the sand, become hard and can persist in soil for a long time. These changes to the soil cause the formation of many fairy circles and the transition proceeds from a site with only plants, to a mixed site with plants and fairy circles, and then a fairy circles-only site. This then results in a regular spatial pattern.

It has been observed that seeds do germinate inside fairy circles and seedlings emerge after good rainfall, but survive only for short periods after rain. As the harsh desert conditions set in, it is proposed that the seedlings in the fairy circles die due to the soil water that infiltrates to depths beyond the reach of the roots of seedlings. In time, decades or even centuries, with the occasional rain, the effect left in the soil by euphorbias will slowly erode away, seedlings will survive for longer periods in the older fairy circles until they are eventually fully established and reach maturity, and the fairy circle will no longer be visible.

GC-MS soil analyses were done at the ITMO St Petersburg University in Russia, with the help of Prof Denis Baranenko, and revealed that soil from fairy circles and from under decomposing *E. damarana* plants are very similar in phytochemistry. Several compounds previously identified with antimicrobial and phytotoxic activity were also identified in *E. gummifera*.

And finally, by integrating rainfall, altitude and landcover in a GIS-based site suitability model, the researchers predicted where fairy circles should occur. The model largely agreed with the distribution of three *Euphorbia* species and resulted in the new discovery of fairy circles in the far southeast of Namibia and even in the Kalahari Desert of South Africa. Historical aerial imagery also showed that in a population of 406 *E. gummifera* plants in southern Namibia, 134 were replaced by fairy circles over a 50-year period.

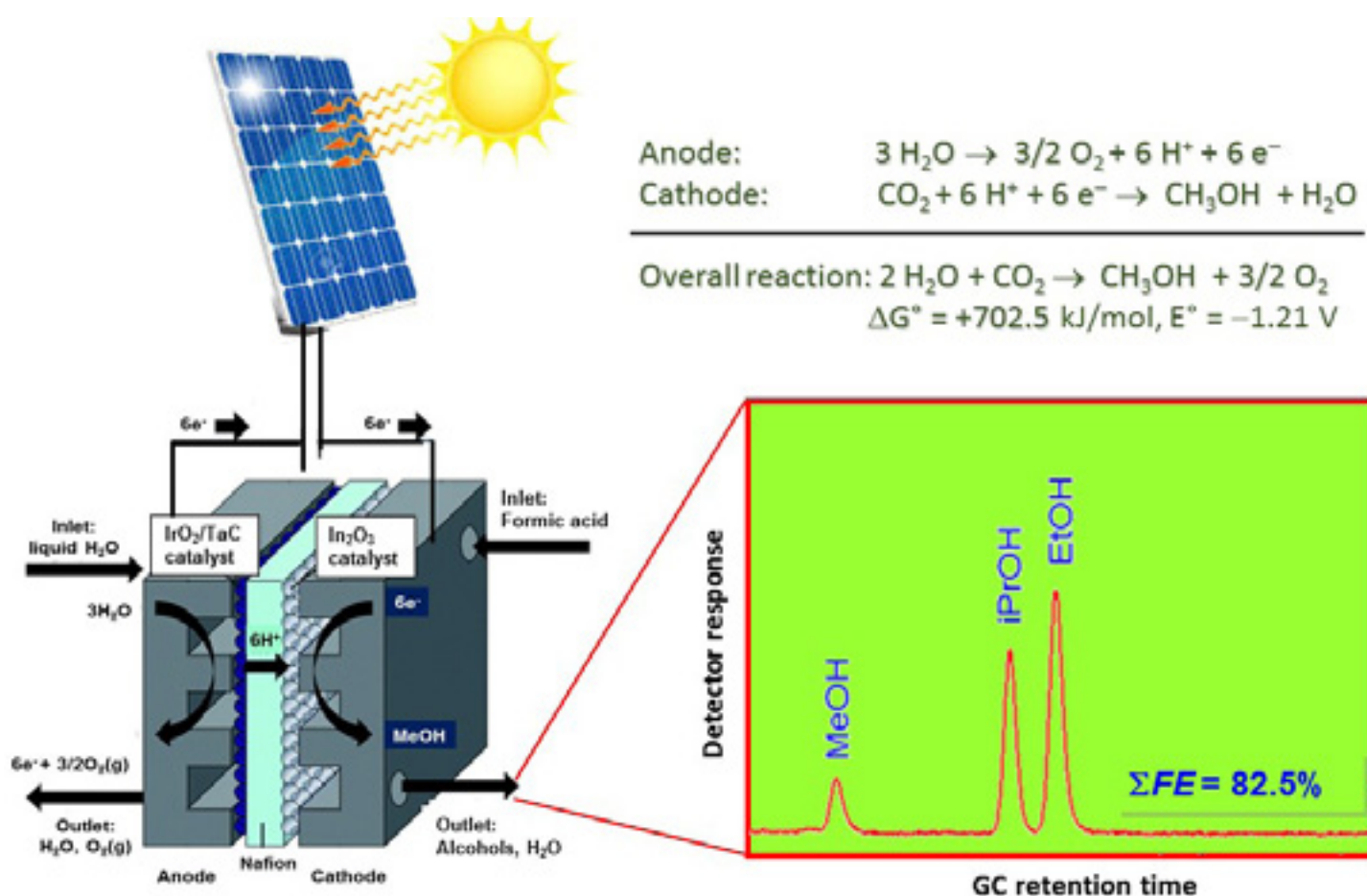
This study provided supporting evidence that the *Euphorbia* theory can explain the formation of fairy circles at specific sites across Namibia, where these succulents co-occur with fairy circles. It was concluded that the allelopathic, adhesive, hydrophobic and toxic latex of *E. damarana*, *E. gummifera*, and possibly other species like *E. gregaria*, is the cause of the fairy circles. Further research in areas with many fairy circles where big populations of the large succulent euphorbias are currently not present, like in the Namib Rand Nature Reserve and Marienfluss, is in progress and focusses on DNA analyses of soil and ancient samples of plant pollen.

The field work in the Namibian Desert was always interesting and even exciting, with occasions where desert lions, cheetah, elephants, snakes etc. were encountered. The other co-authors who were involved in the strenuous field work were Petunia Degashu, who is doing her PhD on this project, and Nicole Meyer, Prof Meyer's wife, who is also a botanist.

Recycling CO₂ with water to liquid solar fuels

South Africa has enormous untapped renewable energy supplies of sunlight, on par with the best in the world, in large, low-populated areas. At the same time, the country is one of the largest polluters of the atmosphere with greenhouse gases, with an annual carbon dioxide emission of 10 tonnes per capita. Sixty-five percent of it is emitted at point sources and is due to electricity production in 14 coal-fired power plants and in another major industrial installation.

The continuous drop of prices for photovoltaic modules over the past years led to lower cost of solar than coal-based electricity. In order to reduce the country's contribution to global warming, researchers in the Department of Chemistry, of Chemistry, Prof **Emil Roduner**, Dr **Shankara Radhakrishnan** and Prof **Egmont Rohwer**, have started a programme that intends to convert CO₂ to liquid fuels such as methanol, using solar energy.



According to Prof Roduner, “liquid fuels are suitable for storage of large amounts of energy in chemical form, much more so than batteries or other means of energy storage, to cope with the asynchronous daily cycles of energy demand and renewable energy supply. These fuels can also be transported over large distances by rail, road or sea with existing infrastructure and may thus even be lucrative for export. Recycled methanol is a carbon-neutral fuel for use in internal combustion engines or turbines, or in fuel cells for direct back-conversion to electricity. An efficient means of solar energy storage can cope with the energy demand at any time of day and in any weather.”

In collaboration with a group at the University of Poitiers in France, they have at first converted formic acid (nominally the first intermediate of the recycling reaction) on an indium oxide catalyst with high efficiency to a mixture of methanol, ethanol and iso-propanol.

The studies will be extended to the full coelectrolysis reaction of CO₂ gas with liquid water. This fundamental research aiming at novel electrochemical processes could later be scaled up for industrial applications.

Source: K.A. Adesina et al., Highly efficient formic acid and carbon dioxide electroreduction to alcohols on indium oxide electrodes. *Sustainable Energy Fuels*, 4 (2020) 4030-4038.



Prof Emil Roduner



Dr Shankara Radhakrishnan



Prof Egmont Rohwer



Marion Island science team setting sail from Cape Town harbour on the Pelagic Australis sailing vessel. Photo credit: Kim Stevens

The Marion Island Marine Mammal Programme is a research programme of the Mammal Research Institute, Department of Zoology & Entomology at the University of Pretoria.

And they're off! Marion Island researchers set sail to resume science activities

After five months of despair, contingency plans and some creative collaboration, our science programmes on Marion Island resumed in the middle of September 2020.

But this was no usual voyage ... instead of the usual SA Agulhas II icebreaking polar supply and research ship, our science team embarked on a six-day journey to Marion Island on the Pelagic Australis, an Antarctic sailing vessel. [Click here for a tour of the vessel.](#)

Earlier this year, scientific research came to an abrupt halt on Marion Island due to concerns around the COVID-19 pandemic and the subsequent hard lock-down in South Africa. This was a massive blow to the scientific community, but particularly so for programmes with long-term data collections, like our Marion Island Marine Mammal Programme (MIMMP), that would be missing out on the entire 2020 field season.



Our experienced sealers are getting some sailing practice on this voyage of a lifetime!
Photo credit: Leandri de Kock

Fortunately, the day has been saved due to a historical collaboration between the MIMMP, Plimsoll Productions and the Department of Environment, Forestry and Fisheries (DEFF), and our science crew has set sail 18 September from Cape Town harbour to resume scientific activities on Marion Island.

Congratulations to all parties involved for this milestone in science, conservation and society. Thanks to these tireless efforts, the integrity of long-term science programmes like the MIMMP can continue and result in achievements like our 39-years of uninterrupted Southern elephant seal monitoring!

Our experienced MIMMP sealers Yinhla Shihlomule went for his third Marion Island expedition, while Frikkie van der Vyver set off for his second expedition). They had to hit the ground running, as they arrived during the busiest field season of all – the Southern elephant seal breeding season.





A seedling exposed to frost in an open field during a cold front

Experimental study explores factors limiting tree seedling establishment in grassland

Dr Monique Botha, a postdoctoral fellow in the Department of Plant and Soil Sciences, has been conducting experiments to assess the ability, and strategies, of tree seedlings to survive disturbances that naturally occur in grasslands and savannas. The aim of the research is to better understand woody encroachment, one of the major threats to the biodiversity of grasslands and savannas worldwide.

Along with Dr Michelle Greve from UP and Prof Sally Archibald from Animal, Plant and Environmental Sciences at the University of the Witwatersrand, Dr Botha recently published a paper in *Ecology and Evolution*, contrasting the effect of fire and frost on tree seedling survival and development. Both fire and frost have been proposed as important limitations to the establishment of trees in grasslands.

Experimental trials for the study were carried out at the Hatfield Experimental Farm, where 19 tree species, amounting to approximately 550 individual trees, were grown from seed. Seedlings were exposed to fire and frost treatments. Dr Botha and her colleagues found that fire caused more severe aboveground damage than a single frost event, suggesting that fire is an important limitation to tree establishment. However, there were discrepancies in the species' abilities to resist damage, and none of the species could resist both treatments. Species with more extensive basal bud banks were better resistors to disturbance. Also, the results supported the notion that survival may be influenced by phenomena that affect the timing and frequency of seedling exposure to damage, as younger trees had higher mortalities after frost and fire. Therefore, fire and possibly frost are important natural disturbances to keep trees out of grasslands. Fewer and less intense fires, as well as warmer climates, are likely to result in increased tree establishment, with ensuing losses of biodiversity in grasslands.

The full text of the published article can be downloaded via this link: <http://dx.doi.org/10.1002/ece3.6730>

Seedlings were exposed to fire by burning a uniform fuel bed of dried grass around the trees



Parallel found between maize and human immunity against pathogenic fungi

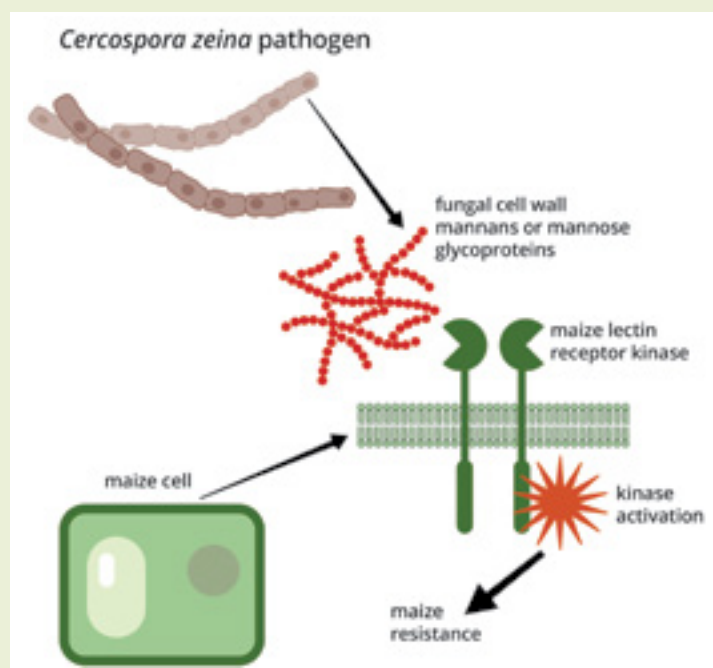
Many pathogenic fungi contain proteins decorated with mannose sugars in their cell walls. Some human cells have receptors that recognise these fungal mannose-rich proteins and activate immunity against invading fungi such as *Candida*.

Human Dectin is one of these protein receptors which have the general structure of an extra-cellular lectin domain that binds mannose, a transmembrane domain to fix it in the cell membrane, and an intra-cellular kinase domain (molecular switch that activates immunity).

According to research by Prof Dave Berger, from the Department of Plant and Soil Sciences and the Forestry and Agricultural Biotechnology Institute (FABI), "maize appears to employ a similar mechanism to defend against the leaf-invading fungus causing grey leaf spot disease. A maize lectin receptor kinase from a fungal-resistant maize line was recently reported by our Molecular Plant-Pathogen Interactions (MPPI) research group in *Frontiers in Plant Science* (Plant Breeding) (2020) doi:10.3389/fpls.2020.00191.



Prof Dave Berger



Model of maize immunity to fungus through lectin receptor kinase protein

"Discovery of this novel gene involved bioinformatics analysis of RNA sequencing data from maize challenged with the fungus in the field. Laboratory experiments confirmed that the candidate gene was activated in response to fungal inoculation. The research was conducted in collaboration with Prof Yves van de Peer, VIB University of Ghent, who also has a joint appointment in UP's Faculty of Natural and Agricultural Sciences (NAS). The research was funded through the Genomics Research Institute at UP and the NRF."

In a stroke of serendipity, the same dataset revealed the first report of maize yellow mosaic virus for South Africa (*European Journal of Plant Pathology* (2020) doi:10.1007/s10658-020-02070-1). A subsequent country-wide survey in collaboration with Prof Gerhard Pieterse from FABI and the Department of Biochemistry, Genetics and Microbiology in NAS indicated its presence in all six provinces surveyed, although it is not associated with serious crop losses. Data-mining of maize RNA sequencing data from the MPPI group showed the oldest record worldwide (2009) from different South African fields. This research was made possible through the infrastructure of the Centre for Bioinformatics and Computational Biology in NAS.

What makes you attractive for mosquitoes?

A chemical investigation

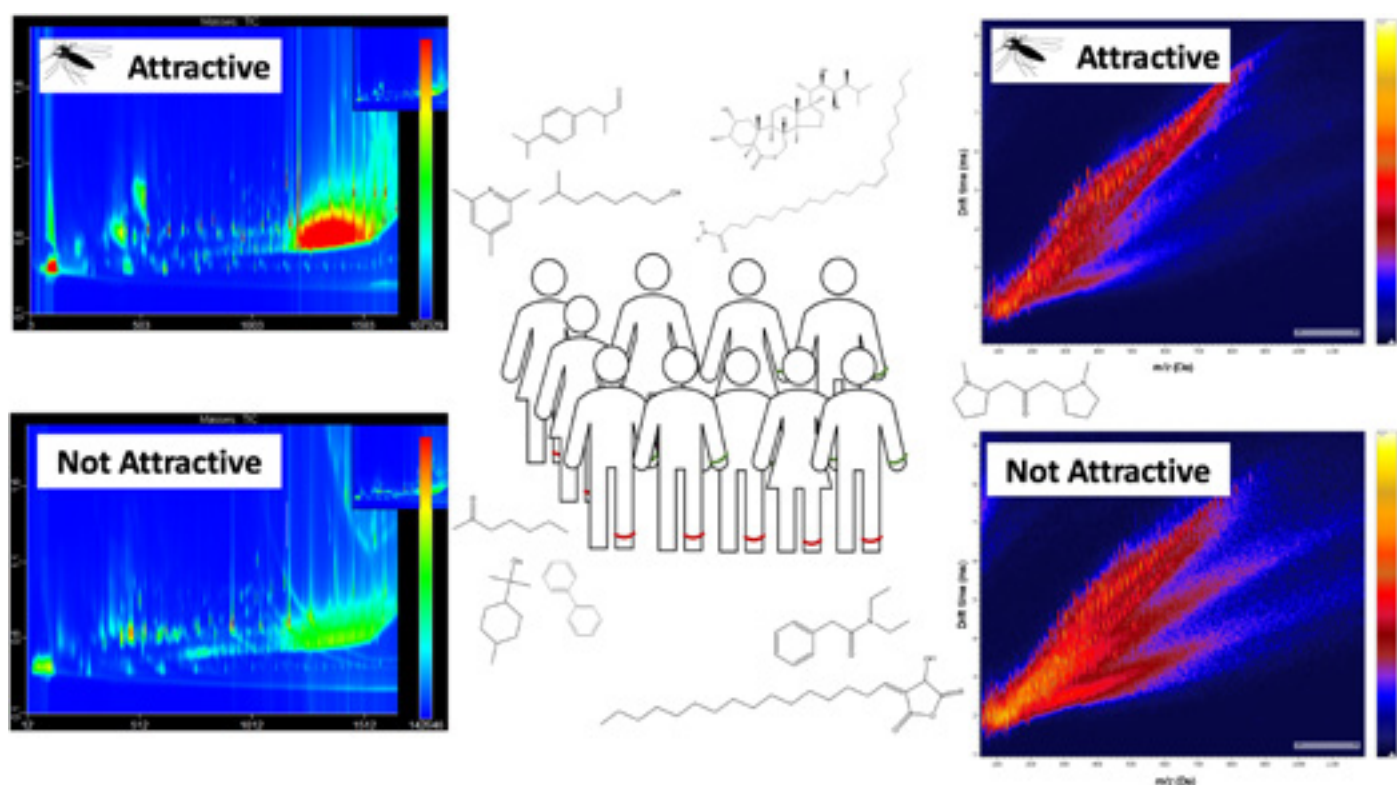
It is well documented that mosquitoes use chemical compounds present on the human skin surface to locate and ultimately bite their human host. But why do mosquitoes prefer certain individuals above others?

This was the research question set out to be answered by Madelien Wooding, PhD candidate, under the supervision of Dr Yvette Naudé and the co-supervision of Prof Egmont Rohwer, from the Department of Chemistry.

With the aid of sophisticated analytical equipment, the search to uncover the chemical compounds that make people attractive, or not, for mosquitoes was on. Using an in-house developed non-invasive polydimethylsiloxane (PDMS) sampler, worn as a bracelet or an ankle, enabled the research group to sample the skin surface of 20 individuals without causing any discomfort or unease.

The human volunteers were compared based on perceived inter-human attractiveness for mosquitoes, and as well as inter- and intra-

A snapshot of the chemical profiles of two individuals, one identifying themselves as not attractive for mosquitoes and the other identifying themselves as attractive for mosquitoes, using two complementary analytical instruments.





Madelien Wooding, PhD candidate, analysing a custom-made silicone rubber bracelet containing human skin emanations.

human mosquito biting site preference. Volatile and semi-volatile compounds (these are the compounds mosquitoes use to find and navigate towards their human host) from a broad range of chemical classes, 69 in total, were detected and identified as contributing to the differences in their surface skin chemical profiles, using comprehensive gas chromatography coupled to time-of-flight mass spectrometry (GC×GC-TOFMS).

According to Ms Wooding, “the final step in the mosquito host-seeking activity, i.e. landing on a suitable host followed by biting, was investigated using ultra-performance liquid chromatography with ion mobility high-resolution mass spectrometry (UPLC-IMS-HRMS). This facilitated the further identification of 20 non-volatile and semi-volatile biomarkers (these are the compounds involved in the final

host acceptance, i.e. biting, by mosquitoes), discerning a difference in perceived mosquito attractiveness.”

The identified biomarkers are of great importance as lead compounds in future malaria vector control programmes, acting as attractants or repellents. The non-invasive skin sampling technique used by the research group has laid the foundation for the mass screening of the human skin surface metabolome, not only for vector control applications, but also for application to human health screenings.

This research was published in the *Journal of Separation Science* and in *Analytical and Bioanalytical Chemistry*.

MRI seal research in spectacular educational book

A renowned researcher from the University of Pretoria's Mammal Research Institute (MRI), Prof Marthán N. Bester, has co-authored chapters on Tristan da Cunha and British Antarctic Territory in a spectacular educational book, *Britain's Distant Seas*.



Prof Marthán N. Bester with a Weddell seal fitted with a satellite tracking device (Photo: Dr Chris Oosthuizen)

Research by the MRI at the Tristan da Cunha Islands (TdCI) and in the Weddell Sea, Antarctica, focused on the use of top predators (seals) as bio-indicators of environmental conditions and as tools for suitable management of natural resources. This served, amongst others, aspirations by the United Kingdom Government to establish a regime for protecting the waters of the TdCI across its entire maritime zone by 2020, and the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) member states to designate a marine protected area (MPA) in the Weddell Sea.

"In 2016 our research at the TdCI was recognised through the TdC Biodiversity stamp series' official first day cover (<http://www.tristandc.com/po/stamps201611.php>), and our fur seal subjects also featured in the 2017 stamp issue (<https://www.tristandc.com/po/ponews-2017-04-12.php>). Now these research findings, both at the TdCI and in the Eastern Weddell Sea, are summarised in Britain's Distant Seas about the waters of the UK Overseas Territories (UKOTs), by Stewart McPherson," Prof Bester explains.

Britain's Distant Seas is one of six books, amongst other resources, contained in the UK Schools Boxes, 20 000 of which are sent to schools across the UK mainland and UKOTs during October. Every school across the UKOTs will receive one of these resource boxes, and the rest will be donated to (most) primary schools across mainland UK. The boxes are generously, fully funded by the Don Hanson Charitable Foundation, and are completely free for the schools. The electronic version of *Britain's Distant Seas*, which prominently features the MRI and NAS logos in the front of the book, will be available online, together with an accompanying video on YouTube, later in December 2020.



Adult female Subantarctic fur seal from Tristan da Cunha (Photo: Prof Marthán N. Bester)

New study clarifies nature of genetic admixture in SA's Afrikaner population

A collaboration between researchers from the University of Pretoria (UP) and Uppsala University in Sweden has found some unexpected patterns of genetic admixture in South Africa's Afrikaner (white and Afrikaans-speaking) population.

The results of the study, titled 'Patterns of African and Asian admixture in the Afrikaner population of South Africa', were published earlier this year in the respected scientific journal *BMC Biology*. This research forms part of work by Prof Jaco Greeff of UP's Faculty of Natural and Agricultural Sciences on the genetic heritage of Afrikaners, and Profs Carina Schlebusch and Mattias Jakobsson (both from Uppsala University) on the history of human populations in general. These studies show how humans have moved and admixed over time, and that migration, mobility and admixture should be seen as a hallmark of our species rather than a new phenomenon.

Genealogies and private DNA tests show that modern Afrikaners' DNA reflects past admixture between European immigrants, slaves arriving from Africa and Asia, and local Khoe-San. In a study that is almost four times larger than similar studies, the researchers genotyped 77 Afrikaners at five million places in their genomes and found that, on average, 4,7% of their DNA has a non-European origin. Despite this small fraction, the vast majority of the sampled individuals, 76 of 77 (98,7%), had non-European admixture.

The non-European component is comprised of Khoe-San (1,3%), Asian (2,6%) and African (excluding Khoe-San; 0,8%) contributions. Further analyses showed some surprises: First, the small Khoe-San signal is a very common signal among Afrikaners and was present in 74 of the 77 men, even though only one marriage between a European and a Khoe-San was recorded at the Cape. This discrepancy can only be explained if there was gene flow between frontier farmers, "*trekboere*" (nomadic farmers), and Khoe-San women.

Second, despite being founded by a fairly small number of immigrants, Afrikaners have a similar degree of inbreeding to other Europeans. This can be explained by the variety of origins of European immigrants, together with admixture with non-European groups.

The study also confirmed some historical observations. First, Afrikaners show West African ancestry rather than links to South African Bantu-speakers. This signal most likely stems from two slave ships from West Africa that arrived in 1658. Second, it confirms that European men preferred slaves from India for formal and informal relationships, since Asia contributed most of the non-European admixture. There is evidence that certain genetic variants were favoured by selection, for example several genes associated with diet, possibly indicating adaptation to modified or novel food sources.

This scientific paper is available [here](#).

Prof Jaco Greeff





Mr Pieter van Zyl and Prof Tawane Kupe

Agreement to fund the York Timbers Chair in Wood Structural Engineering signed

The launch of the transdisciplinary **York Timbers** Chair in Data-Driven, Wood Structural Engineering for a Sustainable Built Environment and African Bio-economy is a step closer following the signing of a funding agreement between the **University of Pretoria (UP)** and York Timbers.

UP Vice-Chancellor and Principal **Prof Tawana Kupe** and York Timbers CEO Mr Pieter van Zyl signed this agreement during a virtual ceremony on 11 September 2020. The ceremony was attended by several members of York Timbers' management and scientific teams, UP Executive members and research leaders, as well as representatives from Forestry South Africa, industry partners and government departments.

The Chair will be officially launched as a transdisciplinary academic research unit at UP in 2021 and plans include the establishment of an operational timber structural engineering laboratory in the **Engineering 4.0 building** on the Innovation Africa 4.0 campus. This will eventually lead to the stimulation of using modular, mass timber, and sustainable approaches to building construction that will also contribute to the development of the bio-economy in Africa.

This new research Chair will bring together a diverse, multidisciplinary team of researchers and postgraduate students from several faculties and departments at UP, including Innovation Africa@UP, the **Faculty of Engineering, Built Environment and Information Technology**, the **Department of Civil Engineering**, the **Department of Chemical Engineering**, the **Graduate School of Technology Management**, the **School of Information Technology**, the **Department of Architecture**, the **Institute of Applied Materials**, the Institute for Data Science, the **Faculty of Natural and Agricultural Sciences' Department of Microbiology, Genetics and Biochemistry** and the **Forestry and Agricultural Biotechnology Institute (FABI)**.

Prof Kupe thanked York Timbers for their foresight in partnering with UP on this new venture. "It is a celebration of innovative partnerships with big societal impact." The Executive Director of **Forestry South Africa**, Mr Michael Peter, described it as "the most exciting development seen in the South African forestry industry in the past 15 years".

"York Timbers' vision is to become the leading integrated timber processor in southern Africa and to pioneer the application of

engineered wood products as sustainable building materials in Africa. As such, we see the establishment of this Research Chair as the first step in realising these ambitions,” explains Mr Van Zyl. Most of South Africa’s timber is used for low-value roof trussing and is, compared to wood from northern hemisphere timber producing countries, perceived to be of lower grade due to the faster growth of our pine plantations. “However, with new engineered wood technology, high-value wood construction products can be produced from local pine plantations. South Africa has to develop the appropriate engineering, safety and building codes for its own engineered wood products to stimulate a new construction industry based on this technology. The collaboration with UP is of critical importance to ensure that York’s integrated vision for mass timber construction ‘from genetics to product’ is realised,” he concludes.

Director of Innovation Africa@UP and FABI, **Prof Bernard Slippers** explains that FABI was the first Institute in Innovation Africa@UP and provides a familiar home for York and other long-term partners. “The relationship between York Timbers and UP stretches back more than 20 years, as the company is already part of FABI, via the **Tree Protection Co-operative Programme (TPCP)** and, more recently, the **Forest Molecular Genetics (FMG)** Programme. These relationships provide a foundation for interaction between the organisations that is based on trust.”

“Innovation Africa@UP is the most recent transdisciplinary platform established by the University of Pretoria, and connects a number of the University’s most prominent research platforms, including FABI, Engineering 4.0 and Future Africa and its broader expertise in the faculties. To me, this initiative embodies the kind of leadership, strategy and vision matched by ability and action, that South Africa and Africa needs to not only emerge from COVID-19, but to develop our country and continent to its rightful place of competing on an equal basis with the rest of the world. It’s an initiative that charts a new course of interaction and integration between departments and faculties at UP, and also connecting to the expertise and capacity of its industry partner,” he concludes.

Prof Zander Myburg, leader of the FMG Programme, points out that developments in tree genomics and biotechnology are creating opportunities to develop molecular breeding approaches and, in future, genetic engineering, to improve growth, tree form and wood quality in ways that will allow engineered wood products of similar or superior quality to northern hemisphere products. “The FMG Programme is developing such genome-assisted breeding resources for forestry species, including the tropical pines that form the basis of structural timber production in South Africa. The integration of large amounts of data spanning genomics, environment, tree growth, harvesting, wood properties and processing require modern data science and artificial intelligence approaches.”

FABI becomes the first institute of Innovation Africa@UP

Innovation Africa@UP is a new business unit that stems from the renaming and repositioning of the University of Pretoria’s (UP) Hatfield Experimental Farm. It aims to provide a more effective platform for the development of long-term industry-university-government partnerships.

In 2020, the Forestry and Agricultural Biotechnology Institute (FABI) became the first institute to join the Innovation Africa@UP unit. FABI has more than 22 years of experience in developing such cross-sectoral partnerships and provides a strong foundation for the development of Innovation Africa@UP. The Faculty of Natural and Agricultural Sciences (NAS) will continue to have the same strong links to teaching, learning and postgraduate research undertaken by FABI as it has in the past, and this is expected to expand these opportunities as FABI grows in Innovation Africa@UP.

“The Innovation Africa@UP concept is an excellent example of innovative thinking towards harnessing industry-government-academia knowledge and knows how, in building a sustainable and resilient future for us all. We at NAS wish the IA@UP team every success as they take on the complex challenges relating to forestry, agriculture and food security,” says Prof Barend Erasmus, Dean of NAS.

Prof Bernard Slippers, Director of FABI and Founder of the Future Africa Institute is equally excited about this new venture. “In establishing the Innovation Africa@UP initiative, closely linked with Future Africa, Engineering 4.0 and the Javett Art Centre, the University demonstrates its commitment to ‘rethink, reimagine and reposition’ (to quote our Vice-Chancellor and Principal, Prof Kupe) itself for greater impact in our society through transdisciplinary, impactful research and development. By using FABI as an engine to drive the development of Innovation Africa@UP, NAS takes a bold step to connect its resources more strongly to the rest of the University structures towards these goals,” Prof Slippers concluded.





Chair in Avocado Research at UP celebrates Merensky's vision

Over the past 12 years, the University of Pretoria has served as the incubator for an innovative research programme that was started by a bright postdoctoral fellow and two master's students and has since become the world's largest programme in avocado research.

One of the programme's many accomplishments is its role as the driving force behind the establishment of the International Avocado Genome Consortium. Research undertaken as part of this programme has been presented at 25 local and 20 international conferences, and 18 related articles have been published in international peer-reviewed journals. The programme boasts five postdoctoral fellows and has produced four PhD, 17 MSc and 16 honours graduates.

The renewed agreement between the Hans Merensky Foundation (HMF) and UP was officially signed at the end of February. A

ceremonial signing was held at Future Africa, where collaboration, teamwork and research excellence was celebrated. Prof Noëlni van den Berg, the leader of the Hans Merensky Chair in Avocado Research, said: 'I am very grateful for this opportunity of a lifetime and appreciate the fact that Prof Mike Wingfield (Founding Director of the Forestry and Biotechnology Institute (FABI)) and the HMF believed in my ability to head this research programme.'

Prof Van den Berg emphasised the benefits of hard work and pointed out that the Avocado Research Programme (ARP) now has a footprint in several research areas. It has grown substantially into a world-class programme focusing on several aspects of avocado tree health and pathogen biology. She confirmed her belief that hard work paves the road to success by quoting Thomas Edison: 'Opportunity is missed by most people because it is dressed in overalls and looks like work.'

Prof Mike Wingfield elaborated on the fact that this research programme makes an enormous impact on the industry, scientific community and the country and added: 'Passion for what you do, which is something that Prof Van den Berg certainly has, plays a large role in the achievement of success.' He further explained that at UP 'we provide education at the highest level and thereby provide solutions to challenges'.

Prof Kupe, Vice-Chancellor and Principal, emphasised the role of the ARP as the world's largest research group focusing on avocado tree health. 'We value collaboration and partnerships, such as this one with HMF, which can be seen as an investment in knowledge creation. The University is the link for the translation of knowledge to solutions for industry. We are creating the next generation of researchers and focus on interdisciplinary and transdisciplinary research.'

Dr Khotso Mokhele, Chairman of the Hans Merensky Board, celebrated the life of Dr Hans Merensky, without which this partnership would not have been possible. He then quoted Dr Merensky as follows: 'This country has given to me so much that I am only too happy to be allowed to help it to develop in some way, and I am grateful to be able to give back to it a fraction of what it has

given to me.' Dr Mokhele reiterated that this partnership with UP celebrates Dr Merensky's vision and that 'we must continue to invest in research. We need to take hands to provide solutions to industry. Don't lose sight of Dr Merensky's vision and generosity.'

'The HMF Board has made a strategic decision to continue the financial support for a further ten years to ensure the continuation of Merensky's vision of building scientific capacity for the development of the South African people. Together with co-investment from the University of Pretoria, the HMF will provide the funds required for the establishment of a Chair in Avocado Research at UP. The aim of this Chair is not only to further develop the ARP, but also to broaden the research scope by supporting a platform for the establishment of new programmes focused on fruit and nut tree health, and to increase scientific capacity,' Dr Mokhele said.

Corroborating these sentiments, Prof Anton Ströh, Vice-Principal: Institutional Planning, Monitoring and Evaluation, who played an instrumental role in establishing this partnership, concluded that: 'This academic-industrial research partnership is a successful flagship initiative for both the HMF and UP and demonstrates how such a partnership can benefit both the industry and the University.'

Front: Prof Tawane Kupe, Dr Khotso Mokhele and Prof Anton Ströh. Back: Prof Bernard Slippers and Prof Noëlan van den Berg.



UP becomes first SA institution to partner with JINR in Russia

The University of Pretoria (UP) has partnered with the Joint Institute for Nuclear Research (JINR) in Russia to strengthen the University's research efforts into nuclear sciences and related disciplines.

The relationship between UP and the JINR was formalised at a ceremony held for the signing of a memorandum of understanding at the JINR's offices earlier this year in Dubna.

The University has, as a result, become the first South African institution to sign such an agreement with a global research infrastructure facility such as JINR.

Commenting on the partnership, UP Vice-Chancellor and Principal Prof Tawana Kupe says he is excited about the kind of research that will come from this partnership. "As an institution, we are continuously looking for ways to improve the lives of the people of our country, continent and world through producing ground-breaking research. I am excited about this new partnership and I believe that through it, we will be able to demonstrate that we are leaders in producing research that matters.

"We look forward to strengthening our research efforts in thematic areas of mutual interest with JINR through the Science Organisation and International Cooperation Office lead by Dr Dmitry Kamanin," he adds.

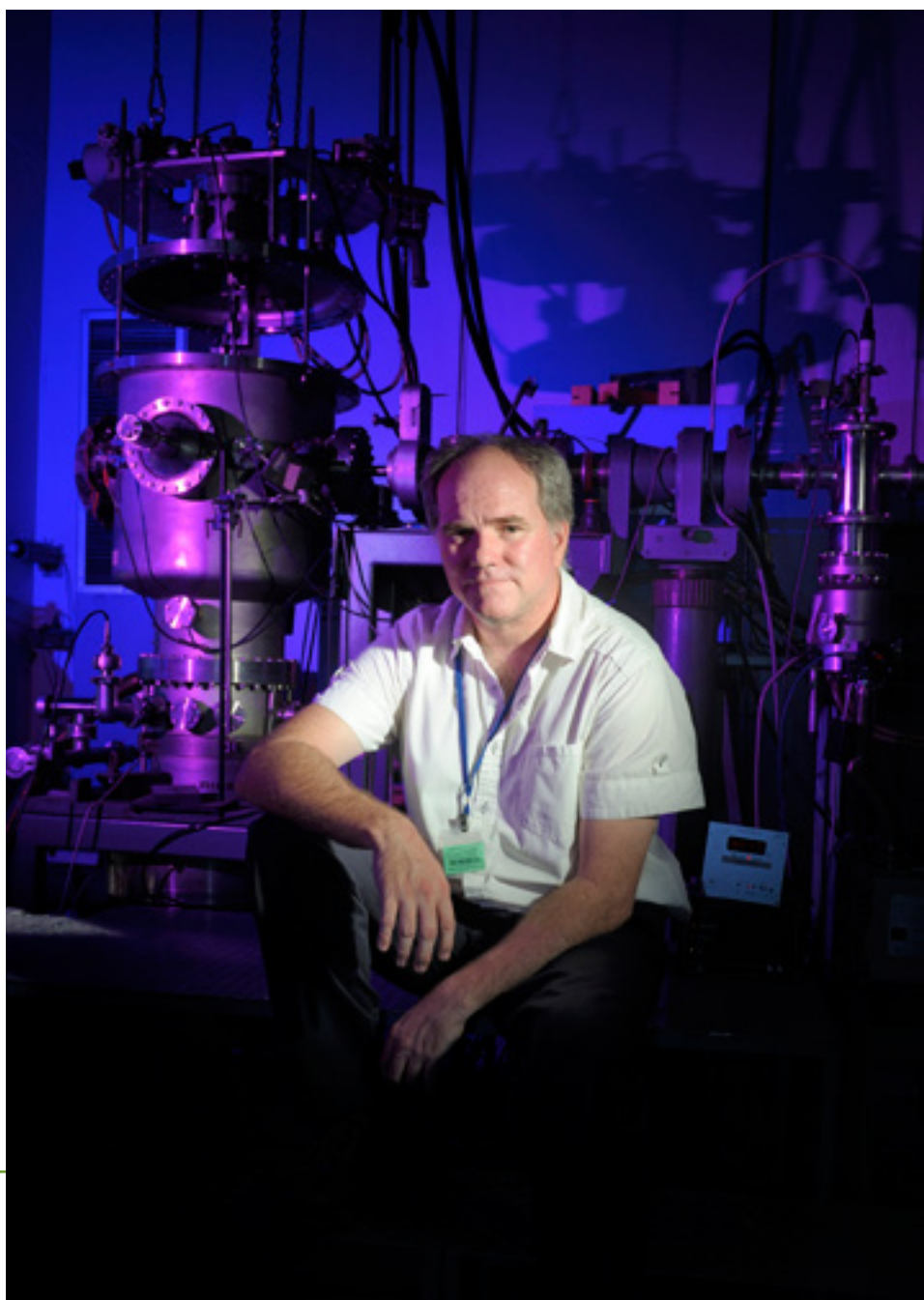
The UP delegation of academics led by Prof Kupe, which included Prof Chris Theron (head of the Department of Physics), Prof Sergei Rakitianski and Prof Thulani Hlatshwayo from the Department of Physics, and Setsipane Mokoduwe and Dr Rakeshnie Ramoutar-Prieschl from the Department of Research and Innovation, went on a week-long visit to JINR, where they were presented with the JINR Expertise for Member States and Partner Countries (JEMS) training programme.

JEMS is a training programme run by JINR and targeted at administrators and managers of international projects in science and research in nuclear sciences and related disciplines.

The main objective of JEMS is to present JINR operating principles, research and educational programmes, and user policies, as well as means and formats of participating in JINR activities.

During the programme, participants from all over the world, including the UP delegation, were offered an exciting tour of JINR research infrastructure; attended presentations and review lectures delivered by top laboratory management and leading scientists, meetings and round-table discussions with the JINR Directorate; and went on excursions around Dubna.

Key features of the JEMS programme included heavy ion physics and accelerator technologies; neutron applications and nanoworld theory, information and education; nuclear medicine; life sciences on Earth and in space; and neutrino.



Prof Chris Theron

Food systems and climate smart agricultural research in NAS

The University of Pretoria, in partnership with the University of Leeds and the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), has been awarded a grant of £2 million (R43 million) to set up a Food Systems Research Network (FSNet-Africa). The project is funded by a partnership between the African Research Universities Alliance (ARUA) and UK Research and Innovation (UKRI) through the Global Challenges Research Fund.



The University is also part of the InnoFoodAfrica project, which explores climate-smart African crops in Ethiopia, Kenya, South Africa and Uganda. InnoFoodAfrica is an EU Horizon2020 Programme for research, technological development and demonstration and the UP grant is worth about €730 000 (R13 million) for the next three years. The UP multidisciplinary team includes food scientists, sensory scientists, nutritionists, agronomists, agricultural economists from NAS, and an augmentative and alternative communication specialist from the Faculty of Humanities.



Three Oppenheimer grants for NAS



THE OPPENHEIMER MEMORIAL TRUST

In 2020, the Faculty of Natural and Agricultural Sciences (NAS) received three grants from the various trusts within the Oppenheimer family of trusts. The grants were awarded to outstanding researchers, who will contribute invaluable research and support to postgraduate students at UP and nationally. Two of the three grants were announced in 2020, with the third to be announced shortly.

Dr Riaan Rifkin, a Research Fellow in the Centre for Microbial Ecology and Genomics (CMEG) secured funding for a six-year project through the Benjamin R Oppenheimer Trust to a total value of just over R 7 million, which awarded him a fellowship for his studies in molecular archaeology. The long-term objective of the fellowship is to contribute to alleviating the adverse influence of ancient re-emerging 'ancestral' diseases on contemporary humans.

The Oppenheimer Memorial Trust Award funds the National Graduate Academy for Mathematical and Statistical Sciences (NGA(MaSS)) at UP to the value of R2,5 million per year for 2021 and 2022. Prof Loyiso Nongxa was appointed as an honorary professor to coordinate the Academy. The (NGA(MaSS)) is a national collaborative consortium and the mission of the Academy is to address the academic and intellectual isolation of South African mathematical and statistical sciences and to help produce the next generation of scholars in these disciplines.

Details of the equally exciting and third grant will be made available in 2021.

"We are very grateful to the Oppenheimer trusts for investing in these research projects. Our researchers will certainly create impactful and meaningful contributions through this generous support" beamed Prof Barend Erasmus, Dean of the Faculty of Natural and Agricultural Sciences.

Prof Paulette Bloomer appointed as new Deputy Dean for Teaching and Learning in NAS

Prof Paulette Bloomer is the new Deputy Dean for Teaching and Learning in the Faculty of Natural and Agricultural Sciences (NAS), effective from 1 April 2020 until 31 March 2024. She succeeds Prof Marietjie Potgieter, who finished her seven-year tenure at the end of February this year.

“It is important to note that, while focusing on our priorities, we need to acknowledge that teaching and research excellence are inextricable. Therefore we should never see the strategic UP objectives as exclusive of each other,” Prof Bloomer said when asked what she envisages for the Faculty’s Teaching and Learning portfolio.

“In the rapidly changing, complex world of today, we need to maintain our emphasis on depth of disciplinary knowledge, associated skills and applications of the knowledge, relevant to and impactful on the grand challenges of South Africa and Africa in particular. However, we should consciously remind students of the nature of science, introduce them to the concepts of multi-, inter- and trans-disciplinarity and embed activities that develop their cross-cutting and soft skills.”

Prof Bloomer also highlighted how relevant and significant the well-known African proverb of ‘it takes a village to raise a child’ is in the tertiary environment. “This is true for our students on their path to becoming successful graduates and responsible citizens. We need to maintain and enhance our collective efforts to contribute to our students reaching their full potential.”

She paid tribute to Prof Johann Engelbrecht, the first Deputy Dean of Teaching and Learning in the Faculty, and to her predecessor Prof Potgieter, who launched many successful initiatives and established structures to holistically support teaching and learning in the Faculty.

Prof Bloomer joined the Department of Genetics as a lecturer in 1999. She has been the Head of Department of Genetics for two terms (January 2010 to December 2017) and of the Department of Biochemistry, Genetics and Microbiology from January 2018 to February 2020.

Her main research interests are vertebrate phylogeography and conservation genetics. She has supervised or co-supervised close to 100 honours, MSc, PhD and postdoctoral students and researchers. She has been the co-author of 90 peer-reviewed papers, conference proceedings and technical reports, and currently holds an NRF C2-rating. Prof Bloomer is also very passionate about teaching. Over the 21 years of her UP academic career, she has lectured across all undergraduate levels. Every year she is part of at least one undergraduate module and several modules at honours level.



Prof Paulette Bloomer

Prof Sibanda to head UP's ARUA Centre of Excellence in Food Security

Prof Lindiwe Majele Sibanda has recently been appointed as Director of the **African Research Universities Alliance (ARUA) Centre of Excellence in Food Security**, hosted at UP in collaboration with the University of Nairobi, Kenya, and the University of Ghana, Legon. Prof Sibanda will be supported by two co-directors at UP – Profs Hettie Schönfeldt and Frans Swanepoel.

ARUA-related activities are an extraordinarily strategic priority for UP as a vehicle for African impact and global recognition. ARUA was inaugurated in Dakar, Senegal, in 2015, bringing together 16 of the continent's leading research universities – including UP. The ARUA network is intended to be different from any other regional university network. It seeks to enhance the quality of research in Africa conducted by Africans, by bringing together peer African institutions who are willing to collaborate by pooling resources to generate a critical mass that can effectively support their growing numbers of researchers. ARUA is built on the premise that partnerships and networking have become essential arrangements for universities throughout the world to leverage their resources for greater impact and influence.

This flagship project at UP, the ARUA Centre of Excellence (ACoE) in Food Security, is a mechanism through which the institution seeks to leverage the strategic potential of the ARUA network, as well as contribute significantly to social, economic and environmental development in Africa. The ACoE was awarded in early 2018 and officially **launched in December 2018**. The ACoE's vision is to harness partnerships in research and innovation that drive agricultural and food system transformation to ensure sustainable food security and nutrition in Africa. Conceptualised as a truly interdisciplinary entity, four focus areas of activity related to crops, livestock, nutritious food and evidence-informed policy help bring the Centre's vision to fruition. The ACoE is positioned as a University-wide, cross-faculty institutional entity reporting to the Vice-Principal: Research and Postgraduate Education.

The ACoE presents the University with substantial opportunities for research and funding partnerships. Under the auspices of the ARUA partnership with UK Research and Innovation (UKRI), UP has already attracted two major, high-profile research and capacity-building grants linked to the ACoE: the Food Systems Research Network for Africa (FSNet-Africa), which is led by Prof Swanepoel, and the Capacity Building in Food Security for Africa (CaBFoodS-Africa), which is led by Prof Schönfeldt. As part of FSNet-Africa, a very prominent partnership with the University of Leeds (UK) has been established. The ACoE



Prof Lindiwe Sibanda

will further enable several other opportunities for partnerships with leading global institutions, including opportunities with Wageningen University and Research (WUR) (the Netherlands), Cornell University (United States) and the **AgriFood 5 Alliance** (a collaboration among the top five agri-food universities in the world).

Prof Sibanda's extensive experience working in Africa and her global stature as a thought leader position her as the ideal candidate to lead this strategic initiative at UP. She has served as CEO of **FANRPAN** and vice-president of **AGRA** for more than 15 years. Prior to her appointment as ACoE director, she was a research fellow at the Centre for the Advancement of Scholarship at UP. She serves as the co-chair of the **Global Alliance for Climate Smart Agriculture (GACSA)**, is a member of the **SDG Target by 2030 Champions on Reducing Food Loss and Waste**, and a commissioner for the **EAT-Lancet Commission on Sustainable Healthy Food Systems**. She works closely with WUR to prepare the **International Fund for Agriculture Development (IFAD) 2021 report** to inform the **United Nations 2021 Food Systems Summit**.

The UP-based leadership team forms part of the larger ACoE management committee, representing all three partner institutions. Under Prof Sibanda's leadership, immediate priorities for the ACoE include the development of a five-year strategy and operational plan in collaboration with the Centre's partners, and to prepare for the upcoming ARUA-led review of its centres of excellence.

Expert in sustainability science appointed



Prof Belinda Ryers

Prof Belinda Ryers, who was appointed at Future Africa in 2018, is a professor in sustainability science. She is also involved in interdisciplinary research in the Faculty of Natural and Agricultural Sciences, acts as a senior advisor on resilience and development at the Resilience Centre at Stockholm University in Sweden and serves as an extraordinary professor at the University of Stellenbosch.

She collaborates with regional and international collaborators from the areas of research and practice to explore the contribution made to the developmental challenges facing Africa by theories, methods and evidence from social-ecological systems research and sustainability science. Her work focuses on exploring the role of social-ecological feedbacks, cross-scale dynamics, non-linearities and resilience capacities in achieving a sustainable and equitable future. She also conducts empirical and conceptual research on the dynamic linkages between sustainability and equity, especially in the context of a more complex, connected and uncertain future.

Prof Ryers received her PhD from the University of Pretoria in 2001. She was employed at the Universities of Pretoria and Stellenbosch until 2004, after which, as Chief Scientist, she established and led the

Biodiversity and Ecosystem Services Research Group at the Council for Scientific and Industrial Research in Stellenbosch until 2015. In 2015 she was appointed as the Director of the GRAID Resilience and Development programme at the Stockholm Resilience Centre in Sweden, but returned to South Africa in 2018 to take up her current position at Future Africa.

She has acted as an advisor to national government and international bodies and has served as vice-chair of the Science Committee of Future Earth and coordinating lead author of the Intergovernmental Platform on Biodiversity and Ecosystem Services. She has also served on the Science Committee: DIVERSITAS; Advisory Committee: Sustainable and Healthy Food Systems; and the Bridge Collaborative. She initiated and co-led the Southern African Program on Ecosystem Change and Society, a network of leading social-ecological researchers working in southern Africa to develop new theory and tools and grow capacity in the social-ecological systems field, and one of the core case studies within the Future Earth Program on Ecosystem Change and Society (PECS). She has served as an editor and associate editor for several interdisciplinary journals.

Dr Tsakani Ngomane appointed to lead agricultural extension

The Department of Agricultural Economics, Extension and Rural Development is delighted to announce the appointment of Dr Tsakani Ngomane as the as Director of the Department's Extension Programme from 1 September 2020.

Her appointment is a strategic step for the Department and the Faculty of Natural and Agricultural Sciences, as agricultural extension offers crucial support to the transformation and development of agriculture and food systems in South Africa and Africa.

Dr Ngomane brings extensive experience and expertise to the programme. Her experience stretches across the disciplines of sustainable agriculture, food security, rural development, extension advisory services, and youth civic engagement, to name a few. Her profile includes executive and senior public sector management roles in climate change, education, agriculture and extension, as well as in academic institutions of higher learning. Dr Ngomane served as the first female President of the Advisory Board of the Technical Centre for Agriculture and Rural Development (CTA) that serves the EU/ Africa Caribbean and Pacific (ACP) region's agricultural programmes. She also served as a Country Member representative in the 3ie Board International Institute for Impact Evaluation (USA).

She further served seven years (on secondment from the University of Pretoria, 2011–2017) as the Deputy Director General (Outcomes Facilitator): Rural Economy, Land Reform, Food Security and Sustainable Environment in The Presidency at the Department of Planning, Monitoring and Evaluation. Since August 2018, she served as the Deputy Director General for Climate Change and Sustainable development at the Department of Environment, Fisheries and Forestry. The Presidency recognised her for her stellar role in support of the Panel on Land Reform and for elevating Climate Change and Food Security in key policy positions of government.

Dr Ngomane completed her PhD in Agricultural Extension and Education in 2004 at the Pennsylvania State University, USA. In August 2014, she was appointed to serve the University of Mpumalanga as Council Member and Exco Council Senate Member, respectively. In 2018, she was appointed as a Council Member for the Stellenbosch University. She was furthermore awarded a certificate of completion for the Senior Executive Fellow (SEF) Program, January 2020, at the John F. Kennedy School of Government at Harvard University.



Dr Ngomane has been a recipient of several awards, including the 2004 Penn State Graduate Student Award for Outstanding Dissertation, LaMarr Kopp International Achievement Award, the top USA/SA Fulbright Scholar Award for the year 2000, and Social Sciences Research Council (SSRC, New York) and National Research Foundation (NRF, SA) African Youth in a Global Age Fellowship (2002-2003).

Her research focus lies in civic engagement, agricultural extension, and rural development. She has addressed numerous platforms over the years in these areas of specialisation. Dr Ngomane's research, experience and roles in government supported dialogue among key stakeholders in the agricultural sphere, which supported policy changes.

Dr Tsakani Ngomane



Prof Sanushka Naidoo appointed

Prof Sanushka Naidoo, current chairperson of the Next Einstein Forum's (NEF) Community of Scientists, has been appointed as the Head of the Department of Biochemistry, Genetics and Microbiology (BGM) at the University of Pretoria from 1 October 2020.

She heads the Eucalyptus and Pine Pathogen Interactions group and works closely with the Forest Molecular Genetics Programme, part of UP's Forestry and Agricultural Biotechnology Institute (FABI). Prof Naidoo joined the University in 2006 as a Microarray Scientific Officer and is currently an Associate Professor.

Prof Naidoo is very excited about the future of the Department. "UP is currently in the 501-550 range of QS World University overall ranking, with BGM academics contributing to several high ranked fields, such as plant and animal science, microbiology, agricultural sciences, biology, and biochemistry. Increasing outputs in research focus areas will contribute to improving UP ISI Web of Knowledge field rankings. Research, teaching and learning are all interwoven within the life of an academic – however, one challenge for academics is dedicated time to conduct research and write papers. With careful planning and time management on an individual basis, academic staff will be encouraged to produce more research outputs," Prof Naidoo explains her vision for the Department.

She also emphasises that "we continuously need to nurture and promote young and emerging researchers towards achieving an National Research Foundation (NRF) rating. Several accomplished researchers with NRF A- and B-ratings within the Department would be able to provide guidance to junior staff members on an individual basis."

Prof Naidoo has published more than 30 papers in international peer-reviewed journals, was awarded a Y-rating by the NRF (2015-2020), a Mellon Foundation Mentoring scholarship for her doctoral studies in plant biotechnology, and serves as president of the South African Genetics Society (2017-2020). She was also a Next Einstein Forum Fellow in 2017-2018. Prof Naidoo recently joined the editorial board of *Scientific African* and is also an editor for *Frontiers in Microbiology* and *Tree Physiology*.

She graduated 16 MSc students (eight with distinctions) and five PhD students. Currently she is the main supervisor to two PhD students and three MSc students, and a co-supervisor to one PhD student and two MSc students.

Prof Sanushka Naidoo

World-renowned sensory-consumer scientist appointed as extraordinary professor



Prof Hely Tuorila

Prominent sensory-consumer scientist Prof Hely Tuorila, Professor Emeritus at the University of Helsinki in Finland, has been appointed an extraordinary professor in UP's Department of Consumer and Food Sciences.

The widely published academic is an expert in sensory-consumer research of foods. Her research interests include consumer response to unfamiliar and nutritionally significant foods, and genetic and cognitive influences on food acceptance.

"Sensory-consumer scientists aim to understand the drivers and constraints that lead to food acceptance and choices," she explains. "For example, the integration of novel food products into an individual's diet is a complex process that is guided by exposures to foods from early childhood, but also by an inherent personality trait, food neophobia [the extreme or irrational fear or dislike of anything new or unfamiliar] and by the surrounding culture. Here, the individual trait food neophobia sets a threshold to try to accept any unfamiliar food."

Scientists try to pinpoint the most important attributes of each food that appeals to different consumer groups. "This is done through laboratory tests in which voluntary participants rate food samples for flavour and other sensory properties, and through surveys that define individual readiness to accept novel, emotionally or health-wise important products."

In terms of food security, sensory-consumer research can help to develop acceptable products from affordable, nutritionally adequate, locally available, under-utilised or completely novel ingredients, while also considering the expectations and mental constraints that might restrict the acceptance.

"The African food market is rapidly changing, especially in urban centres," says Prof Riëtte de Kock, Associate Professor in UP's Department of Consumer and Food Sciences, and a leading sensory scientist. "Lifestyles are changing, with shifts in food consumption patterns moving away from nutrient-rich traditional foods to diets high in dietary energy, saturated fat, sugar and salt. Development of scientifically-based instruments to characterise African food users could help in guiding the design of acceptable food product innovations. Prof Tuorila's experience as professor and researcher in this area is of tremendous value."

Prof Tuorila will assist with mentoring sensory-consumer scientists who are part of the recently established African Network for Sensory Evaluation Research (ANSWER); guiding postgraduate students in their scientific publishing activities; and consumer research in the European Union-funded Food Systems Africa InnoFoodAfrica project, in which the universities of Pretoria and Helsinki are partners.

"I am highly motivated to contribute to the research programme that Prof De Kock and her colleagues have set up," says Prof Tuorila. She enjoys interacting with postgraduate students from various African regions to obtain high-level research training at UP. "Proper education of such individuals is of strategic importance for Africa," says Prof Tuorila. "Food acceptance in Africa contains scientifically unexplored elements that deserve attention, such as responses to foods by the younger, urbanised populations who are often short of financial resources. Understanding their position also has an important health and wellbeing dimension."

During her research visits to UP in 2018 and 2019, Prof Tuorila mentored academics and postgraduate students. She also held interactive paper-writing sessions with PhD students, which contributed to recent publications in international journals.

In 2019, Prof Tuorila supported a research programme to develop instruments to segment food users in South Africa, Lesotho and Botswana in order to structure and apply health intervention strategies and new product developments. Workshops with regular consumers and experts in nutrition, science and trade in these countries revealed the rapid change of food cultures.

"By understanding the factors that drive consumers' food choices and preferences, researchers and developers are better able to design acceptable food product options," she says.



Prof Stephanie Burton

Prof Burton at Future Africa and NAS

Prof Stephanie Burton, former Vice-Principal responsible for Research and Postgraduate Education at the University of Pretoria, has an appointment at Future Africa and will also act as a link between the Faculty of Natural and Agricultural Sciences and Future Africa.

Future Africa is a research institute and pan-African platform at UP that makes possible fundamentally new approaches to research and innovation that span disciplinary fields and geo-political boundaries. More specifically, through the efforts of a growing network of leading scientists and exceptional young talent, Future Africa is set to inspire science excellence to transform Africa and the world.

Prof Burton is an experienced academic leader, a professor in Biochemistry, and an internationally recognised researcher. Her expertise includes research strategy, postgraduate education, internationalisation and innovation. She holds an MSc and PhD focused on Chemistry, Biochemistry, and Biotechnology from Rhodes University and has also worked as a professor in Chemical Engineering at the University of Cape Town, and Director for Postgraduate Studies at Cape Peninsula University of Technology.

Prof Burton has a passion for postgraduate training, and for transdisciplinary research, especially focussing on sustainability. She is the President of the Royal Society of South Africa and Vice-President of the Council of Academy of Science of South Africa.

Renewals of SARChI Chairs and COP for NAS

Two South African Research Chair Initiative (SARChI) Chairs and one SARChI Community of Practice have been renewed for researchers from the Faculty of Natural and Agricultural Sciences.

These chairs are sponsored by the Department of Science and Innovation and the National Research Foundation. All of these UP chairs are on a Tier 1 level, which is for established researchers that are recognised internationally as leaders in their field and have received international recognition for their research contributions.

Prof Brenda Wingfield is the incumbent of the SARChI Chair in Fungal Genomics. "This is the first five-year evaluation that I have just completed and fortunately my chair has been renewed. I feel very fortunate to have a research chair. I have used my chair to leverage funding and collaboration, such that this chair is much more than just my research programme and my students. I collaborate with a number of colleagues at UP and in other parts of the world.



"I have for many years worked with fungi that cause tree diseases. My research chair has enabled me to expand this research into the genomes of these pathogens and more recently we have also started some population genomics. The renewal of the research ensures that I will have research funding and bursaries for some of my students for five years. This is particularly important, given the current economic climate. Having the chair renewed also provides evidence that I have succeeded in achieving the goals that were set for the chair, including publication outputs and student training."

Prof Namrita Lall is the holder of the SARChI Chair in Indigenous Knowledge Systems (IKS). "During my chair position for the past five years, I managed to progress substantially with regard to the development of valuable health products. Working on medicinal plants and IKS is my passion and my team and I are developing innovative pharmaceutical and cosmeceutical products with a local African flair, which is beneficial to the user and indigenous knowledge holders."

She adds that she is am sincerely grateful to UP and the NRF for assistance and support. "My postgraduate team and I are looking forward to improving research and innovation in this exciting field. The main objectives of the research chair initiative are to expand the scientific research and innovation capacity of South Africa locally and internationally, while focusing on socio-economic and health challenges."

Another interesting development is that a research group in the Department of Plant and Soil Sciences under the leadership of Prof Lall will be embarking on COVID-19 research. They will be exploring the potential of South African plants for possible usage as adjuvants for the current COVID-19 epidemic.

Prof Lyn-Marie Birkholtz holds a SARChI Chair in Sustainable Malaria Control and directs UP's first Community of Practice (CoP) focusing on eliminating malaria, hosted in the UP Institute for Sustainable Malaria Control (UP ISMC). The CoP is a NRF mechanism to coordinate SARChI Chair activities in the country on a focussed area of societal importance to South Africa. The CoP on Malaria Elimination was successfully renewed after the first funding cycle and Prof Birkholtz states that "the extension of the CoP indeed underscores the important work delivered by the network of experts to address one of the major societal challenges in Africa".

Prof Birkholtz notes that the CoP is not simply another scientific network of collaborators, but indeed

Prof Brenda Wingfield

Prof Namrita Lall

embraces the ethos of a community of practice as 'a group of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly' (Etienne Wenger). This shared learning experience is exemplified by the massive expansion of the CoP to include more than 50 new members that now has access to well-validated thought processes to enhance drug discovery efforts in South Africa.

"The renewal of the CoP provides an extraordinary opportunity to strengthen our African expertise in malaria drug discovery and has already expanded our footprint internationally. The next two years will see an expansion of the network by inclusion of new European partners (Germany, Italy and Switzerland) to take the leap forward and innovate new drug delivery systems," Prof Birkholtz says. "This emphasises the importance of the expertise associated with SARCHI Chairs in the country and integration thereof into interdisciplinary teams that result in internationally leading research."

Prof Lyn-Marie Birkholtz

Three HoDs reappointed in NAS

Three heads of departments (HoDs) in the Faculty of Natural and Agricultural Sciences have all been reappointed for another four-year term.

Prof Este van Marle-Köster has been reappointed as the Head of the Department of Animal Science from 1 September 2020.

Prof Van Marle-Köster has published widely in peer-reviewed journals and contributed to book chapters. She has also supervised several master's and doctoral students to completion. She holds a C2 rating from the NRF and is a registered Professional Animal Scientist with the South African Council for Natural Scientific Professions (SACNASP).

"My first term as HoD in 2016 commenced with the #FeesMustFall movement and ended with COVID-19. The Department was faced with numerous challenges, but we worked as a team and showed our resilience in both teaching and research. During the past four years, our colleagues from the Centre of Wildlife Management moved to the Mammal Research Institute and the Department's name has been changed to Animal Science," Prof Van Marle-Köster reflects on her first term as HoD.

"The Department has nine full-time academics teaching the BScAgric curriculum. They are also involved in various research projects with the local livestock industry and international collaboration. COVID-19 has "invaded" our approach to teaching and we already had a successful revision of our curriculum. I am excited about the possibilities for our department to explore alternative teaching practices for future online teaching. As an applied science, innovative

practises are required to ensure that understanding in the relevant context takes place and not only knowledge transfer. On the research front, I envisage that we will continue to perform sound and relevant research to enhance livestock and food production in Southern Africa," she concludes.

Prof Vinesh Maharaj, a natural product chemist who was trained in the discovery of new drug leads based on biodiversity samples, was appointed as the Head of the Department of Chemistry for a second term from 1 September 2020.

He has published widely in peer-reviewed journals and has supervised to completion several master's and doctoral students. He was recently awarded funding of over R35 million by the Department of Science and Innovation for the creation of a Biodiscovery Centre at the University. This includes the establishment of high-end robotic equipment for the creation of a repository of natural products, including compounds ready for a high throughput biological screening programme of pharmaceutical interest. He forms part of a core team set up by DSI for the discovery of natural products for the treatment of COVID-19 (SARS-Cov-2).

Prof Maharaj notes that the Chemistry Department comprises 23 full-time academics and close to 20 professional staff. "The Department is actively involved in research areas of strategic importance to the continent, such as alternative and renewable energy, green chemistry, smart synthesis for the pharmaceutical industry, and environmental monitoring for a clean environment, all underpinned by cross-cutting technologies in chemistry education, nanotechnology and computational chemistry."



Prof Este van Marle-Köster



Prof Vinesh Maharaj

The Department was for the first time rated in the top 500 QS ranking during his first term.

“Teaching is a core function of the Department and provides services for inter- and intrafaculty in which the all-important basic laboratory skills are provide to undergraduate students,” Prof Maharaj concludes.

Prof Chris Theron was reappointed for a third term as the Head of the Department of Physics. During his term as HoD, new research areas in biophysics and astronomy have been established, undergraduate laboratories upgraded and a new suite of flat space tutorial venues built on top of the AE du Toit complex. He holds a C2 rating from the NRF.

In his free time, he likes to play snooker and Lego with atoms. When playing snooker, he uses the Van de Graaff accelerator at UP for studies of thin film materials. In this process accelerated ions are directed onto specific target materials and studying the scattered atoms leads to an understanding of the target material properties. He was awarded a National Equipment Programme grant from the NRF for the first molecular beam epitaxy growth system in South Africa. This technology allows the precise growing of crystal layers, where if needed, individual layers of atoms can be stacked on top of one another, much like bricks of Lego are stacked on top of one another. As a first project in the commissioning phase, GaAs-based solar cells will be grown on cheaper silicon substrates. These two Lego sets (silicon and GaAs) have different sizes and so the lattice mismatch in these systems must be managed.

:



Prof Chris Theron



Prof Potgieter leaves a legacy of excellence in teaching and learning

“Serving seven years as Deputy Dean: Teaching and Learning, offered me the opportunity to nurture and support excellence in teaching and learning in the Faculty.”

This was just one of the highlights that Prof Marietjie Potgieter shared at the end of her tenure as Deputy Dean in the Faculty of Natural and Agricultural Sciences (NAS). She adds that academics are subject specialists, who seldom have any formal education in teaching and

learning, yet teaching constitutes a core component of their task and of expectations for their performance.

Prof Potgieter held the position of Deputy Dean from September 2013 to February 2020, and was Acting Deputy Dean for the eight months prior to that.

“During my two terms as Deputy Dean, I worked closely with four deans, Profs Anton Ströh, Brenda Wingfield, Jean Lubuma and Barend Erasmus. Those were very different experiences, because the deans differed so much in personality and style. I think I can group these four deans roughly in two categories: the mathematicians on the one side and the biologists on the other, with either more or less emotion braided into their thinking and being. But they had at least two things in common: their commitment to excellence and their passion for science. These years were without any doubt the highlight of my professional career.

“I have shared many memorable experiences with UP colleagues during these years. One of the highlights was the Hybrid Fair, which the Faculty initiated and hosted together with the Department of Education Innovation. It was a fun event with 26 stalls where everyone with something to tell about teaching technologies could show off their wares: NAS lecturers, Education Innovation, the library, suppliers and publishers. It was a huge success and was attended by staff from the whole institution, as well as outsiders. The timing was perfect; it happened a few months before #FeesMustFall. It was so successful that we repeated it on smaller scale in 2018 with a Soapbox event.

“I also had countless very personal engagements, which I treasure deeply. Staff and students have shared their dreams, successes, challenges and disappointments with me. These blessed me greatly, and challenged me to find better ways to support them.

“Another highlight was launching the Science Teaching and Learning (SCITAL) Forum shortly before being appointed as Acting Deputy Dean in 2012. It was an initiative that sought to address this need [for professional development opportunities] by providing an informal forum, a safe place for lecturers to share experiences and grow their understanding and competence in teaching. The SCITAL Forum morphed into FLY@NAS in 2017, which was aligned with the FLY@UP project. FLY@NAS offered regular brown bag lunch events as well as regular CPD training, which was offered by Dr Ina Louw, the Education Consultant for NAS. It had a much wider impact, reaching the majority of the lecturers in the Faculty. FLY@NAS and its predecessor, the SCITAL Forum, unlocked a great passion for teaching and spurred numerous teaching innovations in the Faculty. It has since taken on a life of its own and made no small contribution to preparing NAS for going virtual during #FeesMustFall, as well as the COVID-19 lockdown,” Prof Potgieter concludes.

Prof Marietjie Potgieter



Prof Webb ends term on a high note

After a successful term of four years as Deputy Dean: Research and Postgraduate Education in the Faculty of Natural and Agricultural Sciences (NAS), Prof Edward Webb is delighted to be back as a professor in the Department of Animal Science. He will be focussing on his passion, Production Animal Physiology and Meat Science, and of course the animal science profession.

Prof Webb served as Acting Deputy Dean from August 2016 and was thereafter appointed as Deputy Dean in April 2017 and served in this position until his term ended in August 2020,

“It was a huge privilege to serve in the NAS executive with Profs Jean Lubuma and Marietjie Potgieter, and more recently Profs Barend Erasmus and Paulette Bloomer, despite the challenges associated with the insourcing project, FeesMustFall, financial crisis and recent Covid-19 pandemic during the past four years.”

During his term as Deputy Dean, Prof Webb was tasked to better position Agricultural Sciences in this mega-faculty. “As part of this team, we managed to move NAS to a truly research-intensive faculty. Some of the highlights during my tenure include that we managed to increase the research intensity of faculty, by strengthening high-impact research fields, increasing the number of NRF-rated researchers (194 – which comprise 67% of NAS staff and 44% of UP staff), and decreasing the huge backlog of MSc and PhD-students to acceptable levels.

“Furthermore, the total number of staff with PhDs exceeded 82%, total publication units increased by almost 100 from 375 in 2016 to about 450 in 2019, while the accredited publication journal units/academic staff

member exceeded 1,4. The number of publications in ISI journals reached 99%. The number of MSc graduates exceeded 200 per annum and we achieved a record PhDs output in 2018 by exceeding the 100 mark with a total of 113 PhD graduates in 2018 – this is huge as it comprises almost a third of UP’s total PhD output.”

Other achievements during his tenure as deputy dean, included refining the NAS ethics management system and NAS postgraduate-flight path, and both were adopted by academics. “We also received good support and buy-in for the NAS REFRESH-programme to strategically align faculty with the SDGs, UP Vision 2025 and foster more multidisciplinary and transdisciplinary research in and across faculties,” he concludes.



Prof Edward Webb

Passing away of Dr Eugene Makgopa

Dr Matome Eugene Makgopa, Senior Lecturer in the Department of Plant and Soil Sciences, passed away on 9 September 2020 after a prolonged illness.

As a lecturer and teacher, Dr Makgopa was widely respected. He taught biotechnology-related content at second and third-year levels, as well as honours courses. His students often gave rave reviews of his teaching and he was an open, friendly and approachable person. He always had a ready smile and quick joke, and was quietly professional. Dr Makgopa was a rising star at the University of Pretoria and in South African academia, and nominated for election as a council member of the South African Association of Botanists. His passing leaves a large hole in our community

Dr Makgopa obtained his BSc degree in Human Genetics in 2005 and his honours degree in Genetics in 2006, both from the University of Pretoria. He graduated with an MSc in Industrial and Commercial Biotechnology from the University of Newcastle, UK, in 2009, and then completed his PhD at UP in 2014. During his PhD, he studied in Prof Christine Foyer's group at Leeds University (UK). After a 10-month postdoctoral fellowship at the Agricultural Research Council, he joined the staff of the Department as a lecturer in June 2014 and was promoted to senior lecturer in 2017.

His particular research interests lay in plant biotechnology, especially in cysteine protease inhibitors and the role it plays in helping the plant (notably soybean) respond to biotic and abiotic stress. He was a research leader within the Molecular Plant Physiology research group in the Forestry and Agricultural Biotechnology Institute (FABI), and recently joined the Grain Research Programme. At the time of his passing, he was growing his research group and expanding his collaborations. He also graduated five postgraduate students.

Rest in peace, Eugene.



Dr Eugene Makgopa

Final farewell to Prof Izak Broere

Prof Izak Broere, an extraordinary professor in the Department of Mathematics and Applied Mathematics in the Faculty of Natural and Agricultural Sciences, passed away on 22 August 2020 at the age of 73 years.

Prof Broere was a very active researcher with an interest in combinatorics and graph theory. He had a National Research Foundation (NRF) C-rating and was also interested in the hereditary properties of graphs.

He was really loved by each and everyone who knew him. Prof Ansie Harding from the Department of Mathematics and Applied Mathematics described him in an eulogy on behalf of his colleagues:

"We have been robbed by an invisible enemy of our dear friend Izak, or Sakkie to some. We are sad beyond measure and still staggering at the loss. Izak was a solid human being, honest and sincere, how humans were intended to be. He was kind, he was quirky, he was endearing, he was playful, he was a huggable teddy bear. We remember his joy of life, his infectious smile and his charm. He loved the banter in the tearoom and the remarks that flew from here to there like a ping pong ball. Then the ball reached him and he reacted with the wittiest remark of all, leaving everyone in stitches. Izak was so, so clever, a cleverness that stretched beyond mathematics.

"He was a master of life skills, of words, of big picture thinking and humble at that. His trade was mathematics, a talent that was written about in the newspaper when he was only twenty and astounded academics at a conference. He studied the hard way, cycling after a day's work to university to attend evening classes. He crafted his mathematics skills to the highest level and always adored the subject. The logic, the rigour, the process of discovering ideas that few people could appreciate excited him. He loved working on his theorems in his office, wearing a sun visor of all things, apparently to keep the glare off his screen and much to our amusement.

"Izak's big buddy, in and out of the office, was Pottie – dry and cynical and a match for Izak's wit. They shared a love for motor biking and with that came many precious memories of taking the long road to the Cape, Namibia, Malawi, round the bends, over the passes, stopping for the renowned heavy buns and a beer in Botswana, literally doing hundreds of thousands of kilometers. Izak was a loyal BMW man with no taste for this Harley nonsense. His happy place was his professionally equipped workshop,



Prof Izak Broere

organised to a tee, where he could reduce a bike to a pile of nuts, bolts and washers and put it back together again. Going on a trip in his 4x4 bakkie was another of his delights, taking out his ever-present handkerchief to wipe a speck of dust from the dashboard and another from the radio and then jokingly "spinning around the gravel bends". With boyish pleasure he would slap the dash with his hand to edge the bakkie on, as if the bakkie was a race horse.

"If you came to the aqua aerobics pool you could see the same boyish pleasure in enjoying the water, the movement, the people and especially the music. He particularly enjoyed the fifties and sixties music of the Beatles and Elvis and heartily sang along with "Don't you step on my blue suede shoes" and "She loves you yeah, yeah, yeah". What a joy. His more serious musical side led him to become a member of the Capital Singers, where he relished in the mass performance. Izak was multi-faceted, easy to hold dear and we have indeed been privileged to know and to love him."



Dr Roger Dixon

Passing away of Dr Roger Dixon

The Department of Geology in the Faculty of Natural and Agricultural Sciences at the University of Pretoria regrets the passing of Dr Roger David Dixon, First Analyst of the Stoneman Laboratories.

Dr Dixon passed away in the early hours of Saturday 6 June 2020, after a brief struggle with cancer. Dr Dixon was a valuable member of the Department in the last few years and we will really miss him.

Born in Swaziland on 25 October 1959, Dr Dixon grew up in Cape Town and was a SACS and University of Cape Town alumnus. After his MSc, he moved to Pretoria in the early 1980s to work at the Geological Survey of South Africa. While at the Survey, he was instrumental in designing the geological display at the Transvaal Museum, which is still available today.

Together with Bruce Cairncross, Dr Dixon authored and published *Minerals of South Africa* for the Geological Society of South Africa in 1995, a volume that is still in great demand today. In the same year, he made a major move, leaving the Survey as it transformed into the Council of Geosciences, and joined the South African Police Service (SAPS) Forensic Laboratories next door as a forensic analyst. At the Forensics Labs, Dr Dixon led the Material Analysis Section, which was responsible for a wide range of investigations, especially working with South African mines on gold, diamond and platinum theft. In this role, he travelled the world, attending and advising police forces in Russia, South America and Europe on methods to trace stolen gold.

In 2013, Dr Dixon joined the Stoneman Laboratory at UP, as First Analyst. With this, he took on several new challenges, as well as a public role as a forensic analyst in cases such as the Oscar Pistorius case. In 2015, he finally achieved his long-held dream and received his PhD for work related to gold theft. Apart from this, his record involves more than 30 publication in a whole range of different subject matters. Furthermore, Dr Dixon motivated for and organised the acquisition of a Selfrag machine for the Stoneman Laboratory – the first on the African continent – and was closely involved in the recent rebuild of the facility.

Dr Dixon was a gregarious person, always ready to talk and help out. He was involved in numerous projects in a wide range of fields and devoted a lot of time to mentoring postgraduate projects. Many students and colleagues will remember him for his sharp, logical mind and his wide general knowledge.

As a clivia enthusiast and expert, he often served as a judge in national clivia competitions, and lead efforts to unravel the DNA of clivias. He had a great love for succulents, and for more than 30 years he was the editor for the succulent society, and brought out many sought-after books, as well as the ALOE magazine. On one of his many explorations to the Richtersveld, he discovered *Conophytum Phoenecium*. He was an avid birder, and was closely involved in avian census activities as well.

Dr Dixon is survived by his children, David and Catherine, as well as his mother, younger brother and sisters. He was a good friend and a valued member of the UP community and his memory will remain for a long time.

NAS highlights 2020

RANKINGS:

Based on the 2020 University Ranking by Academic Performance (URAP) report, UP has improved its world ranking in the field of Zoology (inclusive of Entomology) from position 54 (in 2019) to 50.



World University Rankings by Subject:

- Agriculture and Forestry – 51-100
- Biological Sciences – 301-350
- Environmental Sciences – 301-350
- Mathematics - 401-450
- Chemistry 451-500

Centre for Science and Technology Studies (CWTS) Leiden University

- 1 in mathematics and computer science in South Africa

GRANTS AND COLLABORATIONS:

- The University of Pretoria, in partnership with the University of Leeds and the **Food, Agriculture and Natural Resources Policy Analysis Network** (FANRPAN), has been awarded a grant of £2 million (R43 million) to set up a Food Systems Research Network (FSNet-Africa).
- The Faculty is also part of the **InnoFoodAfrica** project, which explores climate-smart African crops in Ethiopia, Kenya, South Africa and Uganda. InnoFoodAfrica is an EU Horizon2020 Programme for research, technological development and demonstration and the UP grant is worth about €730 000 (R13 million) for the next three years.
- The **Microbiome Research Group** at UP is part of a consortium that has been awarded €11 million (about R 216 million) to study the microbiomes in the South Atlantic Ocean.
- The launch of the transdisciplinary **York Timbers** Chair in Data-Driven, Wood Structural Engineering for a Sustainable Built Environment and African Bio-economy is a step closer following the signing of a funding agreement between the **University of Pretoria (UP)** and York Timbers.
- UP has partnered with the **Joint Institute for Nuclear Research** (JINR) in Russia to strengthen the University's research efforts into nuclear sciences and related disciplines.
- A renewed agreement between the **Hans Merensky Foundation** (HMF) and UP was officially signed to fund the Chair in Avocado Research in FABI.



FACILITIES:

New facilities opened in 2020:



- The extension of the **AE du Toit complex** with two completely new floors adds eight flat-space venues that can seat 30 students working in groups of between five and six students each. This encourages peer learning and introduces students to problem solving by teamwork. The walls are surrounded with whiteboards for working on solutions together, while the seating can be flexibly arranged for various learning scenarios. In addition, the partitioning of each floor (normally in four rooms) can be altered to make two or one large room, suitable for larger groups of symposia or mini-conferences. The design of the rooms has made full use of the magnificent views of the botanical gardens and the rooms feature a number of new social spaces.
- The **Bateman Building** boasts temperature and climate-controlled insect rearing facilities and laboratories.
- **FABI tunnels** on the **Hatfield Experimental Farm** – The three tunnels run fully automatically (cooling, shading, irrigation and misting) and were funded by the forestry industry. It is used to screen their tree breeding material for pest and disease resistance, especially lot of pine and Eucalyptus saplings, which will be screened for resistance against a variety of diseases.

COMMUNITY ENGAGEMENT

NAS collaborates with local community and funder to establish food garden in Hatfield



UP's Community Garden project in Hatfield, **Moja Gabedi**, started out as a vacant property used by vagrants and was transformed with the aid of many donors and willing partners, such as UP's Department of Plant and Soil Sciences, into a flagship community engagement project where the homeless and at-risk people can come to for help. Food gardens and therapy centres were established. Large wendy houses to accommodate the community's activities were constructed. Landlords of adjacent properties have provided support and help; a borehole was drilled. Jason Sampson, Arnold Frisby and the horticultural staff have provided interesting plants, and Prof Michael van der Laan has used it as a site for the community engagement activities for his PPK 251 course. Due to their involvement, this module has been nominated for the UP-Community Engagement award.