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# SQUARED<sup>2</sup> UP

Newsletter of the Faculty of Natural and Agricultural Sciences

June 2021

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## Humans, predators and prey

By Meredith Thornton (MRI)

Large mammals shape their environment and are of great importance to the tourism and conservation industry. Research done by the Mammal Research Institute (MRI) in the Faculty of Natural and Agricultural Sciences provides invaluable information to help manage both wild and captive populations.

### Researchers involved with the MRI produced some interesting research on large mammals over the last year.

Lions are apex predators that experience multiple threats due to human activity and are classified as vulnerable (IUCN Red List). Analysis by Dr Peter Lindsey and co-authors (Bauer et al, 2020) teaches us more about their distribution and numbers. Eleven threats were identified in total, with human-lion conflict and depleted food supply (resulting from the bush meat trade) emerging as the top threats. Lion conservation is a complicated problem, with many threats interacting simultaneously, which can easily result in the complete eradication of a lion population. A problem tree and root-cause analysis was used to visualise this complex situation. According to Dr Lindsay, 'The results of this study will aid conservation managers, social scientists and politicians in teasing apart the underlying issues before lion conservation can be tackled efficiently.'

...continues on page 3.





# Message from the Dean

Prof Barend Erasmus



**“Where are we going, Pooh?  
'Home, Piglet. We're going home  
because that's the best thing to  
do right now.'”**

—A. A. Milne

To stay safe, we need to stay at home. As our country grapples with the third wave, the pandemic is at the forefront of our minds. The majority of our staff and students are working from home and learning online. The campus is quiet and will become a lot quieter over the coming days as we implement the Level 4 adjusted guidelines.

Colleagues are working daily to move assessments, teaching and the remaining on-campus activities online. The constant changes and planning have taken its toll on us, yet we go on to ensure that the students are able to progress, earn their degrees and strive for excellence in research. I am truly grateful and in awe of the resilience of the staff and students in NAS. Each of your contributions reminds me daily, that we have been here before and we can do it again.

2021, has not been without its challenges, yet our staff and students continue to excel and were recognised by many national and international bodies, for their excellence, impact and innovation. We have produced excellent research and launched a few new initiatives in the Faculty. So much so that we could not wait until the end of the year to produce this newsletter. The NAS newsletter will now go out three times a year.

The Faculty also launched the Conversations@NAS series and the expert lecture series in 2021. The Conversations@NAS series has been well received and attended. You can read more about the first event of the year and links to the recorded sessions in the newsletter. The first expert lecture will be held in July, titled *Leapfrogging innovation in Africa by harnessing the microbiome*, presented by Prof Thulani Makhanyane. I encourage our staff and students to attend and participate in these events; they will be informative, interesting, and relevant and challenge our thinking in new ways.

This year also brought a few new faces to NAS. Prof Vinesh Maharaj and Mr Manfred Molomo joined the NAS executive team in

the capacity of Deputy Dean Research and Postgraduate Studies and Faculty Manager respectively. As part of NAS' initiative to pursue more interdisciplinary research, we have Prof Abel Ramoelo as the Director of the Centre for Environmental Studies. There are more activities in the pipeline as part of our interdisciplinary initiatives – keep an eye open! I would also like to extend a sincere welcome to all the new staff members in NAS.

While we have adjusted to the new normal and hybrid approach to work, we are still facing uncertainty, home-schooling young children, parenting while working from home, illness, isolation and unconventional routines. I want you to know that your effort to maintain business continuity in the Faculty, under these circumstances has not gone unnoticed. Remember to take time out to recharge and reach out if you need help.

As we approach the examinations, I would like to wish all our students the best in achieving their academic goals. I hope you enjoy reading about the achievements and highlights of the first quarter of the year in the NAS faculty.



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## Layout and Design

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## Special mention

Xolani Mathibela, Prim Gower  
and Masego Panyane

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...continued from page 1.

In zoological terms, vigilance is more than looking out for danger, it is also observing what other animals are doing around you (social vigilance). A study on impala by Anita van Deventer and Prof Adrian Shrader (2021) investigated circumstances under which individuals within a herd prioritise different behaviours. Social vigilance involves watching to see if other animals are alarmed and where they are feeding, for example, and if an impala is to survive, it must find the right balance between foraging and avoiding predators. Herd size was predictably greater in areas where predator numbers and density were higher. However, what was surprising was that impala in the middle of the herd reduced their antipredator vigilance and increased their social vigilance but didn't increase overall vigilance. In contrast, animals at the edges increased both social and anti-predator vigilance, as well as proportionally increasing their anti-predator vigilance. This demonstrates that centrally positioned impala are advantaged because they have more time to forage or find better forage, in addition to being at reduced risk of predation due to safety in numbers. Interestingly, impala in predator-free areas showed the same amount of

vigilance, regardless of herd position, but still exhibited high levels of total vigilance, despite the reduced threat.

In another paper on vigilance, Dr Mark Keith and colleagues (Yiu et al, 2021) looked at predation risk in relation to intense and routine vigilance in Burchell's zebra and blue wildebeest. Both species form an important part of the lion diet. Intense vigilance is when the environment is scanned continuously and all other activity stops, while routine vigilance is when the animal continues to chew while looking out for predators. The relationship between these two behaviours was calculated and found to be inversely proportional. Zebra's intense vigilance was lower outside lion home ranges, and their routine vigilance was higher in herds. The intense vigilance of wildebeest decreased with an increase in herd size and increased with the presence of a calf. Wildebeest differed from zebra, showing similar vigilance in and outside lion home ranges, but when grass was tall, intense vigilance increased due to the perceived higher ambush risk. Intense vigilance also increased with a higher tree density but, interestingly, decreased at a certain threshold, probably because

wildebeest benefited from added tree cover. Wildebeest relied more on safety in numbers to avoid predation than zebra did.

Be sure to watch this space as we share more exciting mammal news in upcoming newsletters.

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“ Zebra's intense vigilance was lower outside lion home ranges, and their routine vigilance was higher in herds. ”







## Prof Thulani Makhalanyane appointed as Programme Director of ISME's ambassador programme

*"The appointment provides me with an opportunity to contribute towards the development of my field and contribute to the success and growth of the field,"*

says Prof Thulani Makhalanyane from the Department of Biochemistry, Genetics and Microbiology and Deputy Director of the Centre for Microbial Ecology and Genomics.

Prof Makhalanyane was recently appointed Programme Director for the International Society for Microbial Ecology (ISME)'s Ambassadors Programme. He will hold the position for the rest of the term as a member of the ISME board, and be on the board until 2025.

"This is a tremendous responsibility, and I am filling very big shoes," he says. "My predecessor, who was recently appointed as Chief Scientist for the Australian Antarctic Programme, has left behind an amazing legacy. The appointment provides me with an opportunity to contribute towards the development of my field and contribute to the success and growth of the field."

According to Prof Makhalanyane, the ISME is the leading society for microbial ecology research globally. In addition to running the biggest conference in the field (the ISME Symposia), the ISME produces premier academic journals by the Nature Publishing group, including The ISME Journal and ISME Communications. The society is headquartered in the Netherlands and is an official charity that aims to serve microbial ecologists and the wider community by supporting research and education.

The Ambassador Programme is one of the ISME's key activities, and its main aim is to promote the field by helping to support local meetings by establishing regional networks. This is done through the appointment of ambassadors, who serve as representatives and help to coordinate events in their respective countries. The ISME has representation in more than 70 countries spread.

Under his leadership, Prof Makhalanyane hopes that the programme will be able to resume normal functions once there is enough immunity to travel. He aims to set up and coordinate linkages among African countries to expand the programme to at



Prof Thulani Makhalanyane

least 10 new countries and increase the proportion of young ambassadors involved in the ISME.

"I would like to continue working hard to grow as an academic and to further advance my field," says Prof Makhalanyane, who was recently announced as a Pan-African Scientific Research Council (PASRC) fellow. "I am keen to contribute to training microbial ecologists across the African continent and I think my role in the ISME and PASRC are central to these efforts."

## Honorary doctorate for internationally recognised mathematician



Prof Carlos Castillo-Chavez

The Faculty of Natural and Agricultural Sciences (NAS) conferred an honorary doctorate (*honoris causa*) in Mathematics on Mexican-American Professor Carlos Castillo-Chavez during a virtual ceremony as part of its autumn 2021 graduation season.

Prof Castillo-Chavez played a significant role in transforming the demographic landscape in mathematical sciences in the US. He is a founder of the Institute for Strengthening the Understanding of Mathematics and Science, which focuses on providing college opportunities to high school students to increase the number of underrepresented minorities that obtain a PhD and take positions of leadership in the mathematical sciences or in fields that require high levels of quantitative expertise.

He is also the founder of the Mathematical and Theoretical Biology Institute at Arizona State University. Notably, about 70% of students recruited to the institute have been drawn from underrepresented groups in the US. The American Mathematical Society has recognised the institute as a "mathematics programme that makes a difference".

According to Prof Barend Erasmus, Dean of the Faculty of Natural and Agricultural

Sciences, Prof Castillo-Chavez's career serves as an inspiration for aspiring academics. "He has shown that rising above your circumstances is possible. Throughout his career, he enabled students from disadvantaged backgrounds to achieve their potential in the challenging field of mathematics."

Prof Castillo-Chavez's research is the embodiment of multi-disciplinary and inter-disciplinary research, particularly at the interface of mathematics and natural and social sciences.

"Professor Castillo-Chavez's work is recognised globally, and this honorary doctorate is a testament to his outstanding contribution to the field of mathematical science internationally," said UP Vice-Chancellor and Principal Professor Tawana Kupe. "We congratulate him on this achievement, and are very pleased to welcome him to our global UP family."



## UP Extraordinary Professor delivers prestigious AMS Einstein Public Lecture

Professor Abba B Gumel, Extraordinary Professor in the Department of Mathematics and Applied Mathematics, recently had the honour of delivering the annual American Mathematical Society (AMS) Einstein Public Lecture in Mathematics for 2021.

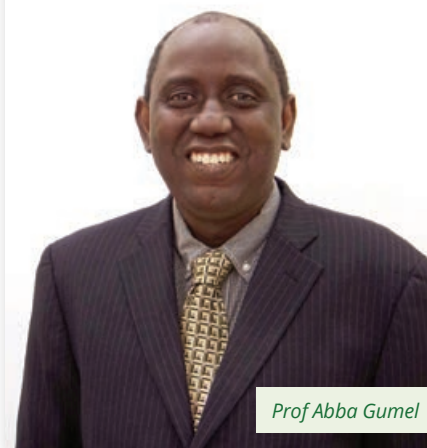
Titled 'Mathematics of infectious diseases', Prof Gumel's online lecture was well attended by mathematicians and members of the public from around the world.

The series of AMS lectures was initiated in 2005 in commemoration of the centennial anniversary of Albert Einstein's *Annus Mirabilis*, the four papers published by the physicist that contributed to the foundation of modern physics. Each year since then, the AMS has selected an outstanding mathematician from around the world to deliver the lecture, such as Sir Michael Atiyah, laureate of the 1966 Fields Medal, who delivered the inaugural lecture in 2005.

"It was a great honour to be selected to deliver such a prestigious lecture," said Prof Gumel, who is also a Foundation Professor of Mathematics at Arizona State University.

*"My selection was in recognition of the major role that mathematical sciences play in providing insight into the transmission dynamics, and control of emerging and re-emerging infectious diseases of major public health and socio-economic importance. To be associated with the name Albert Einstein is always a great honour."*

During his lecture, Prof Gumel highlighted the historic role of mathematics, statistical data analytics and computation, providing insight into transmission dynamics and the



Prof Abba Gumel

control and mitigation of several emerging and re-emerging infectious diseases, such as malaria and COVID-19, that have a major effect on public health and knock-on socio-economic challenges.

Prof Gumel advocated for multifaceted and interdisciplinary approaches to addressing the world's most challenging problems, and highlighted the considerable contributions of other UP's researchers, particularly in the areas of mathematical biology and computational mathematics.



Prof Roumen Anguelov

## UP domestic leader in Mathematics in 2021 QS World University Rankings

The University of Pretoria's (UP) Faculty of Natural and Agricultural Sciences is very proud that UP is the domestic leader in the fields of Mathematics; Accounting and Finance according to the QS World University Rankings by Subject 2021.

According to Prof Roumen Anguelov, Head of the Department of Mathematics and Applied Mathematics, "Ranking by itself was never set as a goal of the Department. The set goal was excellence. We aim for excellence in teaching, research and community engagement. This goal was driving the restructuring of the curriculum and the teaching models, establishing efficient processes of learning facilitation, research policies and recognition,

promotion of our discipline, etc. The Department has become to a large extent a place of choice for conducting an academic career in mathematics."

He added that "Currently the Department has strong and internationally well-recognised groups in Biomathematics (the Department hosts the SARCHI Chair (M3B2), as well as Analysis, Algebra and Logic groups. Not unexpectedly, these efforts and achievements eventually get recognition through various ranking systems. UP has also been a top performer nationally in the field of Mathematics and Computer Science in the Leiden University Ranking (measuring scientific impact). The fact that the Department was for the first time ranked

in the prestigious QS rankings in 2019 and 2020 as the highest-ranked among the mathematics departments in South Africa, came as no surprise."

According to QS, its rankings are based on four main indicators: global surveys of academics and employers, citations per paper, and the H-Index, with the index being the measure of the productivity and impact of the work published by the institution's scientists and scholars.

The Department also boasts with two National Research Foundation (NRF) A-rated professors, Prof Jean Lubuma and Prof James Raftery.





## 8 NAS academics selected to join Pan-African Scientific Research Council



PAN-AFRICAN  
SCIENTIFIC  
RESEARCH  
COUNCIL

The newly formed Pan-African Scientific Research Council (PASRC) recently announced its inaugural members, and 19 UP academics have been included on the council, which consists of 492 researchers and professionals. Eight of these researchers hail from the Faculty of Natural and Agricultural Sciences (NAS).

These members are part of the council's first cohort, following its launch in June 2020. The eight members from NAS are: Dr Abdullahi Yusuf, Prof Dave Berger, Prof Eugenie Kayitesi, Prof Lucy Moleleki, Prof Mmantsae Diale, Prof Thulani Makhwanyane, Dr Miek Messerschmidt and Prof Quenton Kritzing.

Members have been selected for their proven excellence in research, the potential for growth, and ability to contribute to engagement with policymakers in Africa. The inaugural member selection was made by the

council's Evaluation Committee, which consists of 26 established researchers.

The main goals of the PASRC are to highlight excellence in research in Africa, promote the career development of young scholars and encourage interdisciplinary collaboration. The council will also strive to influence evidence-based policymaking in Africa, and communicate scientific research to a wide audience through public engagement.

"It is an honour to have been selected as a fellow of the PASRC, to be part of an African scientific community involved in Africa-focused research," says Prof Eugenie Kayitesi, a food scientist with a Y2 NRF rating. "Now more than ever, scientists must come together to generate policy-relevant research that will help governments and societies respond to the novel coronavirus and other unresolved issues, particularly those relating to poverty reduction and addressing food and nutrition insecurity." Prof Kayitesi adds that she will be playing a leadership role by joining

structures such as the council's editorial board and committees. "I will have the opportunity to present and publish my research, collaborate with other council members and provide guidance to younger researchers. I will also be able to contribute to the council's engagement with policymakers."

Prof Thulani Makhwanyane, who is Deputy Director of UP's Centre for Microbial Ecology and Genomics, says it is a great pleasure to be an inaugural fellow. "As a fellow, I will have an opportunity to contribute to the leadership of the council, and as a microbial ecologist, I hope to promote the advancement of my field throughout the African continent. I hope that being part of the council will allow me to contribute to the mentorship and development of other scholars on our continent. As an academic of UP, this is a fantastic opportunity to promote the objectives advanced by institutional platforms, such as the Future Africa institute and campus, by speaking directly to political leaders."

## NAS postdoctoral researcher awarded a prestigious fellowship



Dr Deon de Jager

Dr Deon de Jager, currently a postdoctoral fellow in the Molecular Ecology and Evolution Programme in the Department of Biochemistry, Genetics and Microbiology, was recently awarded a Marie Skłodowska-Curie Actions (MSCA) Individual Fellowship. This is the flagship fellowship of the

European Union's Horizon 2020 Framework Programme and only 1 630 researchers, of 11 300-plus who submitted proposals from across the globe, were funded in this round.

Dr De Jager's proposal received a final score of 95% (cut-off: 94.4%) in the hyper-competitive Life Sciences category. The project aims to use ancient DNA to evaluate the response of African wildlife to climate- and habitat change during the Last Glacial Period (12 000-30 000 years ago) by investigating change in genetic diversity over time of species that roamed the now-submerged Palaeo-Agulhas Plain off the southern coast of South Africa (SA).

"SA has a rich fossil record of wildlife that roamed this plain, thanks to early humans who hunted and utilised these animals and accumulated their remains in caves along the southern coast, which used to be the northern border of the plain. Unfortunately, we do not have the specialised ancient DNA facilities in SA to investigate the genetic make-up of the ancient populations of

these species," Dr De Jager commented.

Dr De Jager will have the opportunity to perform research in the world-class ancient DNA facilities at the University of Copenhagen, Denmark, with Associate Professor Eline Lorenzen, an ancient DNA and wildlife genetics expert, as his host.

***"We can use this rich resource to better understand how species responded to climate change in the past and thereby inform how we might better conserve African wildlife under current climate- and habitat change threats."***

Dr De Jager, who completed all his degrees at UP, says he could not have achieved this without the training and support he received at UP, and in particular from his PhD supervisor and mentor, Prof Paulette Bloomer.



## Prof Marion Meyer wins Havenga Prize at SA Academy for Science and the Arts Awards

*The prestigious Havenga Prize of the Suid-Afrikaanse Akademie vir Wetenskap en Kuns (South African Academy for Science and Arts) has been awarded to Prof Marion Meyer from the Department of Plant and Soil Sciences in the Faculty of Natural and Agricultural Sciences.*

His research focuses on phytochemistry in general, and more specifically on the metabolomics of secondary compounds of medicinal and toxic plants. His papers have been cited about 3 600 times (excluding self-citations) and according to Scopus, he has an 'H-score' of 36.

The Thomson Reuters Essential Science Indicators (ESI) ranked him in the top 1% of researchers on citations in the field of Pharmacology and Toxicology. Thirty-seven MSc and PhD degrees have been awarded to students under his supervision.

A recent paper of Prof Meyer and his co-workers on the cause of the mysterious fairy circles of the Namib and Kalahari Deserts attracted considerable worldwide attention in the press, incl. *The Times of London* and an interview with BBC World Service Radio. The hundreds of thousands of circular barren patches not containing any vegetation in the arid grasslands of the Namib and Kalahari Deserts, commonly referred to as fairy circles, have puzzled the scientific community for decades. Their multidisciplinary study provides soil chemical, phytochemical and GIS spatial patterning evidence that fairy circles of Namibia are caused by toxic *Euphorbia* species.

His group also recently discovered cocaine-related tropanes in an indigenous *Erythroxylum* species and is now attempting to produce these valuable medicinal compounds in tissue cultures. His other main focus is currently on the toxins of indigenous poisonous plants causing the death of large quantities of livestock.

He has received several awards over the years, including the UP Exceptional

Academic Achiever Award four times. He also received the SA Association of Botanists' Silver and Gold Medal Awards and plays an active role in the professional societies in his field of research and is a past president of the SA Association of Botanists.

Prof Meyer also served as the Head of the Department of Plant Sciences from 2001 until 2013 at the University of Pretoria.

Prof Meyer's research has always been driven by a passion to solve some of nature's interesting secrets. He mentioned that this felt more like a hobby than work to him. His fieldwork, especially in the remote parts of southern Africa and his interactions with postgraduate students were some of the most enjoyable parts of his life.

He also worked closely with his botanist wife, Nicole, to solve the mystery of the fairy circles. He is extremely proud to have been awarded the Havenga Prize and to follow in the footsteps of previous awardees like Profs HGWJ Schweickerdt, N Grobbelaar, H Huismans, AE van Wyk, M Wingfield, B Slippers and other eminent scientists.

“A recent paper of Prof Meyer and his co-workers on the cause of the mysterious fairy circles of the Namib and Kalahari Deserts attracted considerable worldwide attention in the press.”

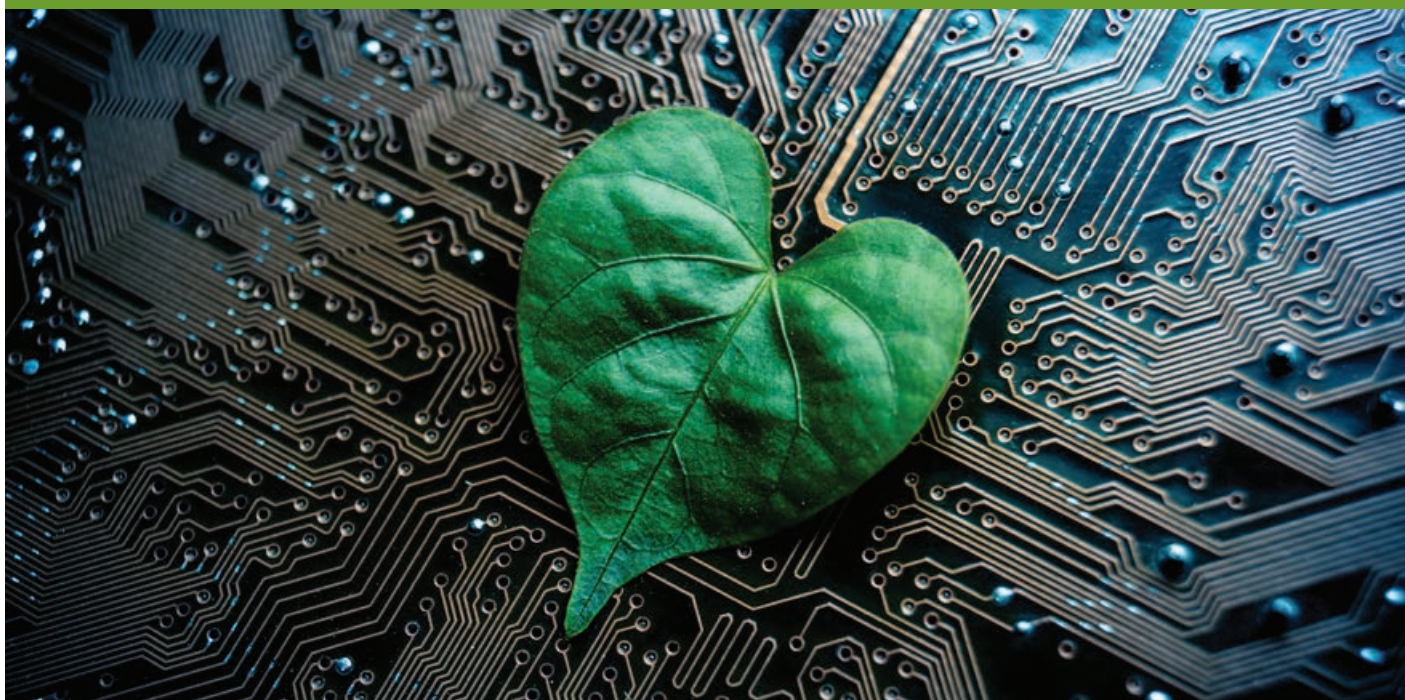


Prof Marion Meyer on a research trip.





## UP alumnus enters Kaggle rankings after winning a silver medal in Google Research Football Competition



*Dr Hossein Masoumi Karakani, an alumnus of the University of Pretoria (UP), recently became the first person from UP to enter the global rankings in Kaggle. His current rank is 529 of 162 141, and his best rank was 477 after he won his second consecutive silver medal in the Google Research Football Competition hosted by Kaggle.*

He also won a silver medal in a 2020 Kaggle competition (University of Liverpool: Ion Switching), finishing in 129th place out of 2 618 teams registered globally.

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. The term 'data science' has gradually been incorporated into the English lexicon over the past decade, and the words 'Kaggle' and 'data science' have become inextricably linked.

Dr Karakani now ranks among the top 1% of data scientists globally. With this second silver medal, he has

officially entered the Kaggle rankings, a live leaderboard of the absolute best data scientists. Currently, there are 6 682 competition experts in Kaggle. In Africa, there are only about 40 ranked Kaggle experts, about 20 of whom are South African, including Dr Karakani. Dr Karakani also currently ranks third among Kaggle users from Iran.

Dr Karakani, who holds a PhD in mathematical statistics, finished 55th out of 1 138 teams (including single-member 'teams', like Dr Karakani's) in this Football Competition.

This particular artificial intelligence (AI) research football competition was hosted by Kaggle in collaboration with Google Research and Manchester City Football Club. In this competition, competitors were tasked with creating AI agents that can play football — the most popular sport in the world with an estimated following of four billion fans — and compete in steps where agents react to a game state.

When asked how he feels about this achievement, Dr Karakani commented, 'I always dreamed about combining my data science knowledge with my passion for football, and winning this prestigious award turned my dream into reality. The number of data scientists is not equally distributed around the world. Since Kaggle is well-known among the data science community, it can be



*Dr Hossein Masoumi Karakani*

used as a proxy to understand the gap between countries and continents. These competitions help push the boundaries of a user's abilities, and competitors learn and master the art of critical thinking.

The ranked users dataset was obtained by scraping the location data off Kaggle's website. North America, Asia, and Europe are responsible for 75% of all ranked users, and Africa, Oceania, South America, and Central America are responsible for only 5%. Also, North America and Europe have the most experienced users in machine learning (ML), and Africa has around 2% of ML veterans. Hence, my next step is to facilitate knowledge transfer in the data science field to the younger generations.'





## NAS Teaching and Learning Awards encourage passionate lecturers



Mr Gideon Brits



Prof Vida van Staden



Dr René Ehlers



Dr Eder Kikianty



Mrs Anita Botha



Dr Victoria Rautenbach



Prof Adrian Shrader

Funding made available via the University Capacity Development Grant was again utilised to give recognition to the colleagues nominated by the student Faculty house, NATHouse, and to make cluster awards.

The NATHouse best first-year lecturer for 2020 was Mr Gideon Brits, who provides an important foundation in Mathematics

to the extended curriculum programme students. The best lecturer of senior courses was Prof Vida van Staden who teaches two core Genetics modules in the first and second year.

The cluster winners were: Prof Vida van Staden (Biological Sciences), Dr René Ehlers and Dr Eder Kikianty (both for

Mathematics Sciences) and Mrs Anita Botha (Physical Sciences). Two colleagues were recognised for exceptional innovation, Dr Victoria Rautenbach from Geography, Geoinformatics and Meteorology and Prof Adrian Shrader from Zoology and Entomology.

**Prof Vida van Staden** shared that she feels honoured to receive these two awards and be simultaneously recognised from the students' and the Cluster's side. "I like to teach Genetics. I faced a group of students as a young and inexperienced lecturer for the first time in 1994. Today, more than 25 years later, when I open my textbook to prepare for the first class of a semester, I get that same feeling of excitement. No student of biology can remain untouched by the concepts taught in any of our genetics modules."

**Prof Adrian Shrader** focused on science communication and had his third-year students do two social media assignments. The first was a project where the students generated a blog, podcast, or video of a conservation topic that they were passionate about. The second social media assignment that the ZEN 364 students did was a practical where they generated memes (text overlaid on a picture) to convey conservation messages. If you think about it, memes are a very powerful way in which bite-sized chunks of information can be spread to a vast number of people.

**Dr Eder Kikianty** is a passionate Mathematics lecturer and believes that the most important element of teaching is to be an enthusiastic and inspiring teacher. It is an incredibly rewarding experience to inspire students and to raise future mathematicians. "It is our duty, as academics, to impart our knowledge to the younger generations, teaching and raising them to become valuable members of society."

**Mrs Anita Botha** has demonstrated excellence in and commitment to teaching chemistry initially to foundation students and then to large first-year classes in NAS and EBIT over the past twenty years as a full-time lecturer. Anita has been involved in curriculum development and subsequently in curriculum transformation in keeping with changing times from 2000.



## Hjalmar Rall (18) graduates *cum laude* with an honours in physics



Hjalmar Rall

Whizz-kid Hjalmar Rall started his academic journey with the University of Pretoria (UP) in 2017. The young man, who registered for a BSc in physics at the age of 14, completed his initial degree *cum laude* and has recently graduated *cum laude* with a BSc (Hons) Physics in this year's autumn graduation season.

"I was aiming for a *cum laude* from the start, and that motivated me to continue with the hard work. As a result, I passed with distinctions," he said.

According to the 18-year-old, who is planning a career in academia, there are no research groups in South Africa focusing on his specific field, and only a few worldwide. "I will have to look overseas as I'll be focusing on Quantum Information Theory research," he said.

Hjalmar completed Cambridge A-levels at the age of 13. When Grade 5 lessons no longer held any interest or excitement for him, Hjalmar's father began home-schooling him. From that moment on, he sped through the Cambridge curriculum.

"I consider myself a diligent and mature student, and my home-schooling gave me the necessary academic background to be able to complete my studies at the University with relative ease. Although, there were a handful of modules that seemed completely impossible to pass. Some of them frightened me. But, once

I ignored that, it was simply a matter of putting in enough hours of effort and practise," he said.

Hailing originally from Riebeeck Kasteel in the Western Cape, Rall describes his academic journey as relatively easy, most of the time. It was his love for mathematics that made his studies enjoyable and served as sufficient motivation for him to overcome any challenges he encountered.

According to Rall, had he not chosen physics as his field of study, it would have been pure mathematics.

***"My motivation for studying physics is that I get to use abstract mathematics daily, without too much effort, but it is such an interesting field that I wouldn't have minded pursuing the subject itself,"***

he concluded.

## UP graduate in Advanced Data Analytics wins national paper competition

Mr Thembinkosi Kunene, an alumnus of the University of Pretoria (UP), was recently announced as the winner of the South African Statistical Association Postgraduate Paper Competition for 2020 for his paper titled 'Spatial dependency between a linear network and a point pattern'.

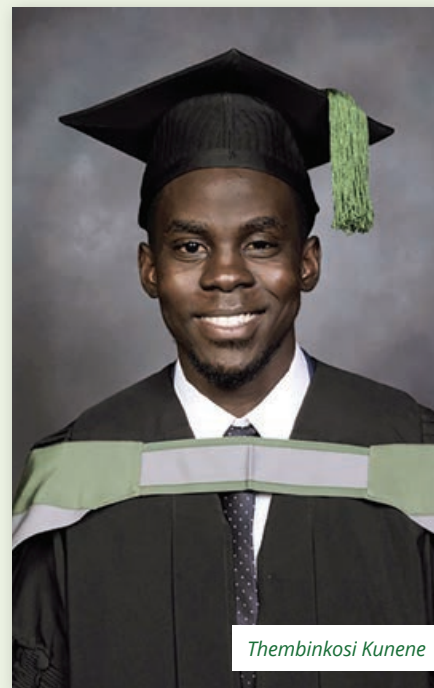
The competition is open to entries from South African master's and doctoral students. A total of 16 papers were received from six universities (UCT, UP, UKZN, NWU, UNISA and SU) and underwent a review process.

"I feel incredibly proud to have won this competition in a field I am passionate about while contributing what I can to the existing literature and methodology. I was able to accomplish this with the guiding hand of my supervisor, Prof Fabris-Rotelli. In the future, when she is not involved, I will draw from this experience whenever I am faced with a challenging task. It certainly reinforced the

idea of how much one can achieve if one sets their mind to it, and this will spur me on," Thembinkosi said when asked how he felt about this achievement.

Thembinkosi completed his master's degree in 2020 with a mini-dissertation of the same title under the supervision of Prof Inger Fabris-Rotelli in the Department of Statistics. His research develops a methodology to measure the spatial relationship between point processes and a linear network, for example, location data such as crime occurrence locations in relation to a road network. Such location data is regularly studied when occurring directly on the linear network. Thembinkosi's work contributes to spatial data near the linear network but not on it, requiring a good choice of distance measure between the data types.

Thembinkosi started his BSc (Actuarial and Financial Mathematics) studies at UP in 2017 and completed his MSc (Advanced Data Analytics) in 2020.



Thembinkosi Kunene





## NAS celebrate students' academic achievements

*“It’s good to be curious. Be inspired – it may be many people doing great things that inspire you or a single person who is so passionate about what they do that will inspire you. Listen to good mentors. Remember that it is okay to take a break. Don’t forget to help others and collaboration is key to addressing some of the major issues plaguing society today.”*

These were the inspiring words shared by Prof Sanushka Naidoo, Head of the Department of Biochemistry, Genetics and Microbiology at the prestigious Annual Outstanding Achievers Function for students of the Faculty of Natural and Agricultural Sciences (NAS) earlier this year. Prof Naidoo 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.

James Murray Louw was honoured at the event with the Vice-Chancellor and Principal’s Medal for excellent undergraduate academic achievement as the best student in the Faculty. He graduated with a BSc degree in Mathematics and achieved a cumulative weighted average of 97.14%; Louw is enrolled for a BSc (Hons) degree in Mathematics.

“It is a great privilege to be acknowledged by the Vice-Chancellor for my academic achievements. Looking back at my undergraduate years, I realise there were a lot of hard times and weeks that I thought I would not make it through. But in the end,



Prof Barend Erasmus (Dean: Faculty of Natural and Agricultural Sciences) and James Murray Louw, Vice-Chancellor and Principal’s Medal winner.

everything turned out amazingly. I want to glorify God who carried me through it all. He is my rock in hard times, and working diligently on my academic studies is how I worship him for what he has given me,” Louw said after receiving this Award.”

Louw also won the Dewald Hattingh Book Prize for the Best third-year student in Mathematics as well as for the Top third-year student in the Faculty.

The Dean’s Academic Merit List for current undergraduate students with an average of 80% or more was also announced during this event. This year the list included the top first-year, second-year, third-year and fourth-year (BSc Agric) students, as well as the top students from the BSc – Extended Programme.

The winners of these categories are Mr DC Cronje (Top first-year student), Mr DM Dodkins (Top second-year student), Mr JM Louw (Top third year student) and Ms R Zhonga (Top BSc Extended Programme student). Ms Zhonga also won the Prof Nthabiseng Ogude Award for the best female first-year student in the BSc Extended Programme.

At this prestigious event, more than 60 prizes and trophies were awarded to the top students in the Faculty. The Faculty is proud to have such outstanding academic achievers in its midst and is very grateful to all the sponsors of the prizes and trophies.

For those that missed the event, [watch it here](#).



## Nanotechnology as a solution to antimalarial drug delivery



Meta Leshabane

Meta Leshabane from the Malaria Parasite Molecular Laboratory (M<sup>2</sup>PL) in the Department of Biochemistry, Genetics and Microbiology, has recently completed her MSc in biochemistry, and her work was included in four scientific papers in \*top international journals.

In 2017, Ms Leshabane was placed at the M<sup>2</sup>PL under the NRF internship programme where she received valuable exposure to management, research and technical skills. Since then, she has been involved in the M<sup>2</sup>PL group, completing both her honours and master's degrees. Ms Leshabane attributes the success of her MSc project to the structure of the communities of practice (CoP) in malaria elimination and

her supervisors Prof Birkholtz (SARCHI Chair in Sustainable Malaria Control) and Dr Coertzen. The CoP allowed 'one-of-a-kind' transdisciplinary research to lead to health innovations for malaria elimination. 'The research completed under the CoP project covers a wide range of topics, which is very interesting. This allowed me to acquire invaluable skills and knowledge from many students and experts on a level that would be difficult without the CoP structure,' Meta explained.

'My research specifically focused on determining the antimalarial properties of novel nanoparticles encapsulated with antimalarial drugs and is based on expertise from three fields, namely

advanced macromolecular structures, drug discovery and molecular biology. These are headed by Prof Klumperman from Stellenbosch University, Prof Chibale from the University of Cape Town, and Prof Birkholtz, respectively.' We discovered several novel antimalarial series that can kill multiple stages of malaria parasites. With the use of nanotechnology, the delivery of such antimalarials in an orally bioavailable fashion becomes a reality.

Ms Leshabane is currently employed as a research assistant at M<sup>2</sup>PL under the CoP and now focuses on target identification of antimalarial drugs active against the most lethal form of malaria-causing parasites.

*\*ACS Infectious Diseases; ACS Biomaterials Science and Engineering; ACS Biomacromolecules; and the Journal of Medicinal Chemistry*

## Gopika Ramkilawon reaches semifinals of FameLab SA



Gopika Ramkilawon

Gopika Ramkilawon, a master's student in the Department of Statistics recently competed in the FameLab SA competition against peers from the DSI-NRF Centre

of Excellence in Mathematics and Statistical Sciences/Centre of Excellence in Palaeosciences and reached the semi-finals of the competition.

According to her supervisor, Dr Johan Ferreira, "This is very exciting because as far as I know, this is the first time that a student in the discipline of statistics/mathematical statistics has even reached the semi-final."

Gopika is busy with an MSc in Advanced Data Analytics and is also a Statistics Intern Team Leader in the Department.

According to Gopika, "Famelab is a science communication competition with heats across many universities and scientific institutions/centres. I made it through the first heat, competing with up to 45 other

individuals from various scientific platforms to reach the semi-final. I specifically competed amongst peers from the Centre of Excellence and discussed the Central Limit Theorem in my talk."

The semi-finals took place in April, and I was truly excited to talk about Statistics in a manner that everyone can understand, love and appreciate. I am privileged and proud to again represent the Department of Statistics. I strive to fly our University's and Department's flag and name high in high regard.

Gopika was also in the Top 100 of the Absa Group GradStar Awards in 2020. These achievements indicate that we as future leaders can bridge the gap between academics, leadership and innovation.





## NATHouse wins Beg1nners 2021 Showcase competition

*NATHouse showed off its talent at this year's Student Culture Committee (STUKU) online event. Not only did they win first prize in the mixed category but also took the prize for Best Multicultural.*



Winning first prize in the mixed category and the prize for Best Multicultural.

STUKU is a multi-cultural student organisation responsible for the management of cultural events at the University. STUKU serves as a facilitator tasked to execute all cultural activities on behalf of the Student Representative Council (SRC).

According to the Chairperson, Stefan Steenekamp, "We made history by becoming the first Faculty House that participated and got placed in the Beg1nners 2021 Showcase. Thanks to all the first years that participated, you all have great talent, and we appreciate your contribution."

Beg1nners 2021 Showcase was an online event hosted by STUKU. The showcase aimed to introduce the first-year students to the Student Culture and give them a platform to showcase their talents.

Their approved theme for the event was #RememberWeAreOne. The theme aimed to celebrate our history, how far we have come as a country and how we overcame the struggle to become a united nation. Instead of hating and fearing our differences in gender, ethnicity, and class, we embrace them.

The commencement of online classes marked the beginning of a tough obstacle for first-year competitors as they had to contribute to the first event of the year. Students with a variety of talents participated from flutists to poets, musicians and, dancers. Although they faced many challenges, such as adapting to online learning in a new environment, they came up with the most fascinating ideas and we had a phenomenal event.

You had to be watching the show to believe it. [Hit the link](#) and become a believer!

### More about NATHouse

NATHouse is the faculty house of the Faculty of Natural and Agricultural Sciences. It has an academic focus and plays an important role in linking students and staff in our Faculty. They actively identify student challenges; communicate these challenges with the faculty executives and finding workable solutions.

They also create opportunities and events between the different student houses, specifically to increase our visibility and encourage diversity. According to Chairperson Stefan Steenekamp, "Our vision is to be part of a culture where innovation and curiosity are encouraged in both our academic and social activities, where scientific findings are actively used to overcome challenges experienced in our daily lives at University and within our broader society. We want the NAS Faculty to be known for its inclusivity where students are encouraged to participate in science as equals that are free from age, gender, race, religion and economic status."

Stefan also emphasised that "We commit to promote a safe, fun, and healthy learning environment for students and staff through several initiatives and events which will be held during the year. Some of the initiatives and events that NAS students and staff can look forward to includes initiatives such as NATHouse Academics Tab, Honours Month Presentations, mental health awareness

and some events such as NATHouse Inspire, Academic and Culture Quiz Nights, Science Career Expo, best lecturer rewards, sanitary and winter blanket drives, and outreaches to the SPCA. Through these initiatives and activities, opportunities will be created within our faculty, diversity and a balanced lifestyle will be encouraged."



NATHouse Executive Committee



## Discovery of a rare gas-rich galaxy group with the MeerKAT telescope



Shilpa Ranchod

Ms Shilpa Ranchod, who recently graduated with a master's degree in Physics from the University of Pretoria (UP) leads an international team that reports the discovery of a large, unusual group of galaxies with South Africa's MeerKAT telescope. This result is a component of

her MSc thesis, supervised by Prof Roger Deane.

Her research is focused on understanding atomic hydrogen's role in star-formation in the younger universe, and dense regions within it. To do this, she uses the 64-antenna MeerKAT telescope, the South African precursor to the Square Kilometre Array. The observations that led to this serendipitous discovery form part of the MeerKAT International GHz Tiered Extragalactic Exploration (MIGHTEE) Survey, a large collaboration of international scientists. The survey produces hundreds of terabytes of data, which are processed on the cloud computing facility hosted by the Inter-university Institute of Data-Intensive Astronomy (IDIA), a partnership between the universities of Pretoria, Cape Town and the Western Cape.

This galaxy group was identified through the detection of 21cm atomic hydrogen (HI) emission, an important component

of galaxies and a key ingredient in star formation. Within galaxies, HI is diffuse and extends far beyond the extent of the stars, making HI a sensitive tracer for the dynamics of galaxy evolution, particularly how the group environment affects this.

Twenty of these HI-rich galaxies were detected, and through HI spectral line observations were identified as a large galaxy group for the first time. Some of the member galaxies have disturbed morphologies, clearly influenced by the group environment. These include an interacting pair of galaxies that will potentially merge, and a "jellyfish galaxy" exhibiting a long tidal tail. The results suggest that the group is rare and in the early stages of assembly due to a large number of HI-detected galaxies and its unsettled velocity distribution. This discovery will be published in the Monthly Notices of the *Royal Astronomical Society* journal.

## Journal paper selected as Editor's Choice

A recent publication by Adedapo Adeola, a PhD student in Chemistry and Prof Patricia Forbes from the Department of Chemistry, published in *Water Environment Research* (a Wiley publication) was selected as the Editor's Choice in March 2021.

The article titled is titled "Advances in water treatment technologies for removal of polycyclic aromatic hydrocarbons: Existing concepts, emerging trends, and future prospects" (<https://doi.org/10.1002/wer.1420>) and is highly acclaimed.

In his Editorial entitled "The water industry toolbox" (<https://doi.org/10.1002/wer.1528>), Prof Baeza noted that "this article is a comprehensive review of existing and emerging technologies for remediation of PAH-polluted water... the great variety of

existing alternatives for water treatment and the efforts of many researchers to advance water treatment with new proposals".

Adedapo Adeola, PhD student and first author of the paper, said that "this is a great honour, as it is recognition of the hard work put into the gathering of data and information on this subject".

Adeola is a UP-Commonwealth Scholarship holder and his research focuses on the synthesis and application of a graphene wool composite for the removal of selected organic pollutants from water. His project is also supported by Rand Water and he is supervised by Prof Patricia Forbes, who holds a Rand Water Research Chair in the Department of Chemistry.



Adedapo Adeola

Adeola has four publications from his PhD work to date. He commented that "we should be encouraged to continue to make a difference irrespective of global and regional challenges. I would like to acknowledge my supervisor, funders as well as the Department of Chemistry and University of Pretoria for providing enabling environment for my studies".





## Whale Unit conducts boat-based research on 'data deficient' and 'vulnerable' Bryde's whales off SW Cape coast

The Whale Unit at the University of Pretoria's Mammal Research Institute (MRI) has recently conducted boat-based field research on Bryde's whales in Walker Bay on the south-western Cape coast under permit conditions of the South African government. This includes boat approaches to the whales to obtain photographs for subsequent individual identification (using the marks in the dorsal fins) as well as skin biopsy samples for subsequent genetic analysis.

At an estimated 600 individuals, the inshore population of Bryde's whales has the smallest population size of any large whale species occurring in South African waters, with its current international conservation status listed as 'Data Deficient' and nationally as 'Vulnerable' under the International Union for Conservation of Nature's criteria.

The two research projects on the whales are as follows:

### Conservation genetics

The South African inshore Bryde's whales do not make extensive North-South migrations as other baleen whale species (such as the southern right whale), but are known to exhibit a year-round residency in South African coastal waters, the only baleen whale species identified as such. As they need to forage frequently to meet their daily energetic needs, they are subject to following their seasonally moving prey. Therefore, they have a seasonal movement

coinciding with the movement of their main prey species (sardines and anchovies), with a northward movement along the east and west coast during autumn and winter, and a return to the central Agulhas bank during spring.

However, it is not fully understood if the movement of inshore Bryde's whales is geographically restricted to either the west or east coast, or if they all form one random mating and moving population. Nonetheless, knowledge of possible population structure has strong implications in the conservation management of the species. To address this question, the research team aims to obtain skin biopsy samples of Bryde's whales for subsequent genetic analysis. Additionally, Bryde's whales will be photo-identified through the marks on their dorsal fins at various sites along the South African coast to find possible movement patterns of individual whales.

### Foraging ecology

Despite the basic knowledge on primary prey and seasonal movements, the feeding and tropic ecology of South Africa's inshore Bryde's whales remains understudied. Due to their year-round residency on the Agulhas Bank and dependency on economically important pelagic fish (mainly sardine and anchovy) as their primary food source, they are extremely vulnerable to the effects of overfishing and environmental change. As a result, the team aims to investigate past and present dietary



Dr Els Vermeulen

contributions, evaluate possible changes in foraging strategies and assess the effects of pelagic fish exploitation on the trophic level at which these whales feed. This will be done through the analysis of stable isotope profiles in the baleen plates of stranded animals, as well as from skin biopsy samples. Additionally, the researchers will be flying drones to evaluate the temporal changes in body condition as a proxy of foraging success.

### For further enquiries please contact

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*Bryde's whales will be photo-identified by the Whale Unit's research team using the marks on their dorsal fins at various sites along the South African coast to find possible movement patterns of individual whales.*

*Photo credit: MRI Whale Unit*





## Discovery of new compounds with the potential to eliminate malaria

***Prof Lyn-Marie Birkholtz, Professor in Biochemistry and South African Research Chair in Sustainable Malaria Control (part of the South African Research Chair Initiative, SARChI), has discovered new potent chemical compounds that show potential as candidates for both the treatment and elimination of malaria.***

This was part of an international team that published this discovery in the journal *Nature Communications* on 11 January 2021. "The breakthrough involves the identification of unique compounds that can kill several stages of the malaria-causing parasite and can block the transmission of the parasite between humans and mosquitoes," she explained.

The deadly human malaria parasite *Plasmodium falciparum* occurs in South Africa. These parasites are transmitted to humans by female *Anopheles* mosquitoes. The only means of killing the parasite itself is to use chemical drugs, but new antimalarial drugs are urgently needed to address the growing concern of antimalarial drug resistance.







Prof Birkholtz describes the parasite as a “shapeshifter” since it can take on multiple forms while in humans. Some of the forms cause disease and others allow the parasite to be transmitted back to mosquitoes to continue the life cycle. Prof Birkholtz states:

***“To eliminate malaria, we must have the necessary tools to kill all these different forms of the parasite. We can then cure patients of the disease but, importantly, also block the malaria transmission cycle. This is the only way to achieve malaria elimination.”***

In an innovative strategy, the team looked for new chemical compounds that can do exactly this, but that is completely new so that the parasite does not have resistance against them. The team runs a unique research platform on the African continent, in which all of these stages of the malaria parasite can be produced in the lab and be used to test chemical compounds. The team discovered compounds that kill the disease-causing form and compounds that blocked the parasite from infecting mosquitoes in the lab.

Two potent compounds target processes essential to the parasite's survival: one is a clinical candidate against tuberculosis and blocks cell membrane synthesis and another is an anti-cancer candidate that targets epigenetic mechanisms (mechanisms that control cell fate beyond the genome). “This is the first time that these compounds were shown to have

activity against malaria parasites and since they are not toxic to humans, they show the potential to be developed as antimalarials for both the treatment and elimination of the disease,” said Prof Birkholtz.

The discovery was made possible by the team's use of an open-source chemical compound set called the Pandemic Response Box, developed by the Switzerland-based Medicines for Malaria Venture (MMV) and the Drugs for Neglected Diseases Initiative (DNDi). This compound box contains compounds that can be used for drug repurposing/repositioning, a process where drugs that have activity against a specific disease (e.g. cancer) can be reused for another disease (e.g. malaria).

Dr James Duffy, MMV Project Director, describes the discovery “as an important breakthrough that emphasises the potential to use existing drugs as inspiration for drug discovery projects targeting different diseases. Never before has this been more important than in light of current outbreaks, where the rapid response to discovering new chemicals able to kill infectious organisms is essential.”

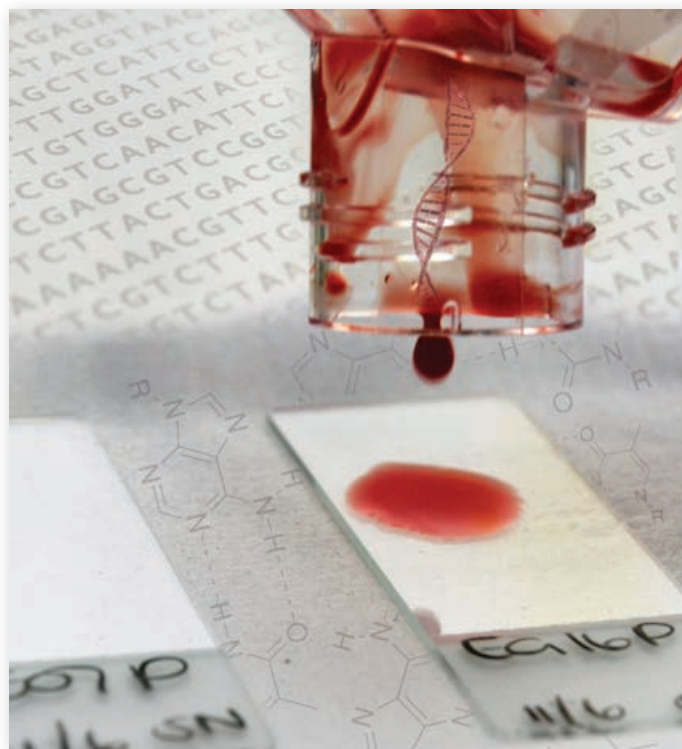
Prof Birkholtz directs the parasite cluster of the UP Institute for Sustainable Malaria Control (ISMC), a multidisciplinary institute with a focus on integrated innovations towards malaria elimination in South Africa. Professor Tiaan de Jager, Director of the ISMC and Dean of Health Sciences at UP, said: “A discovery of this kind attests to the leading experts in antimalarial drug discovery at UP, and in South Africa, addressing African-centred societal challenges. This work also shows the commitment of scientists at

UP to contribute to the United Nation's Sustainable Development Goal for Good Health and Wellbeing.”

Prof Birkholtz's team led the transmission-blocking drug discovery effort as a partner in the South African Malaria Drug Discovery Consortium (SAMDD) that includes two other South African Research Chairs, Professor Kelly Chibale (Chair in Drug Discovery at the Drug Discovery and Development Centre, H3D, at the University of Cape Town) and Professor Lizette Koekemoer (Chair in Medical Entomology at the WITS Institute for Research on Malaria at the University of the Witwatersrand) as well as scientists from the Council for Scientific and Industrial Research and international partners from the USA and Spain.

The work has benefitted from sustained funding from the MMV and the Medical Research Council's Strategic Health Innovation Programme (SHIP) and the Department of Science and Innovation and affirms that investments in health innovations place South Africa at the forefront of discovery.

The discovery received large media coverage, ranging from television (eNCA, eNEWS, NewzRoomAfrica, ETV, Voice of America, German ZDF (TV2); UP YouTube; ExpressoShow) Radio (702, SAFM, RSG, Groot FM, Mandelaz Radio (PE); Rise FM (Mpumalanga) and in print (Reuters, CNBC Africa, Spotlight Africa, Business Insider, Citizen; Voice of America, News24, Bloemfontein Koerant, Amazonaws; DispatchLive; TimesLive, Record East Pretoria).





## Ground-breaking study reveals colonies of mole-rats communicate in their own dialect

*Life underground with family.  
Credit: Lorna Faulkes Photography*

A study by a team of scientists at the Max Delbrück Center for Molecular Medicine (MDC) in Berlin, Germany and the University of Pretoria (UP) has found that naked mole-rats can communicate with one another within their colony. They do this with a unique dialect that is specific to that individual colony.

Naked mole-rats – rodents with wrinkled, pink skin and large protruding teeth – live in large, underground families. Most studies to date have been focused on their unique physiological qualities, namely that they rarely get cancer, are resistant to some types of pain, can survive up to 18 minutes without oxygen, and live into their mid-30s, a remarkable feat for a small rodent.

“Naked mole-rats, one of only two eusocial (an extreme version of social group living) species of mammals, use shared dialects to strengthen the unity of their large colonies,” reports the team, whose research article is featured on the cover of the prestigious journal *Science*. “The social and communication skills of human beings and naked mole-rats appear to have much more in common than anyone might have previously thought. Naked mole-rats have a linguistic culture that developed long before human beings even existed.”

“Naked mole-rats are very communicative creatures,” said Prof Gary Lewin, Head of the MDC’s Lewin Lab focused on the molecular physiology of somatic sensation. “If you stand outside their home and listen, you can hear the little rodents quietly chirping, squeaking, twittering, or even grunting to one another. We wanted to find out whether these vocalisations have a social function for the animals, who live underground together in an ordered colony with a strict division of labour.”

According to Prof Nigel Bennett, holder of the South African Research Chairs Initiative (SARChI) chair in Mammalian Behavioural Ecology and Physiology at UP’s Department of Zoology and Entomology in the Faculty

of Natural and Agricultural Sciences, “Like other eusocial organisms such as termites, ants and bees, naked mole-rats live in large groups of around 40 to 50 animals which, in exceptional cases, can reach up to 300 with only one reproductive female, the queen, and one to three of the larger males responsible for reproduction. The remaining colony members are reproductively suppressed. Many species of mole-rat, naked mole-rats in particular, are extremely vocal, and it is of no surprise that they can identify one another by their vocalisations.”

The MDC and UP team, which includes Professor Gary Lewin, Dr Alison Barker, Lina Mograby, mathematician Grigori Vevjurko (who is now at the Delft University of Technology in the Netherlands), Prof Bennett and Dr Daniel Hart, set out to closely analyse the chirps that the naked mole-rats use to greet one another. “In so doing, we established that each colony has its own distinct dialect,” reports Dr Barker, lead author of the study. “The development of a shared dialect strengthens cohesion and a sense of belonging among the naked mole-rats of a specific colony.”

To analyse the naked mole-rats’ language, for two years the research team recorded a total of 36 190 chirps made by 166 individuals from seven naked mole-rat colonies held in laboratories at Berlin and UP. Prof Lewin’s team used an algorithm to analyse the acoustic properties of the individual vocalisations. “That enabled us to collect and compare eight different factors, such as the height or level of asymmetry in the sound spectrogram,” explained Prof Lewin.

Vevjurko also developed a computer programme that, after an initial training period, was able to reliably detect which chirps came from which individual naked mole-rat. “We knew that each naked mole-rat has its own voice. What we did not know, however, was whether the animals could recognise one another from their voices,” Dr Barker said.

The computer programme, which uses artificial intelligence, did not only identify the animals based on their individual voices but also detected similarities in the types of sounds made within a single colony. The programme was able to identify which colony a specific individual came from. “Surprisingly, that meant that each colony probably had its own distinct dialect,” Dr Barker said. At that point, the research team did not yet know whether the animals were aware of that and whether they could recognise their own dialect and distinguish it from others.

After a series of playback experiments it was observed that if the sounds were made by an individual from the test subject’s own colony, it would give an immediate vocal response, but if they were made by an individual from a foreign colony, the mole-rat would remain silent.

“That enabled us to infer that naked mole-rats can recognise their own dialect and will selectively respond to that,” Dr Barker said. In further experiments, the researchers placed three orphaned naked mole-rat pups in foreign colonies where the queen had also recently had a litter. Six months later, the computer programme showed that the foster pups had acquired the dialect of their new home.

The team said the next step is to find out what mechanisms in the animals’ brains support this culture of communication, as this could provide important insights into how human culture evolved. With access to many other species of African mole-rats and with hundreds of hours of observation on the only other eusocial mammal species (the Damaraland mole-rat) under his belt, Prof Bennett believes that this is only the tip of the iceberg, and that with further analysis and continued collaboration with the world’s best at the MDC, the evolution of vocal communication lies at the tips of our fingers.

**The journal article may be accessed at:**  
doi:10.1126/science.abc6588.





## Data Science Africa Research Award for UP project on informal road detection

Prof Inger Fabris-Rotelli from the Department of Statistics and her team were awarded a sought-after Data Science Africa grant for the year 2021.

### The rest of the team consists of:

Ms Renate Thiede (PhD student, Department of Statistics), Prof Pravesh Debba (CSIR competence area manager for spatial planning and systems) and Dr Gao Maribe (Department of Statistics). The grant is very competitive and awarded to only 10 applicants.

The project aims to develop an *informal road detection neural network for societal impact in developing countries*. According to Prof Fabris-Rotelli, "Informal settlements are present in many developing countries in the Global South and pose severe challenges for sustainable development, service delivery and crisis management, including COVID-19 mitigation. The South African census distinguishes between informal and traditional dwellings. According to its specifications, informal dwellings are typically shacks, either on the same property as a government-approved formal house or as part of a larger informal settlement where most other dwellings are informal. Traditional dwellings or huts are made from traditional building materials"

"Unfortunately no such distinction is apparent for roads. Informal roads herein refer to any roads created by residents without government approval. These roads occur in and around a variety of settlements, which may be formal, traditional or informal. They arise naturally through human movement on foot and by vehicle and are not authorised

or maintained by the government, nor commonly recorded in official databases or online maps. The knowledge of roads in informal settings is essential for navigation by medical personnel checking on self-isolating cases during the current pandemic, as well as for access to emergency medical cases in non-pandemic circumstances. In addition, roads provide access to services. Knowledge of the roads assists decision-makers in the optimal placing of additional emergency and support facilities."

Prof Fabris-Rotelli further explains that "The development of an extraction method has to consider the unique challenges posed by informal roads. Due to their unplanned nature, informal roads often occur in irregular networks, and may not have clear boundaries or centrelines. Their unpaved surfaces exhibit heterogeneous colour and fade into their surroundings, and road width may change abruptly. This contradicts many of the assumptions made by traditional formal-road extraction methods. Furthermore, since information on these roads does not typically exist in any database, accuracy cannot be assessed using reference data. An informal-road extraction method must therefore preferably provide a measure of extraction uncertainty that does not rely on a comparison with ground truth. A semi-automatic method for extracting informal roads from satellite imagery has been developed by Ms Thiede in her master's degree (2018-2019)."

"Informal road detection is also important in the context of the current pandemic, where information on transport and access



Prof Inger Fabris-Rotelli

have been shown to play a crucial role in disease tracking, and the provision of support to residents of such informal areas. The uncertainty involved is still a hindrance in such an approach, although very valuable as an open source easily implementable technique."

With the success of deep learning techniques for such an image classification and segmentation task, the obvious next approach would be to investigate the power of a neural network architecture for such informal road detection. The limitation is training data.

This project aims to develop a ground truth training set of informal roads in South Africa, made freely available once in place; and train a neural network for the detection of such informal roads not available currently, for use in the rest of Africa and developing countries across the world," Prof concluded.

The project involves four honours students and a master's student, and is also collaborating with Dr Victoria Rautenbach from the Department of Geography, Geomorphology and Geoinformatics.







## UP plays its part in international project to promote local crops and develop new food products



*Prof Naushad  
Emmambux*



*Prof Riëtte  
de Kock*



*Prof Shakila  
Dada*

***The University of Pretoria (UP) is representing South Africa in a multinational, cross-continental project that aims to enhance food and nutrition security in Africa and open the door to export markets.***

InnoFoodAfrica is a three-year project focused on South Africa, Ethiopia, Kenya and Uganda, but extended to form a multidisciplinary consortium of 20 partners – 15 in Africa and five in Europe. The project is being funded by the European Union's Horizon 2020 programme to the tune of €6,5m (R115,6m), with an envisaged economic impact of €7.5bn (R133bn).

The impact refers to outputs being achieved. If business created after this project was positive in terms of farming and food manufacturing, or if diet-related non-communicable diseases or pollution in the environment were lowered, and bio-based packaging increased, "that could be the impact", said Professor Naushad Emmambux of UP's Department of Consumer and Food Sciences.

Prof Emmambux, who is also the research leader for food processing at the DST-NRF Centre of Excellence in Food Security – which UP co-hosts with the University of the Western Cape – is the principal investigator of the South African leg of InnoFoodAfrica.

UP has been involved from the start. Prof Emmambux wrote the funding proposal with Dr Raija Lantto, principal investigator at the VTT Technical Research Centre of Finland. VTT is now coordinating the project, which began in August 2020.

One of its goals is to develop new ways to add value to the cultivation, processing and production of climate-smart African crops. "Crops like sorghum, finger millet, teff, amaranth, faba bean, orange-fleshed sweet potato, Bambara groundnut and cowpea have great nutritional value, but they are underutilised due to technological challenges in the preparation of food products and acceptable quality for urban consumers," said Dr Lantto.

The project is split into seven work packages, which include researching each country's nutrition status and its link to diet-related diseases, empowering farmers, manufacturing healthy foods





and food ingredients, and creating bio-based packaging that is edible or mostly biodegradable.

InnoFoodAfrica's ultimate aim, however, is to improve food and nutrition security in Africa, said Prof Emmambux.

**More detailed goals include:**

- demonstrating the huge potential of African crops as healthy ingredients in combating both malnutrition and overnutrition;
- addressing the key bottlenecks of African food value chains such as low productivity and limited access to urban markets;
- creating opportunities for export; and
- addressing the needs of vulnerable groups such as malnourished children, pregnant women and adults at risk of obesity.

Besides educating its target groups about improved eating habits, InnoFoodAfrica also wants to increase the diversity of affordable, nutrient-dense and healthy food products based on local crops.

This is one area where UP is playing a big role; by developing new food products. As Prof Emmambux's colleague at UP, Prof Riëtte de Kock, who is also involved in the project, said: "The nutritional value of uneaten food is zero. A food product may contain lots of nutrients, but if it is not acceptable it will not be of any use. It needs to be both appealing ('I want to eat it'), and acceptable ('I consider it as recognisable and appropriate food in my culture')."

Addressing malnutrition in African countries requires nutrient-dense foods that are appealing, acceptable, available, accessible and affordable, she said.

One of the products they are working on is flour from orange-fleshed sweet potatoes. These contain beta-carotene that, when converted into vitamin A in the body, helps boost the immune system. However, these potatoes have a short shelf life of two to three weeks, so the UP team is making flour from them, which expands the number of ways the potatoes can be used. Together with Delphius Commercial and Industrial (CIT) Technologies, they are developing processing equipment that retains more beta-carotene and uses less energy during the drying process.

UP has also developed a fat replacer that it has applied to patent. It reduces the fat content of food but keeps its desirable qualities by mimicking its lubrication, in much the same way oil reduces friction and lubricates parts of a machine. Completely natural, it is made from starch, with the addition of about 2% lipids (fatty acids or their derivatives). "People like fatty food because it's a very nice feeling in the mouth. So if we can make something that tastes similar to fat, but doesn't have the negative aspect of fat, that is a win," said Prof Emmambux.

"We are modifying flours that have a high glycemic index (GI) to make them low-GI," he said. These flours are used to make snacks similar to the popular cheese puffs, but which are high-protein and high-fibre

and so especially suitable for children. InnoFoodAfrica involves a multidisciplinary range of specialists at UP, from food scientists to sensory scientists, nutritionists, agronomists, and agricultural economists. It also includes postgraduate students – six PhD and four master's students, as well as four postdoctoral fellows.

The project has also extended to the Faculty of Humanities. Prof Shakila Dada, Director at UP's Centre for Augmentative and Alternative Communication, is applying its strategies, such as graphic symbol supports, to ensure nobody is excluded from the research because of low levels of literacy, or not speaking the language of the researchers.

***"Our main role is to ensure that the materials, instructions, surveys and communication about the project are accessible (easy to read) and understood,"***

she said.

She also liaises with the Faculty's Department of African Languages for project materials to be translated. "This ensures a more inclusive, equitable research agenda, ensuring that participants who may be otherwise marginalised are now included in the research process," she said.

**For more information, see:**

<http://innofoodafrica.eu>

*Flour from orange-fleshed sweet potatoes (a project the team is working on) contains beta-carotene that, when converted into vitamin A in the body, helps boost the immune system. Image: [www.innofoodafrica.eu](http://www.innofoodafrica.eu)*





## Dr Mumoki contributes to an international article on improving scientific meetings

Dr Fiona Mumoki, a postdoctoral researcher at the Social Insects Research Group, Department of Zoology and Entomology was one of nine early careers researchers from various scientific disciplines to contribute to an article in *Nature Human Behavior*.

In a collaborative initiative and through the 2019 - 2020 eLife Community Ambassadors program, a set of recommendations on how scientific meetings can be improved globally was put forward in a comment published recently in the journal *Nature Human Behavior*.

Data from 270 national and international scientific meetings held in person between 2018-2019 was examined, identifying some shortcomings from the meetings while also discussing ways in which these meetings could be improved.

Key limitations of in-person meetings pointed out to include high costs of

attendance due to high conference registration fees, accommodation and travel, visa requirements that make it impossible for many attendees to travel to some destinations due to travel bans and restrictions, and the various numerous factors that may lead to the exclusion of researchers on grounds such as gender, ethnic, racial, career stages and health.

Several recommendations on ways to improve scientific meetings were put forward. One crucial method is by promoting the use of virtual global conferences with local/regional hubs whenever possible. Here, attendees could meet regionally in hubs virtually connected to larger global meetings.

These virtual meetings could then be recorded and made available online, increasing the reach of these assemblies to attendees who would have otherwise been left out. Further, institutional and funding practices should change to mandate reductions in air travel, to reduce



Dr Fiona Nelima Mumoki

the academic carbon footprint. Third, conference funders and organisers should make a conscious effort to make a fair representation of all researchers. A great way to do this would be to remove biases by blinding the selection of talks and poster presentations.

A link to this article can be found [here](#).



Prof Lise Korsten and  
Dr Willeke de Bruin



**Researchers at the University of Pretoria have recently focused on the impact of increased hand sanitiser use due to COVID-19 regulations.**

Hand sanitisers have traditionally been used in the agricultural and food industries as part of personal hand hygiene strategies. Personal hygiene practices form part of food safety standards used in packhouses and food processing plants. The impact of these hand sanitisers on the hand

## Hand sanitisers becoming the norm: How are we adapting and is it safe?

microflora has also been studied in the context of transmitting possible foodborne pathogens such as *Salmonella* spp., *Enterogenic Escherichia coli* and *Staphylococcus* spp.

Hand sanitisers have now become the norm for all people including children and the elderly with sensitive skins. The use of hand sanitisers is encouraged by the World Health Organisation (WHO) who identify hand hygiene as a preventative measure against contracting COVID-19.

The WHO has guided its formulation and use. Hand sanitisers should comprise ethyl alcohol (ethanol) or isopropyl alcohol (2-propanol) as the active ingredient, in addition to inactive ingredients such as water, glycerol and hydrogen peroxide.

The question remains, how safe is hand sanitisers that has suddenly been introduced to the market and who is regulating this space? What will the long-term impacts be on general public health and hand microflora? To investigate this a team from the Faculty of Natural and Agricultural Sciences, Prof Lise

Korsten, from the Department of Plant and Soil Sciences, Dr Willeke de Bruin, a postdoctoral fellow in food safety assessment and Dr Tracy Muwanga, a postdoctoral fellow in food systems law, have been awarded a small grant under the UNICEF One for Change project namely "COVID-19: Downstream impact of disinfectants and sanitisers on the environment, food and healthcare system: A legal and regulatory framework".

Recent chemical analysis of 60 products obtained from formal and informal markets revealed that only 39 complied with the WHO's minimum prescribed alcohol content of 70%. Seventeen of the products made false claims about their supposed alcohol content.

The effective regulation of hand sanitisers remains a challenge and its long-term impact on the hand microflora and skin conditions such as eczema remains an important aspect to investigate. The team has been advocated for improved public awareness and increased government regulation of hand sanitisers to ultimately safeguard consumers.





## Physics and Biology join forces to study photosynthesis in the Namib

Sea of quartz stones in the Namib, most of which host hypolithons.



Dr Michal Gwizdala



Prof Tjaart Krüger



Dr Pedro Lebre



Prof Don Cowan

The Biophysics Research Group in the Department of Physics has teamed up with Prof Don Cowan and Dr Pedro Lebre from the Centre for Microbial Ecology and Genomics to explore the molecular mechanisms responsible for sustaining photosynthesis of hypolithons (organisms growing underneath translucent stones) in extreme environments.

According to Prof Tjaart Krüger from the Biophysics Research Group in the Department of Physics, "This transdisciplinary topic required a combination of biophysical and biochemical methods, including spectroscopy, fluorometry, and metagenomics, and a multidisciplinary team of researchers.

Fluorometry, which is based on the amount of fluorescence emitted during various stages of the photosynthetic process, is a very sensitive method for quantifying changes in the photosynthetic apparatus in response to light, while spectroscopy, another sensitive tool, was used to closely investigate the light transmitted through the stones and the composition of light-harvesting molecules in the hypoliths."

The research team's first study on hypoliths in the Namib Desert, titled "*Sub-lithic photosynthesis in hot desert habitats*", has recently been published in a prestigious international microbiology journal, *Environmental Microbiology*. The study was conceptualised and driven by Dr Michal Gwizdala, an NRF Y1-rated postdoctoral researcher in the Department of Physics, led by Prof Tjaart Krüger from the same department, and done in collaboration with researchers from the Namib Research Institute at Gobabeb in Namibia.

Prof Krüger also explained that "The study revealed that the translucent stones filter both the short wavelength radiation (UV and blue colours) and high incident visible light intensities in the Namib Desert to create a favourable niche for the organisms in terms of UV protection, light intensity and colour. This is a unique feature because UV radiation and excessive light can be deadly for photosynthetic organisms in more conventional settings.

The study shows that since the light quality is taken care of by the stones, water availability is the primary limiting factor for the photosynthetic activity of hypolithic microbial communities: the organisms can photosynthesise only when liquid water is present. The absence of light-induced

molecular stress mechanisms in these organisms was confirmed by metagenomic analysis."

It is astonishing to see how life finds ways to overcome challenges and how flexible it can be when adapting to harsh environments. With this work, an exciting chapter of multidisciplinary studies has started at UP.

### Article URL:

<https://doi.org/10.1111/1462-2920.15505>



Side view of a quartz stone, showing the hypoliths on the side and bottom.



## Research by UP-led team reveals eating habits of black holes



Dr Jack Radcliffe

*Artist's impression of a galaxy with an active nucleus, a supermassive black hole in the centre. When the black hole swallows matter, two powerful jets can form at the edges of the black hole. These jets form gigantic 'radio clouds' that can be detected by radio telescopes. Credit: ESA/C. Carreau*

### **Research by an international team of scientists led by the University of Pretoria's (UP) Dr Jack Radcliffe has clarified the eating habits of massive black holes.**

The team, which included astronomers Professor Peter Barthel (University of Groningen, Netherlands) and Professor Michael Garrett (University of Manchester, UK), concluded that central black hole growth can occur in many kinds of galaxies. "They feed themselves in various ways: some gobble as much as they can, others digest slowly, and others are starving for food."

This research is important for multiple reasons: It is now well established that there's an intimate link between the creation of new stars and the growth of the central black hole within the same galaxy. For this to occur, there must be some interaction or 'feedback' between the two. This comes in the form of bright radiation from the central black hole. This is a crucial area of research in astronomy, as the Universe we see today is dependent upon the interaction between these two processes. This research is important as it shows that new-generation radio telescopes, such as MeerKAT (in the Karoo desert, SA), will play a huge role in disentangling the link between these two processes.

"However, we show, rather controversially, that some of these objects will remain

undetectable in such studies and show, for the first time, that the radio jets – comprising of fast-moving particles travelling near the speed of light from the black hole and a crucial component of this 'feedback' mechanism – are optional," said Dr Radcliffe.

A black hole is a region of space that is so dense that even light cannot escape. While most black holes are formed when massive stars die, the ones in the centre of galaxies (as seen by the black hole image of M87 by the Event Horizon Telescope) have been growing larger and larger over many billions of years by either merging with other black holes or eating streams of gas and dust, much of which are ripped off stars.

The research was published as a series of two papers in the international journal *Astronomy & Astrophysics*. It entailed a systematic study of the occurrence and nature of nuclear activity in galaxies. The team investigated issues including: 'Which types of galaxies do the central black holes start eating?'; 'How does this manifest itself?'; and 'What is the best way to detect these eating phases in galaxies?.'

Dr Radcliffe, Lecturer in the department of Physics explained that "Occasionally a growth phase occurs simultaneous with a star-formation phase, and is then difficult to detect. The nuclear growth process may or may not generate radio jets. Taken together, the absorption of matter onto the central black hole appears to be a standard ingredient in the life of a galaxy: black holes love food, but they eat in different ways." He finished his PhD on this research in

2019, with professors Barthel and Garrett as his supervisors.

Occasionally an accretion or eating phase occurs simultaneously with stars being created which is then difficult to detect; the nuclear accretion process may or may not generate radio jets. These jets are important in the evolution of galaxies because they heat gas, which can then prevent stars from being formed. On the other hand, the same jets can also cause turbulence, which causes gas to collapse to form new stars. As a result, these jets can essentially regulate how many stars are formed.

"Observations with space telescopes have taught us a lot about active galaxies, but such telescopes are expensive," Dr Radcliffe said. "We have shown that the radio telescopes of today and the coming decade, such as the Square Kilometre Array, based in SA and Australia, are optimally suited to study the eating habits of black holes in galaxies."

According to professors Barthel and Garrett, "The evidence for massive black holes in the nuclei of all galaxies is now very strong. These black holes grow to their current mass, and it appears that our radio studies permit unique observations to address all aspects of the accretion processes, and to ultimately understand them."

Galaxies are the building blocks of the universe. All galaxies, including the Milky Way, harbour supermassive black holes with masses millions or billions of times that of our sun. Galaxies make stars

*...continues on page 21.*





continuously, from diffuse gas clumping together to form new stars, and occasionally during a short but rapid stellar birth wave. At the same time, supermassive black holes at the centre of galaxies grow, during relatively short phases, when they swallow matter from their immediate environment. These growth episodes manifest themselves as violent phenomena: emitting extremely strong radiation that we can then detect with our telescopes.

Astronomers have studied active galaxies since the 1950s and gave them exotic names such as quasars, radio galaxies, and blazars. Decades of study with all kinds of telescopes on the ground and in space have yielded a good, but still not complete, picture of active galaxies.

The astronomers focused their study on a special part of the sky, the so-called GOODS-North field. That field, in size about one-fifth of the area of the full moon, displays tens of thousands of faint distant galaxies, of which already quite a lot was known through studies with large optical telescopes as well as the Hubble, Spitzer and Chandra space telescopes.

Earlier, the team of astronomers used a transcontinental network of ultra-sensitive radio telescope to discover the active galaxies among all the galaxies in the field, and they published the results of that search in 2018. "Their suspicion that this technique is uniquely suited to detect nuclear activity in galaxies appeared true, but also demonstrated the existence of a class of active galaxies which are seemingly invisible to radio telescopes," Dr Radcliffe said.

The publications '*Nowhere to hide: radio-faint AGN in the GOODS-N field*' and '*The radio emission from Active Galactic Nuclei*', by the astronomers J.F. Radcliffe, P.D. Barthel, M.A. Garrett, R.J. Beswick, A.P. Thomson, and T.W.B. Muxlow will appear this autumn in the international journal *Astronomy & Astrophysics*.

#### Scientific papers

"Nowhere to Hide: Radio-faint AGN in the GOODS-N field". By: J.F. Radcliffe et al. Accepted for publication in *Astronomy & Astrophysics*.

Original: <https://doi.org/10.1051/0004-6361/202038591>

Free preprint: <https://arxiv.org/abs/2103.08575v2>

"The radio emission from Active Galactic Nuclei". By: J.F. Radcliffe et al. Accepted for publication in *Astronomy & Astrophysics*.

Original: [www.aanda.org](http://www.aanda.org)

#### Free preprint:

<https://arxiv.org/abs/2104.04519>



## NAS natural product library ready for high throughput screening programmes

The Faculty of Natural and Agricultural Sciences (NAS) is at the forefront of biodiscovery research with the allocation of R26 million funding from the Department of Science and Innovation (DSI) to create a library of natural products.

According to Prof Vinesh Maharaj, Deputy Dean: Research and Postgraduate Education and leader of this project, this funding will be used to create a library of natural products, the first of its kind in Africa and have made significant progress with equipment being installed.

"Due to its geographical position, South Africa is reported to be the third most diverse country in the world. Approximately 10% of the world's known species and 15% of known coastal and marine species are found in South Africa. This presents as a unique resource for the discovery of novel natural ingredients for the pharmaceutical, food and cosmetic industries. However, due to the diversity of the genetic resources, a systematic study of this can only be done through the creation of natural product libraries that are ready for high throughput screening campaigns which are now at the forefront of the pharmaceutical industry in the search for new medicines."

The DSI is funding the creation of a unique repository of natural products as part of the NAS Biodiscovery research housed in the Department of Chemistry.

According to Prof Maharaj, "A collection of samples comprising thousands of plant extracts and 10 000 dry plants are being transferred from the CSIR to the University and is being used as the basis for the library. This is being converted into



Prof Vinesh Maharaj

purified samples consisting of semi-purified fractions and natural compounds stored in microtiter plates ready for high-throughput (HTS) purposes. The infrastructure is being put into place which consists of high end hyphenated analytical equipment such as HPLC MS, HPLC-MS-NMR as well as existing UPLC QTOF MS systems for the chemical characterization of the library. Robotic liquid handlers and robotic freezers will be used for the front-end management of the samples together with a database for future artificial intelligence purposes," he explained.

Collaborations have already been established with Wistar Institute in the United States for COVID-19 anti-viral screening, University of Basel, Switzerland for HIV and COVID-19 screening; Wellcome Institute for Infectious Diseases, the University of Dundee for treatment of leishmaniasis and human African trypanosomiasis, National Cancer Institute in the US and JSS University in India for anti-cancer screening and Zhejiang University in China for inflammatory diseases.





## Fencing-in of Botswana elephants could explain why 350 elephants died in one area, reveals UP-led study

Photo credit:  
Prof Rudi van Aarde



An international study led by the University of Pretoria's (UP) Professor Rudi van Aarde suggests that the mass die-off of 350 elephants in one area of northern Botswana last year could be attributed to the fencing-in of these animals.

Prof Van Aarde, Emeritus Professor of Zoology and Chair of Conservation Ecology at UP's Faculty of Natural and Agricultural Sciences, said while the causes of the deaths are "still unknown and will never be known," the fencing-in of these elephants in one area, and their relatively high densities, probably explain why the die-off occurred.

The study, published in *PeerJ – Life and Environment*, suggests a "re-alignment or removal of fences that restrict elephant movements and limits year-round access to freshwater" is needed.

Botswana reported the death of 350 savannah elephants from May to June last year, sparking speculation among conservationists and the public around the cause. Carcasses were first found in the Okavango Panhandle region. Samples from the carcasses were tested by scientists in Zimbabwe, the USA, and at UP's Faculty of Veterinary Science.

In September officials in Botswana indicated that cyanobacteria (toxic bacteria which can occur naturally in standing water and sometimes grow into large blooms

known as blue-green algae) was the source of the deaths. However, Prof Van Aarde said, "restriction of freshwater supplies that force elephants to use pans as a water source possibly polluted by blue-green algae blooms is a possible cause, but as yet not supported by evidence."

As part of his team's long-running research programme, which considers regional elephant populations and their management, 10 elephants within the NG11 (an administrative district in northern Botswana where elephants and people





share the land) were tracked using satellite tracking collars that were fitted on the elephants to map their movements, along with several hundred elephants in other areas across southern and eastern savanna Africa.

He explained that conditions for elephants in NG11 differ from those of non-confined elephants in the surrounding landscapes: “We show that NG11’s elephants are isolated by the Okavango River to the south-west and by fences on the other sides. NG11 imprisons the elephants, preventing their dispersal when numbers are high or when conditions may become harmful. The population growth rate within NG11 differs from that outside.”

The place in which the die-off occurred is not in a conservation area. Human-elephant conflict is high, leading to elephants avoiding the permanent freshwater sources along which people live, said Prof Van Aarde.

The study argues that restricted elephant movements made this sudden die-off much more likely. “If a contagious agent were

responsible, it would have implications for elephants beyond NG11 and neighbouring NG12, and the consequences of this are important for managing elephant populations across Africa.”

A team comprising UP and Pakistani scientists, including Prof Van Aarde, deduced last year that malicious poisoning and poaching are unlikely to have played a role. Other species were unaffected, and elephant carcasses had their tusks intact.

*“The apparent lack of fresh samples from carcasses and lockdowns of activities to contain the spread of COVID-19 add to the difficulties of establishing the cause of death. We may never have a definitive answer. Instead, the best we can do is to sketch the ecological aspects and setting of the affected area, its elephants, and its surroundings,”*

said Prof Van Aarde.



Photos credit: Prof Rudi van Aarde



Prof Sheryl Hendriks

Professor Sheryl Hendriks, Head of the Department of Agricultural Economics, Extension and Rural Development has been at the forefront of preparatory actions for the [United Nations Food Systems Summit](#).

The Summit is to be held in September and promises to offer a very different outcome to previous summits. Termed the 'people' summit, this summit includes innovations to ensure long-lasting commitment from all stakeholders to ensuring healthier and more sustainable food systems in future.

## Prof Sheryl Hendriks plays leading role in UN Food Systems Summit

A uniqueness of the Summit is the identification of game-changing solutions backed by the latest scientific evidence. Prof Hendriks is among the 25 scientists participating in the [Scientific Group](#), an independent group of leading researchers and scientists from around the world. Its members are responsible for ensuring the robustness, breadth and independence of the science that underpins the Summit. Sheryl has been representing the Scientific Group, working alongside Dr Lawrence Haddad, the leader of Action Track one, supporting the identification of [game-changing solutions](#) – ideas that food system stakeholders can consider as part of a strategy to speed up delivery on the Sustainable Development Goals before 2030.

As the leader of many transdisciplinary programmes and projects in the past, working on complex and complicated social challenges is not novel to Prof Hendriks. In fact, she was part of the High-Level Panel of Experts on Food Security and Nutrition (HLPE) that first defined food systems in a [2014 report](#). She has co-led the drafting of the [Scientific input](#) for the Summit's Action Track one (to ensure access to safe and nutritious food for all by 2030) and

contributed to the drafting guidelines on [healthy diets](#) and the Food Systems Countdown Report. She has participated in numerous independent dialogues, including the African Think Tank dialogues on African food system transformation and led the drafting of a paper on the role of science, technology and innovation in African food systems. She will be contributing to additional dialogues, including South Africa's national dialogue and those of the [Alliance for Food and Climate Systems Transformation](#).

One of her most significant contributions to the Summit is the coordination of a working group commissioned by the Chair of the Scientific Group, Prof Joachim von Braun on costing the hidden costs of our food system. The [recently released report](#) is the first to monetise the environmental and health costs of our current food system and identify the true price of our food.

Understanding the enormous costs of unhealthy food and the environmental impact of its production, processing, storage and transportation highlights the magnitude and urgency of change required to transform food systems.

## DNA of living organisms might assist in navigating climate change

The DNA of living organisms harbour footprints of natural selection that can be used in combination with environmental data to predict how a species will likely navigate climate change.

Dr Marja O'Neill, Postdoctoral Fellow in the Forest Molecular Genetics (FMG) Programme in the Department of Biochemistry, Genetics and Microbiology and the Forestry and Agricultural Biotechnology Institute (FABI) explained that "In a recently published study, the FMG Programme looked at wild populations of the commercially important forestry species, *Eucalyptus grandis*, to identify genetic resources that could be used to improve South African breeding efforts in preparation for warmer and drier climates."

"In this study, genetic profiles of hundreds of *E. grandis* individuals were characterised within the context of several climate, soil and geological factors to uncover genes that may

underlie adaptive differences between wild provenances (source locations). Furthermore, evidence that *E. grandis* has intermixed with another species in provenances at the edge of the species' natural distribution - likely in response to increased aridity - was uncovered. These 'hybrid provenances' may represent valuable genetic material to be infused into South African breeding programmes. This study confirmed that the natural species range of *E. grandis* retains a rich reserve of genetic diversity, which could aid our responses to climate change. The material used in this study will be the foundation of large landscape genomics trials wherein genetic profiles, commercially important traits and environmental variables are combined to model genotype-by-site compatibility," Dr O'Neill concluded.

### Link to the original publication in Molecular Ecology:

<https://onlinelibrary.wiley.com/doi/full/10.1111/mec.15615>



### Link to TIP-Mag Interest piece:

<https://www.forestrysouthafrica.co.za/wp-content/uploads/2021/01/TIP-Mag-Issue-Two-1.pdf>

### Link to FMG Programme:

<https://www.fabinet.up.ac.za/index.php/research-groups/forest-molecular-genetics>





## Alexander von Humboldt Fellow joins SIRG

*Dr Anja Buttstedt, a Feodor Lynen Fellow funded by the Alexander von Humboldt Foundation has joined the Social Insect Research Group (SIRG) of the Department of Zoology and Entomology in January this year.*

Her research focuses on the evolution of new protein functions using the *Major royal jelly protein* (MRJP) family of the insect order Hymenoptera as model system. Whereas most of the sequenced hymenopteran species do only possess a single MRJP gene, this gene multiplied seemingly randomly in some genera, e.g., the parasitoid wasps *Nasonia* and the eusocial honey bees *Apis*, and gave rise to gene clusters with up to ten gene copies. Such gene dupli-/multiplications are known to be major drivers of evolution, as the function of the original gene remains untouched whereas the copy may be changed into something

that eventually enhances the fitness of the carrier.

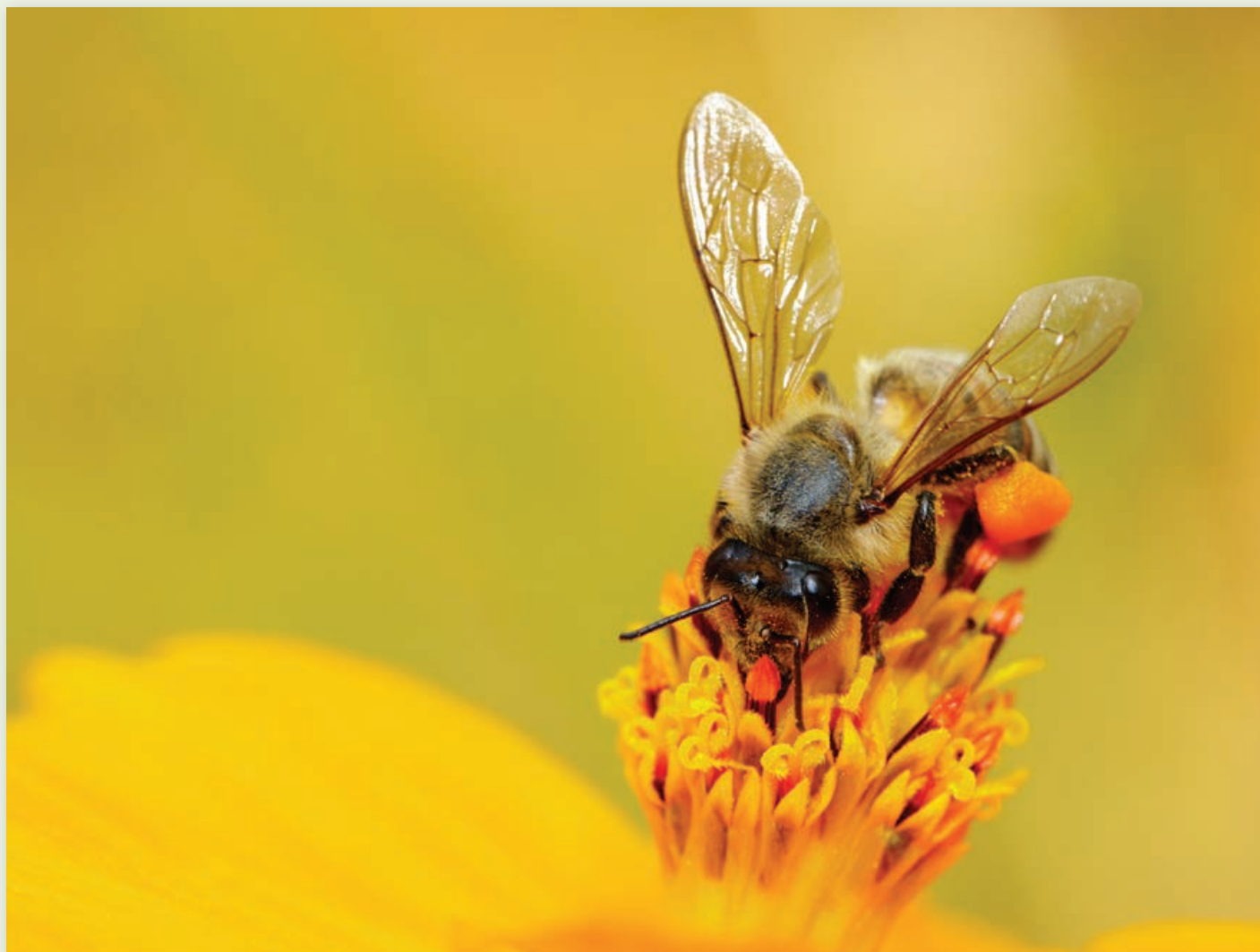
During Dr Buttstedt's functional elucidation of MRJPs in honey bees, she and her colleagues recently showed that indeed at least one of the ten MRJPs, namely MRJP1, neofunctionalised and became essential for the survival of the entire genus (Buttstedt et al., 2018). MRJP1 is amongst others in form of a protein complex involved in sterol provisioning of honey bee larvae.

Her research at the University of Pretoria is hosted by Dr Abdullahi Yusuf (SIRG) and aims on the elucidation of the molecular basis of this sterol provisioning.

Dr Buttstedt completed her PhD in Biochemistry from the Martin-Luther-University Halle-Wittenberg (MLU), Germany in 2011. Her passion for honey bees started in 2012 during her postdoctoral research at the University of Agricultural Sciences and Veterinary Medicine in Cluj-Napoca, Romania.



Dr Anja Buttstedt





## Prof Namrita Lall's research showcased at Kew Gardens

*Prof Namrita Lall, holder of the South African Research Chair Initiative (SARChI) in Indigenous Knowledge Systems (IKS) at the University of Pretoria and who is also on the Essential Science Indicators list of the top 1% of publication outputs (citations) in the discipline Pharmacology and Toxicology, is no stranger to awards and accolades.*

Prof Lall was recently contacted by the Royal Botanic Gardens, Kew and requested to contribute to a new public display in one of their glasshouses, the North Octagon, Temperate house of Kew. Kew Gardens is a botanical garden in southwest London that houses the largest and most diverse botanical and mycological collections in the world.

"According to Prof Lall, "The display addresses the importance of biodiversity in sustainable healthcare. I am also honoured to announce that they include information on one of my articles in the Kew publication on the State of the World's Plants and Fungi."

She was contacted by the Royal Botanic Gardens to contribute as a consequence of an article that she was co-author with her two postdoctoral students, Dr De Canha and Dr Twilley. Some of the information in this paper was also included in the recent [Kew publication on the State of the World's Plants and Fungi](#).

Three books edited by Prof Lall will be showcased at the Royal Botanic Garden Kew Library, which boasts one of the largest collections of published botanical information in the world.

Prof Lall has been also appointed as an Adjunct Professor at the School of Natural Resources University of Missouri, USA



Prof Namrita Lall

(Department is 1 of the top 15 in the world), and at JSS AHER, India and as a Senior Research fellow at the Bio-Tech R&D Institute, Jamaica.

Her research into cosmeceuticals and pharmaceuticals has resulted in various start-up companies such as Tone Tribe, Blyde Botanics, Scholareview, LookSci (formed by Young postgraduates) and Bio Indigenous Solution (a community-based company in Pretoria) and the granting of twelve patents of which nine are internationally filed. Recently, two license agreements have been concluded with "Botanichem" company and "Letago Pharmaceuticals", for various technologies emanated from the team. Recent publications of importance that resulted from Prof Lall's research group include a [review on the COVID-19 pandemic and the potential of natural products to inhibit SARS-CoV-2 \(COVID-19\)](#) and the effect of *Aspalathus linearis* (Rooibos) on the stimulation of melanogenesis.

She has been elected to serve as President-Elect for the prestigious, association, [International Society of Ethnopharmacology](#) (ISE). Further to this honourable position, Prof Lall will then serve as the President of the Society after her two-year term as President-Elect has ended.

Her recent interests include the establishment of the African Phytomedicine Scientific Society which aims to bring together all the African researchers working on medicinal plants. This is a great networking opportunity and to promote our indigenous flora in the African continent.

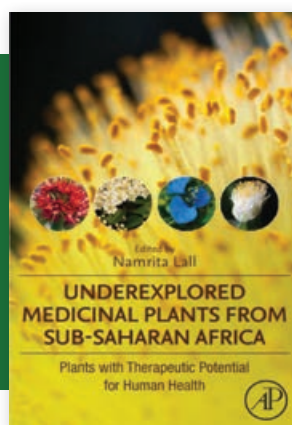
Several prestigious awards have been granted to Prof Lall over the recent years including "The Order of Mapungubwe", South Africa's highest honour from the Honourable South African President Jacob Zuma.

### Books edited by Prof Namrita Lall:

*Medicinal Plants for Holistic Health and Well-Being*

*Underexplored Medicinal Plants from Sub-Saharan Africa: Plants with Therapeutic Potential for Human Health*

*Aquatic Plants: Pharmaceutical and Cosmetic Applications*







## Two UP researchers receive R5,6m in grants to aid research into improving food security and nutrition

Two University of Pretoria (UP) researchers have received grants of up to \$200 000 (R2,8m) each from the Alliance for African Partnership (AAP), as part of the Partnerships for Innovative Research in Africa (PIRA) grant programme.

Professor Eugénie Kayitesi and Dr Farai Kapfudzaruwa are the principal investigators in two research projects that are being funded by PIRA, a tiered funding opportunity designed to cultivate and support multidirectional and transregional research partnerships that are focused on impacting lives and livelihoods in Africa and beyond. One of the unique aspects of these grants is the expectation that organisations will establish and develop equitable partnerships from the conception to the closeout of the project among themselves and with relevant local stakeholders.

Prof Kayitesi, an Associate Professor from the Department of Consumer and Food Sciences in the Faculty of Natural and Agricultural Sciences (NAS) at UP, will lead an investigation that looks into the nutrient deficiencies (iron and vitamin A, and protein) of at-risk populations in South Africa, Jamaica and the USA through the formulation of innovative nutrient-dense composite flours. The funding for the project is for 18 months.

"This project involves innovations around the use of common and recognisable food crops such as dry beans, maize, cassava and vitamin A bio-fortified sweet potato to create products with improved nutritional and health-promoting properties," Prof Kayitesi explained.

Titled *Novel Composite Flours for Globally Nutritious Foods*, the research project

will be tackled by the team, made up of researchers from Michigan State University (MSU) in the USA and University of the West Indies (UWI) in Jamaica as well as the University of Pretoria.

Prof Kayitesi added that she is excited to continue this research, as it deals with malnutrition. "Many communities worldwide suffer high rates of malnutrition, especially among children, while diet-related chronic non-communicable diseases have become a common phenomenon in developed countries. In each of our partner countries, there is limited availability of economical, nutrient-dense flours for small-to medium-scale food manufacturers," she said.

***"The subsequent unavailability of affordable, nutrient-rich, convenient foods for low- and medium-income urban consumers may contribute to malnutrition. It is therefore important to use sustainable and easily accessible (economically and physically) food crops, already in use by the target population, to produce nutritionally-enhanced foods. As a result, this project will present possible solutions for these challenges, thus contributing to nutrition and food security."***

Dr Kapfudzaruwa, Postdoctoral Fellow: Future Africa at the Centre for the Advancement of Scholarship (CAS) at UP, will lead a project titled *Implementing an Africa-Asia Business Partnership Forum using Trans-Local Networks and Transdisciplinary Approaches to Support Capacity Development of African Entrepreneurs and New Collaborative Business Ventures* that will establish an *Africa-Asia Business Partnership Forum* by developing a trans-local network of African and Japanese entrepreneurs,



Prof Eugénie Kayitesi



Dr Farai Kapfudzaruwa

researchers, policymakers, business, civil society and local communities utilising a combination of interactive workshops and two case study "living labs".

"These labs will do the following: Firstly, provide regular opportunities and platforms for young African and Asian entrepreneurs to interact with and learn from experts and leaders engaged in various types of Africa-Asia partnership exchanges; secondly, promote co-innovation of new collaborative business ventures; and thirdly, make room to evaluate the effectiveness, efficiency and validity of trans-local approaches," Dr Kapfudzaruwa explained.

The project's funding is for two years and will bring together researchers from the Michigan State University in the US and Akita International University in Japan. Dr Kapfudzaruwa said this project had an important role to play because it critiques the developmental approach in Africa.





## FPIB research grant of R4.5 m will help to document SA biodiversity



***The Faculty of Natural and Agricultural Sciences has received almost R4.5 million from the Foundational Biodiversity Information Programme (FPIB) for biodiversity research across multiple institutions and disciplines. The funding is for three years.***

According to Prof Nigel Barker, Head of the Department of Plant and Soil Sciences and the Principal Investigator (PI) of this research project, this will document South Africa's biodiversity, focussing on the Waterberg Mountain Complex (WMC) by providing specimens records, genetic information, databases etc.

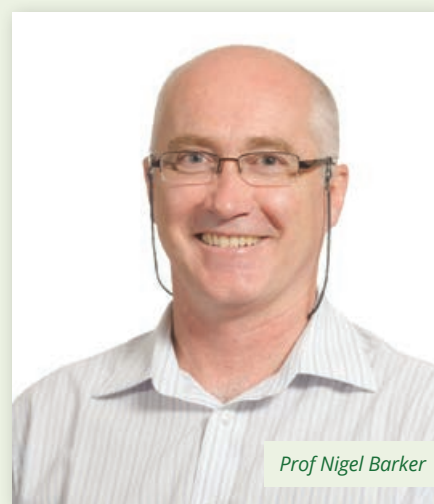
"To put it simply, we intend to survey and sample plants, insects, fish and other aquatic organisms, bats, spiders, small mammals, snakes, frogs etc."

The Waterberg Mountain Complex is a discrete geological entity situated in the Limpopo Province. "Previously largely an agricultural area, there have been considerable changes in land use to

conservation and eco-tourism activities, and one-third of the region has been declared a UNESCO Waterberg Biosphere Reserve (WBR). In addition, Marakele National Park is also situated in the WMC and is part of the WBR, as are some of the Limpopo Department of Economic Development, Environment and Tourism reserves. While thus enjoying some environmental protection, proposed coal mines and related infrastructure projects on the northern borders of this area represent a major potential environmental conflict, and will impact the ecological integrity of the WMC," Prof Barker explained.

"The WMC is a region of special conservation concern. However, despite being situated a mere two to three hours from Pretoria where there is a hub of plant and animal biodiversity scientists and the fact that it includes a large part of the Waterberg Biosphere Reserve, there has never been a comprehensive and structured biodiversity survey of the WMC."

"We want to have as detailed an understanding of what organisms are found in these mountains, which will provide much-needed data and information for the management of the various Waterberg conservation areas and bordering regions. The data generated through this project will



Prof Nigel Barker

support the conservation and management activities of numerous stakeholders in the region. In addition, this information will feed into climate change studies"

Prof Barker concluded, saying: "What makes this project special is that there is funding included for citizen science and community engagement activities, and we anticipate being able to collaborate with local environmental education NGO's and have workshops for teachers from the local schools, interested Grade 12 learners, etc."





## Prof Maharaj appointed as Deputy Dean for Research and Postgraduate Education in NAS

Prof Vinesh Maharaj, a natural product chemist who was trained in the discovery of new pharmaceutical ingredients based on biodiversity samples, was appointed as the new Deputy Dean: Research and Postgraduate Education in the Faculty of Natural and Agricultural Sciences (NAS) from 1 February 2021.

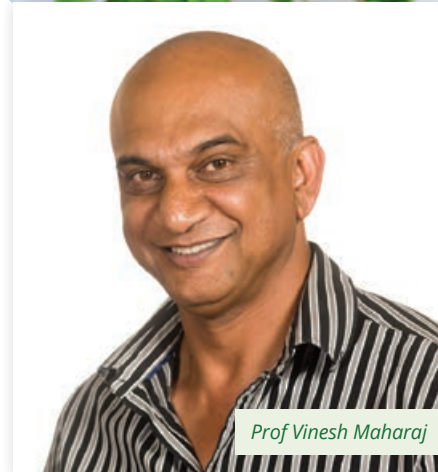
Before this appointment, he was the Head of the Department of Chemistry from September 2016.

Prof Maharaj 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 a high-end robotic system for the creation of a repository of natural products, including compounds ready for high throughput biological screening programmes of pharmaceutical interest. Recently he joined a core team set up by DSI for the discovery of natural products for the treatment of COVID-19 (SARS-Cov-2).

"Strengthening the University's research and international profile, the focus will be on increasing postgraduates through-put, encouraging collaborative research in Africa focusing on research that is of relevance to impact on Africa's socio-economic needs and improving publication impact and citations," Prof Maharaj explained the importance of this portfolio.

He also added that his vision for research and postgraduate education will build on the Faculty's competitive advantage. "This includes its diversity specialising in highly relevant programmes in the Biological, Mathematical, Physical and Agricultural and Food Sciences and with a combined effort significantly contributing to challenges of the National System of Innovation. The Faculty's research impact areas would be focused and aligned in government initiatives and publicising this through more public offerings and closer interaction with government departments, industry, society and funding agencies."

Prof Maharaj emphasised that fundraising is one of the critical areas that will receive attention, especially in the constrained



Prof Vinesh Maharaj

economic environment due to the COVID-19 pandemic. The Faculty will respond to exploit the White Paper which aims to expand research outputs and transform the research institutional landscape, for instance, through programmes to improve the performance of historically disadvantaged staff. The Faculty has some of the most advanced analytical equipment in South Africa. A model will be developed to create a sustainable offering of the services for inter-departmental and external use thereby ensuring a steady income for the sustainable maintenance, upgrading and appointments for the equipment and facilities without compromising research," he concluded.



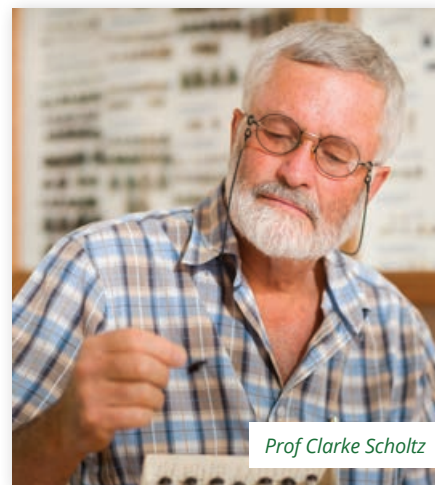
## Book on pollinators, predators and parasites launched

*Pollinators, predators and parasites: the ecological roles of insects in southern Africa* by **Clarke Scholtz, Jenny Scholtz and Hennie de Klerk.**

The recently-published book 'Pollinators, predators and parasites: the ecological roles of insects in southern Africa' had its genesis in the various insect biology courses Clarke Scholtz taught in the Department of Zoology and Entomology over the past 40 years and after teaming up with his conservationist wife, Jenny, and metallurgist-trained (also a UP graduate) passionate natural history photographer,

Hennie de Klerk, started on a 10-year journey to review, research and photograph the insect fauna that culminated in the book.

It was planned to fill a gap on local insect biology and that it would be useful as a student textbook since most of the ecological attributes of the dominant insect groups in the region are covered, but also that it would appeal to a wide variety of entomologists, naturalists, agriculturalists, farmers and veterinarians. The 1 600 beautiful photos in the book should also appeal to anyone who appreciates the aesthetic splendour of the region's (and the world's) most abundant and ecologically important animals.



Prof Clarke Scholtz







## Conversations@NAS launch on World Meteorological Day

The University of Pretoria's Faculty of Natural and Agricultural Sciences (NAS) celebrated World Meteorological Day in style with the launch of the Conversations@NAS initiative on 23 March 2021.

The topic, 'Meteorology in support of decision-making: What lessons can be learned from the extraordinary weather events of the 2020/2021 rainfall season?' gained great interest and many high profile guests attended the virtual event.

Prof Barend Erasmus, Dean of the Faculty of Natural and Agricultural Sciences, chaired the panel and explained that "A core part of re-imagining higher education is how universities work with broader society to tackle the global existential crises of our time. These collaborations need conversations, and Conversations@NAS provides the platform for the required thought leadership and solutions."

Mr Mnikeli Ndabambi, Acting CEO of the South African Weather Service (SAWS), was the first speaker to share his views. "Without collaboration, we won't achieve any success – collaboration with the private sector and meteorological societies and the government are equally important." Prof Willem Landman from UP's Department of Geography, Geoinformatics and Meteorology (GGM) and a renowned seasonal forecaster, reiterated that all stakeholders need to be involved and part of the conversation about meteorology. "Forecasting is part and parcel of decision making and we need to understand what people and organisations require from



forecasting." He also acknowledged the positive relationship that exists between the Department and the SAWS.

***"It is not always necessary to provide clients with more complicated data, but rather make sure that the information is useful for them and that they understand it and that the information is applied successfully,"***

said Mr Sihle Kunene, Meteorological Product Developer at Africa Weather and a UP alumnus who also shared his views as a panellist.

Prof Liesl Dyson, also from GGM, focusing on weather forecasting, shared her experiences of recent extraordinary weather events, including 'Africanes' (a new concept which is tropical cyclone-like with low-pressure systems that develop

over southern Africa and is responsible for widespread, heavy rainfall and floods) and tropical cyclones such as Eloise. "Weather forecasting has many financial implications and affect the livelihood of people."

Another UP alumna also participated in the first Conversations@NAS, Ms Elizabeth Viljoen from the South African Weather Service shared her insights on the success of the SAWS Impact-Based Severe Weather Warning System. She underlined the fact that early warning systems need to be understandable and easy to use.

Dr Thando Ndarana, from UP's Department of Geography, Geoinformatics and Meteorology is an expert on dynamic meteorology explained that there need to be more research done on the medium range for weather events (seven to 14 days forecast). "If we understand this better, we would be able to plan better."

[Click here](#) to view the recording of the first Conversations@NAS on 23 March 2021.

*Prof Terry Aveling*

It is with great sadness that we announce the passing of Professor Theresa Ann Sheila (Terry) Aveling, an associate professor in the Department of Plant and Soil Sciences at the University of Pretoria's Faculty of Natural and Agricultural Sciences on Friday 18 December 2020.

Prof Aveling (58) completed her PhD degree in seed pathology at what is today known as the University of KwaZulu-Natal (UKZN). Her thesis resulted in seven peer-reviewed papers. Later she was awarded a six-month British Commonwealth Fellowship

## Final farewell to Prof Terry Aveling

at the University of Aberdeen, Scotland in 1999/2000 working alongside Dr Powell. They published one of the few papers combining seed pathology and vigour, a niche field.

She was considered one of the leading seed scientists in the country and established the Seed Research Unit at the University of Pretoria (UP), which is now internationally recognised. Prof Aveling also developed the Seed Science course that is now mandatory for all seed analysts working in South Africa, according to the requirements of the South African National Seed Organisation (SANSOR). Prof Aveling was internationally recognised for her leadership role in seed science through her active engagement with the International Seed Testing Association (ISTA). She also served as chairperson on many ISTA committees. As invited/guest professor and researcher, she established long-term research collaborations with institutions in Spain, Norway, Poland, France and Benin.

To date, 27 MSc and 13 PhD students have graduated under her leadership. Prof Aveling and her students have published 56 scientific papers (549 citations), with

an H index of 14, and she held an NRF C3 rating. She has more than 100 national and 98 international conference presentations with co-authors from Africa, Europe and the USA. Prof Aveling has given numerous keynote presentations and has been the organiser/convener/chair of numerous national and international conferences, workshops and symposia for the seed industry.

Prof Aveling's postgraduate students describe her as an inspiration and fearless soul who taught them to be brave and 'live life to the fullest even if you have a disability'. She made everybody feel like somebody, saw the potential in every student and never judged people.

She worked at UP for 33 years and was an excellent lecturer and was proudly a plant pathologist. We as friends, colleagues, students and the wider plant pathology community will sorely miss her!

*Acknowledgement for the eulogy to Prof Lise Korsten, Prof Nigel Barker and UP Plant Pathology staff.*

*“ Prof Aveling was considered one of the leading seed scientists in the country and established the Seed Research Unit at the University of Pretoria (UP), which is now internationally recognised. ”*







## Prof Lötz Strauss – emeritus professor in Physics passed away



Prof Lötz Strauss

Prof Lötz Strauss, a well-known emeritus professor in Physics at the University of Pretoria (UP) and the ‘father’ of Sci-Enza has passed away on 25 November 2020.

Prof Lötz Strauss was born on 16 May 1930 and grew up in the Free State town of Brandfort. He obtained his BSc (Physics) at the UFS in 1949, after which he taught science and mathematics at various schools, mainly in Namibia.

He obtained his education diploma (THED) in 1955 at Johannesburg College of Education, and in 1960 he was appointed as technical assistant in the Department of Physics at the UP and a year later as a lecturer. He obtained both his MSc and PhD in nuclear physics at the University of Pretoria and was promoted to associate professor in 1977 and professor in 1984.

Although his research for his MSc and PhD led to a couple of publications, he never pursued a research career but instead found his real passion in teaching. He had a remarkable talent to explain physics clearly and the thousands of students that passed through his hands when he taught introductory physics to the B.Sc. and B.Eng. groups from 1968 to 1995 still remember his lectures in the A.E. du Toit Auditorium and his no-nonsense but also fair and caring approach to teaching.

He developed and published two textbooks “Inleidende Fisika” and “Wiskunde vir

Natuurwetenskaplikes”, both of which he translated into English. He also published numerous papers on science education in journals aimed at teachers and lecturers.

He realised the importance of school-level science and mathematics teaching and in 1990 he submitted a proposal on improving the state of mathematics and science education, which was accepted and acted on by the minister.

Hereafter he was appointed ad-hominem member of a committee that made further suggestions for solving the crisis in teaching science and mathematics in South Africa. He also served as chair of the Foundation for Education, Science and Technology (now SAASTA), and was a consultant on many SABC television series developed for secondary education. On a personal level, he helped many school leavers prepare for university by presenting informal mathematics bridging courses.

Prof Strauss was an early enthusiast of computer-based instruction and was a strong supporter of its implementation at the University of Pretoria as early as 1983 when he published a paper in ‘UP Dosent’, which later led to the establishment of the Gold Fields Computer Centre at UP in 1988.

In addition to teaching at university level, Prof Strauss loved explaining science to the public and presented many lectures on science to groups ranging from schools to societies. He presented numerous radio and television series on science, physics

and classical music. From the 1980s to 2010 he answered physics-related questions on the radio programmes ‘Hoe verklaar u dit?’ and later ‘Ek wil weet’. Many of the interesting questions answered in the radio programme were published in a series of books with the same name.

*One of his greatest contributions to UP was the establishment in 1977 of Sci-Enza, South Africa’s oldest interactive science centre. He aimed to allow the public and students to experience physics principles hands-on.*

*He was also the driving force behind the Camera Obscura and Foucault pendulum that were installed in the Natural Sciences 1 Building. Sci-Enza has since expanded and moved into much larger premises to become an integrated science, engineering and technology centre with more than 200 exhibitions with daily visits by school groups and the general public.*

Prof Strauss was one of the founding members of “Expo for Young Scientists” which is now known as the “Eskom Expo for Young Scientists” and is South Africa’s largest science fair. He also contributed significantly to the Afrikaans-English Physics Dictionary. His hobbies included classical music, photography and scientific illustrations. He was an organist in his congregation and directed many choirs. After retirement, he also presented many radio programmes featuring classical music from his extensive collection.

He was awarded the Suid Afrikaanse Akademie vir Wetenskap en Kuns Erepenning vir Wetenskaplike Vakbevordering and the Laureatus award of the Bond van Oud-Tukkies (TuksAlumni Association).

He is survived by his wife Esther, his children Heinrich and Marlene and grandchildren.

*Prof Keith Beavon*

**Prof Keith Beavon, a former Head of the Department of Geography, Geoinformatics and Meteorology, passed away on 16 April 2021.**

Prof Beavon joined the University of Pretoria (UP) as Head of the Department of Geography in 1999, following his 'retirement' from Wits University as Dean of the Faculty of Education and Faculty of Arts.

Under his watch at UP, the Department of Geography, Geoinformatics and Meteorology was formed in 2002 with the amalgamation of the former Department of Geography with the Meteorology component (with its mathematics and physics focus) from the Department of Geology, and the Geoinformatics component (with its computer science focus) from the Department of Town and Regional Planning. Environmental sciences had also become a discipline in its own right, which allowed the scope of the Department to widen significantly. Prof Beavon served in this position until he officially retired from UP in 2005.

## Remembering Prof Keith Beavon – HoD of Geography, Geoinformatics and Meteorology

Colleagues who worked with him at UP remember him for his integrity, his no-nonsense and to-the-point approach, coupled with a dry sense of humour, which served him well for the difficult task of merging academics from very different backgrounds into a single department. He was wise and extremely supportive, especially of the younger academic staff members, and even support staff remember him fondly. He knew the sadness and happiness that happened in his colleagues' lives. At Friday get-togethers, the week would be recapped and birthdays celebrated.

One of his former students, Prof Greg Breetzke, who is now a staff member, describes him as the most brilliant storyteller and lecturer he ever had as a student. He could grab the attention of a class for the entire 50 minutes, without the help of an overhead projector or presentation slides, and inspired students by his enthusiasm for the geography discipline.

For Dr Nerhene Davis, also a current staff member, Prof Beavon was the most delightful breath of fresh air who often ridiculed bureaucratic red tape and just got things done in a no-nonsense manner. "We never knew where his incredible sense of humour would lead a discussion in the tea room and we often left it with residual laughter. With his easy-going approach to heading the newly merged department, his seminal contribution in the field of urban geography became almost forgotten. It was only when I attended local and international conferences that I realised the true extent of his scholarly contributions. His legacy for me is, therefore, one of a very formidable

academic who remained humble and approachable to students and staff with a keen academic and humane curiosity".

Nearly 20 years ago, Prof Beavon also taught Mr Michael Loubser, who now teaches geography to our students. He can still remember the stories of Paris during the Industrial Revolution, and how the huge changes taking place at that time influenced the development of the city.

Prof Liesl Dyson, remembers Prof Beavon's very untidy desk as one of his most noticeable characteristics. There were a hundred books stacked on the desk – some were not sure whether he was able to work there, while others were convinced that he could find everything in the "professor's chaos". He did not suffer fools but he was also very kind. He told her to stop making excuses for not completing her PhD, which gave her some momentum in that direction. However, he was also very supportive when her father was diagnosed with cancer and attended the funeral in Benoni. She had the opportunity to accompany him on an excursion through Johannesburg after he had retired - his wit and knowledge kept them all spellbound: Johannesburg, through his eyes, was so interesting!

Prof Beavon was a truly remarkable man. He will be missed, but his legacy lives on in the students he taught and the young colleagues he mentored. Many have spread their wings and are working in industry and academia all over the world. He shaped the Department in its early days and we are grateful that we have his legacy with us in the department today.



## The Faculty of Natural and Agricultural Sciences is the most diverse faculty of its kind in Africa.

All degree programmes are designed to develop problem-solving individuals who can easily adapt to changing circumstances and take the lead in their chosen fields of specialisation. Our world-class qualifications provide access to numerous career opportunities for dynamic and creative people. Some of the Faculty's degree programmes are unique to the University of Pretoria, while others are also offered at other institutions.







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