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SQUARED² UP

Newsletter of the Faculty of Natural and Agricultural Sciences

November 2024

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Make today matter

Second successful RESEARCH SYMPOSIUM showcased cutting-edge research and collaboration

Advancing new frontiers in natural and agricultural sciences by showcasing cutting-edge research, postgraduate education and collaboration with industry was centre stage at the Faculty of Natural and Agricultural Sciences (NAS) second Research Symposium from 4 to 5 September 2024.

Ms Rimbilana Shingange, Lecturer and PhD candidate in the Department of Animal Science was the dynamic programme director and guided everybody through their paces.

Prof Barend Erasmus, Dean of the Faculty, officially opened the Symposium. "Following the success of the inaugural Symposium in 2023, NAS built on the momentum with this year's event, where topics such as interdisciplinary and transdisciplinary research, industry partnerships, and national and international collaboration will be discussed."

This **hybrid event** mobilised researchers, postdoctoral fellows, students from various departments in the Faculty and University, and members of industry and researcher organisations.

He added, "This year, we want to **showcase, connect and inspire**. "This is an opportunity to get to know what your colleagues do and connect with the industry. Final-year and postgraduate students will hopefully be inspired and get the opportunity to discover what is next in their academic careers."

Prof Erasmus emphasised the importance of ensuring that "you don't miss the bigger picture. Climate change affects everything we do on planet Earth—in the past nine years, we experienced the highest temperature ever. Therefore, in the global context, we must stay on top of what is happening because this will give you a competitive advantage."

Poster session convenor, Prof Gregory Breetzke (centre), with poster winners, Shalya Moodley, Kira Lynn, Thabang Msimango and Sphiwe Skosana.

Prof Bruce Mellado, Coordinator of the Technology Innovation Platform in Artificial Intelligence (AI) at iThemba LABS and the SA-CERN Technology Innovation Pillar; Senior Advisor in AI for the School of Medicine at Emory University and Healthmetryx, was the guest speaker for the day spoke on the topic *Technology Transfer with Emphasis on AI for Health*.

Three sessions with speakers from industry and academia shared their insights on themes ranging from Agriculture and Food, Science and Water, and Big Data Science.

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Message from the Dean Prof Barend Erasmus

Jacarandas are blooming beautifully now, a sign of exam time and the fast-approaching end of the year.

It is not just the jacarandas that are starting a new cycle of life. October 2024 is also the start of a new era for the University with the appointment of a new Vice-Chancellor and Principal, Prof Francis Petersen. We want to warmly welcome Prof Petersen and look forward to working with him. He has already held a series of one-on-one engagements and team strategy sessions, and we look forward to welcoming him in the new year for an open meeting with the entire Faculty. His arrival at UP also coincides with the next iteration of UP's planning process for the next 10 to 15 years. Keep an eye out for communication from the VC's office on this matter, and make sure you use the opportunity to participate in shaping UP's strategy for the next decade.

Speaking of new things... NAS and the Faculty of Engineering, Built Environment and Information Technology (EBIT) are combining forces to host the first Science and Engineering Open Day on Saturday, 8 March 2025 (page 50). Learners from Grades 8 to 12, as well as educators and guardians, can explore opportunities in science – where curiosity meets innovation. In the run-up to the event, we will intensify our digital marketing campaign to ensure potential learners and their parents and guardians are kept abreast of this exciting venture.

As part of UP's financial sustainability plan, there is a new emphasis on meeting student enrolment targets. As the pool of Grade 12 learners with the required mathematics marks gets smaller, the competition for students among science and engineering faculties at the top universities increases. We must do everything possible to meet our enrolment targets and ensure the conditionally admitted students who attended the #ChooseUPDay in August register to join us in 2025.

Spring graduations are a distant memory, but NAS produced exceptional graduates, as always. The Faculty is renowned for delivering about 25% of the University's research output, and it was no exception with the conferring of 36 PhDs (out of the University's total of 148 PhDs). Inspirational stories were shared, including that of graduate Celeste Fourie, who discovered she had a brain tumour while studying for a master's degree in meteorology (page 37).

In 2023, the Faculty had its first Research Symposium to showcase the depth and breadth of our expertise. In 2024, we built on this success by hosting a second event in August and advancing new frontiers in natural and agricultural sciences, showcasing cutting-edge research and postgraduate education. Like the first event, having our industry collaborators on site was mutually beneficial - our students could explore possible employment opportunities, and the industry partners could see what cutting-edge new science the Faculty is doing (page 1).

Cutting-edge research is synonymous with the Faculty, and in this edition, we share how our researchers have been part of a ground-breaking international study to understand how plants found in drylands have adapted to these extreme habitats (page 12). Our Mammal Research Institute Whale Unit leads a new global network to galvanise conservation action for the increasingly vulnerable Indian Ocean humpback dolphin (page 14). Also, read more on how UP and CSIR pioneer maps for maize farmers to enable precision weeding (page 18).

Innovative approaches to teaching and learning remain a high priority. Culinary arts students hosted a creative culinary experience for food and plant enthusiasts in collaboration with Future Africa Indigenous and Orphan Crops Collection of the Manie van der Schijff Botanical Garden and the Botanical Society of South Africa. They featured innovative dishes made from indigenous species that contribute significantly to enhancing the genetic diversity of the food system (page 35).

Our research endeavours continue to reach new heights. NAS researchers rise to the challenge of sharing their transdisciplinary research in the latest edition of the University's Re.Search magazine (page 15). It features many research highlights relating to food security, conservation and other important focus areas in NAS.

Our partnerships for impact are also highlighted, with UP playing a crucial role in the Food and Microbiota in Africa (FAMA) project, which aims to assess the role of traditional African foods in improving gut microbiota and reducing the triple burden of malnutrition in South African and Senegalese populations (page 52). The Department of Statistics at the University of Pretoria (UP) is partnering with the United Nations Volunteers to develop and validate a Global Volunteer Index Framework (page 53). This is a large and prestigious grant, and UP had to compete with the best in the world to be the final and only recipient of this grant.

We round off the bumper edition with highlights of the RETHINK@NAS Transformation Initiative's activities (pages 45-49), including the NAS march to raise awareness for women and the 'Buckets of Hope' initiative. The latter is a heartwarming collaboration with SA Harvest that has recently concluded but left a lasting impact on our communities. SA Harvest collects essential, non-perishable food items and supplies for vulnerable families across South Africa (page 45).

We are in the final stretch of the academic year, and I want to thank everyone for their contributions, hard work, and dedication to making this Faculty as outstanding as it is. Exams are underway, and there are still a few tasks and obstacles to overcome in the next few weeks. But as always, we tackle the challenges with enthusiasm and determination.

I encourage you all to take a well-deserved break over the festive season. Take the time to appreciate your loved ones and do the things that inspire and keep you happy. I wish you and your loved ones a safe and joyous holiday and look forward to welcoming you back in the New Year.

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Prof Vinesh Maharaj, Deputy Dean for Research and Postgraduate Education in NAS, opened the symposium on the second day and highlighted some of the Faculty's research endeavours and output successes.

A highlight of the second day was the presentation of Dr Stavros Nicolaou, Group Senior Executive, ASPEN PHARMA, who joined virtually. His address focused on *"Moving Toward Health Security in Africa – What's Necessary".*

Postgraduate students and postdoctoral fellows also had the opportunity to share their experiences at the Symposium. Dr Carmen Muller, a postdoctoral fellow at the Department of Animal Science, chaired the session, and it kicked off with Ms Imke Smit, an MSc student in the Department of Plant and Soil Sciences, sharing more about the unexpected challenges presented by a master's degree. Mr Tsholanang Rammopo, a PhD candidate in the Department of Geography, Geoinformatics and Meteorology, shared his views on the PhD journey titled *What Are You?* Dr Lethula Mofokeng, a postdoctoral researcher in the Department of Chemistry, shared more on postdoctoral challenges and expanded opportunities, with Ms Nyasha Mureriwa, who is working at Swift Geospatial, concluding the session by sharing her talk on *The Thin Line Between Theory and Application*.

Speakers from NAS, Health Sciences and Veterinary Science focused on Animal and Human Health. Mr Steven Ball, Director of TuksSport, gave a motivational talk titled, *For the Love of the Game. What on Earth Can Help Me?*

The symposium concluded with a poster session where postgraduate students had three minutes to explain their posters to the audience. Prizes were given to the best two presentations and the best two posters displayed during the Symposium. Sphiwe Skosana, PhD candidate in Statistics, won the first prize in the poster presentation section, with Thabang Msimango, PhD candidate in Biotechnology, as the runner-up. Shalya Moodley, an MSc Microbiology student, won the first prize in the posters exhibited section, with Kira Lynn (PhD candidate in Genetics as runner-up.

For those who missed the event, both days are available online:

Watch Day 1

Watch Day 2

RESEARCH

African mole rat

NAS experts contribute to discovery of new 'superpowers' in mole rats, which could inform human health interventions

Prof Nigel Bennett

Dr Daniel Hart

University of Pretoria (UP) scientists have contributed to discovering how the naked mole rat is able to withstand heart attacks and fend off bowel cancer, two of the most fatal human ailments in the developed world. Their findings were published recently in two *Nature Communications* papers.

Prof Nigel Bennett and Dr Daniel Hart, co-authors on both papers and experts in mole rat evolution from the Department of Zoology and Entomology in the Faculty of Natural and Agricultural Sciences (NAS), say the findings add to a long list of mole rat "superpowers" that have already been discovered, including slower ageing, natural contraception and the ability to bypass pain responses – all of which are of great interest to biomedical researchers working on human health.

"The main reason we believe mole rat have these 'superpowers' is because they live in such harsh environments underground," Dr Hart says, adding that there is very little oxygen underground and that the roots mole rats eat are tough, fibrous and even toxic to most mammals.

He says the best place to study colon cancer in mammals, a disease characterised by cell division gone wrong, is in the intestinal crypt, a small pocket at the base of the intestine where stem cells are found. These cells normally begin to divide, and specialise into intestinal cells that line and protect the gut.

"If something is wrong with the stem cells, the animal has big problems," Dr Hart says. Mice, for instance, will die when given a cancer-causing agent that targets those stem cells. But not the naked mole rat.

"We saw no physical damage in the animal when we attempted to induce the precursor to colon cancer, and no signs of distress – just business as usual," Dr Hart explains. When they had a closer look at the intestinal crypt using specialised scanning techniques, they found that the stem cells had simply stopped dividing to protect themselves against damage from the cancer-causing chemical.

"It's like [the stem cells] batten down the hatches until the storm is gone; it's as if they go into a dormant stage," Dr Hart says. "Then when the stressor has left, they come out and start dividing again."

The researchers also found more intestinal adult stem cells, and more cells that protect against gut cancers and degradation due to ageing. This is not surprising, Dr Hart says, because scientists have already noticed that all mole rat species have a very low incidence of cancer, so it's likely these kinds of mechanisms confer protection against all cancers, not just colon cancer.

Much of the experimentation behind the cancer discovery was done at UP at the specialised mole rat laboratory established by Prof Bennett. Dr Hart says the work would have been impossible without their collaborators from the University of Oxford in the UK, led by Dr Shazia Irshad and Dr Shamir Montazid, as well as Dr Sheila Bandyopadhyay of Rutgers University in the US.

The UP lab, which was recently featured in the "Dark" episode of the BBC documentary series *Mammals*, is home to about eight different mole rat species, many of which are unique to South Africa and exclusively studied there. International researchers working on more common global species like the naked mole rat often look to UP for evolutionary comparisons and cross-species studies.

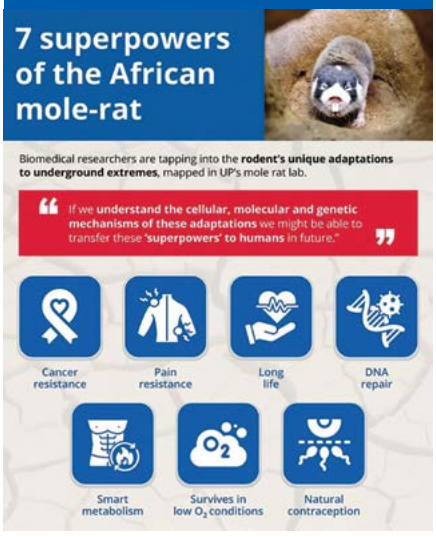
"We have opportunities to work with some of the best scientists and laboratories in the world because we have these mole rats," Dr Hart says. "We aren't just seen as a source of material or source of potential, but as equal collaborators."

To bring the bowel cancer finding closer to human biomedical research, the genetic markers must be pinpointed next, Dr Hart explains, so that gene therapies for equivalent human genes can be investigated. This is exactly what the international team of scientists studying naked mole rat heart attacks have done: they mapped the genetic adaptations that keep a naked mole rat's heart beating despite it being deprived of oxygen and nutrients.

In humans and other mammals, a heart attack occurs when the heart's oxygen and food supply is interrupted, due to a blockage in blood vessels, for instance. When researchers tried to induce a heart attack in the naked mole rat, as they would usually do when studying mice and other mammals, the super critter's little heart just kept beating and suffered almost no damage. The research team went on to pinpoint the specific metabolic and genetic adaptations that protect the naked mole rat's heart.

Prof Bennett's laboratory helped conceive this study and provided species comparisons for this experiment; his team praised the brilliance of the international team, led by Dr Dunja Aksentijevic and Dr Chris Faulkes of Queen Mary University of London, for the heart findings.

Click on the infographic below to learn about the seven superpowers of the African mole rat.



Urgent call for clean-up of toxic Krugersdorp mine dumps

Young children in Krugersdorp are breathing in uranium, arsenic and mercury fumes wafting over from abandoned legacy mines, while pollutants are seeping into the groundwater and nearby dams and lakes, cautions Dr Alseno Kagiso Mosai, a water remediation expert at the University of Pretoria's (UP) Department of Chemistry.

"If this is not treated now, the effects of legacy mines will continue and the impact will be much more severe," he says. "This means that the government will need large amounts of money to clean the water in order to bring it up to the standard needed for households."

Dr Mosai says that while the mining companies responsible for the pollution are often nowhere to be seen, it is ultimately up to the government to fund acid mine drainage (AMD) clean-ups in order to protect the right of citizens to a healthy environment and clean water.

"Many AMD clean-up technologies do exist," he adds. "Some are more or less expensive, while others are more or less effective, depending on the local context."

To help authorities take urgent action in Krugersdorp and other parts of South Africa, Dr Mosai and fellow experts Dr Gebhu Ndlovu, of national mineral research organisation Mintek, and Professor Hlanganani Tutu, of the University of the Witwatersrand, authored a journal article in which they reviewed existing technologies, and recommended a combined approach that is both affordable and effective.

Communities at risk

"Krugersdorp is full of legacy mines, and most residents who live in the vicinity of the mine dumps have had serious health issues, such as asthma," Dr Mosai says, noting that this is backed up by several research studies.

"I've been there and I've seen it," he adds. "It is not only kids – there are dams in this area that are used by older people for recreational activities like swimming, as well as religious activities like baptisms. We talk to them about the dangers, but they're just doing these things innocently; it's really sad for me and my colleagues to see."

Dr Mosai explains that because the toxins can spread in both the air and in the water, even people who live some distance away from mine dumps may be affected.

Call to action

The scientists are calling on authorities to make use of two technologies developed by South African researchers at Mintek: one precipitates unwanted toxins and the other uses microorganisms sourced from plant waste to "eat" heavy metal pollutants. The technologies are trademarked as SAVMIN™ and CloSURE™ respectively.

Dr Mosai explains that in the case of using microorganisms, there is the double benefit of recycling plant waste while saving costs on water treatment chemicals. Both technologies would also enable precious metals like cobalt, copper and nickel to be recovered for commercial use.

"It is therefore in the interest of municipal decision-makers, industry and other researchers to take note of the review article, so that South Africa doesn't keep reinventing the wheel when it comes to researching new AMD clean-up technologies, and so that the benefits of mine remediation for governance, business and the safety of our children become clear," he says.

On a positive note, Dr Mosai adds that UP experts like himself have been supporting remediation efforts by the national Department of Water and Sanitation, which has detected toxic mine elements in several areas.

"If we don't act now though, this issue is not going to go away," he says.

Click on the gallery to see some of the effects of Acid Mine Drainage.

Dr Alseno Mosai

Acid mine drainage is a persistent old enemy of the environment despite so many solutions available.

Food scientist develops new assessment tool


Nomzamo Dlamini

Knowing what motivates people to select the food they purchase and consume is not only necessary for optimal product development, but is crucial for achieving successful diet intervention and effective consumer education towards positive public health outcomes. Food choice motives are vast and complex, and understanding them is a subject that researchers have approached, determined and quantified in a number of ways, given their important implications.

PhD candidate Nomzamo Dlamini of the University of Pretoria's Department of Consumer and Food Sciences recently published her article "I find it hard to change poor food habits": *Measuring food choice motives in an emerging economy* which sought to develop a tool to study people's food choices in an emerging economy. While researchers all over the world, including in Africa, use questionnaires to study people's food choice motives, Dlamini realised that most of these tools were developed in the global north, using insights from people living in these contexts.

"As these questionnaires did not fully reflect the factors considered by people in an emerging economy when making food choices, I saw a need to create our own tool using present-day insights from people in this context," she says. "In that way, we could get a more accurate understanding of the factors driving people's food choices, and use this information to implement necessary changes."

Dlamini combined both quantitative and qualitative research to produce an alternative food choice questionnaire for use in emerging economies. A total of 814 completed responses from people living in urban cities in all nine provinces of South Africa was obtained. The majority of respondents were women (69%) and black (58%). They also tended to be working class (30%), full-time employed (37%), between 18 and 35 years old (42%) and with high school education (45%) completed. 58% were the primary decision makers regarding food eaten and purchased in the household. This tool, she says, is more nuanced, and can be leveraged by researchers in emerging economies to understand the factors driving food choice.

The statements derived from the study, highlighting factors underlying food choice in an emerging economy include: Healthy eating constraints, Frugality, Emotional eating, Meat appeal, Weather, Quality seeking, and Cooking constraints. Some interesting findings were the unique factors that emerged in this questionnaire that are not typically reflected in conventional food choice questionnaires. "This includes, for example, the constraints to healthy eating, rather than the health-positive questions found in conventional questionnaires. Affordability (in addition to preferences for unhealthy food, mood, and longstanding unhealthy food habits) makes a healthy diet hard to attain for many. Another example is the importance of meat eating, which was uniquely highlighted in our questionnaire. For many Africans, eating meat is aspirational and an important part of culture and socialisation, with everyday meals and special occasions planned and built around meat. In contrast, people in developed countries are in the process of adjusting to eating less meat, and meat may lose its significance in these countries," Dlamini says.

A follow-up study to this questionnaire was the application of the food choice questionnaire to test its ability to predict people's food choices, and Dlamini says that the results look promising. "We also did a cross-cultural study as part of the InnoFood Africa project by administering the questionnaire to urban dwellers in seven different countries (South Africa, Ethiopia, Kenya, Uganda, France. Finland and Norway) and the analysis of this data is soon to be underway. Something else I am currently busy with is wrapping up my time in the USA as a visiting student researcher on a Fulbright scholarship. My time here has been inspiring and invaluable for my growth as a researcher," she says.

"I would like to extend my gratitude to my supervisors, Professor Riette de Kock and Professor Hely Tuorila, our statistician Gopika Ramkilawon, and members of the InnoFood Africa project for their input in this work," Dlamini says. "This was an interdisciplinary project which required support from various fields; our material needed to be translated in preparation for the focus group discussions, and I needed guidance from social scientists on how to handle the resulting transcripts. A lot of this study involved learning on the job from me – from coding transcripts using unfamiliar software, to dealing with a series of really large datasets from hundreds of respondents, and I was grateful to everyone who so willingly assisted," she says.

Dlamini hopes that researchers in emerging economies (and beyond) will apply the questionnaire to understand food choice motives in various populations and locations. The insights obtained from such studies can inform policy amendments, diet intervention strategies and consumer education initiatives towards positive public health and sustainability outcomes.

Prof Namrita Lall

Could these South African herbs work against blood clots, lung cancer?

UP researchers stumbled upon the blood-thinning potential of South Africa's indigenous lavender tree "by accident" while trying to establish the safety of an oral rinse, and they say a local sweet-smelling herb could fight inflammation in the lungs.

The findings were recently published in the South African Journal of Botany (SAJB), in two separate basic research studies led by Prof Namrita Lall.

Prof Lall has made a name for herself studying the potential medical uses of South Africa's rich diversity of indigenous plants, hand-in-hand with traditional knowledge holders. She is based at UP's Department of Plant and Soil Sciences and serves as South Africa's Research Chair for Indigenous Knowledge Systems.

Blood thinning potential

"The wild lavender tree has been proven for periodontal diseases," explained Prof Lall. "But if we want to produce an oral rinse we have to do a full toxicology study to ensure that if a small amount is swallowed by accident, it should not be toxic."

She says that although the rinse was found to be non-toxic and safe when used correctly (spitting out after rinsing), they noticed during the toxicology study in mice that a few of the animals bled a little bit when they ingested large amounts. "That's when we thought of checking, 'does some part of this plant have any anticoagulant effect?'," said Prof Lall.

Prof Lall and her postgraduate students. Lilitha Lwando Denga, Bianca Diedericks and Anna-Mari Kok revealed in the February edition of the SAJB that, indeed, plant extracts from the wild lavender tree have the potential to prevent blood clots.

The wild lavender tree is native to KwaZulu Natal, as per its scientific name *Heteropyxis natalensis*, but it also grows in Gauteng, Mpumalanga, Swaziland and Zimbabwe. Parts of the plant are traditionally used in tea and potpourri, according to the South African National Biodiversity Institute (SANBI).

Lall's all-woman team investigated its blood-thinning properties alongside several other indigenous plants, but they determined that *H. natalensis* was the best candidate for further studies.

Over the years, Prof Lall has taken many such preliminary studies on indigenous plants all the way to clinical studies and commercial products, including an oral rinse to prevent periodontal disease, as well as a sunscreen and a cream to combat skin hyperpigmentation.

Indigenous knowledge and scientific evidence

She says the first clue for a scientific study of a plant's potential medicinal or cosmeceutical value often comes from indigenous knowledge, where communities and traditional healers are already using herbs in similar ways.

"But those medicines are not registered, so only a handful of people benefit," said Prof Lall. "If we can generate scientific data, we feel a lot more people will benefit, and there will be a chance to export these things to other countries."

This is important, she says because South Africans are currently using many clinically proven treatments and cosmetics developed and sourced in other countries. "So why not develop our own local stuff? Local is lekker!"

She explained that the intellectual property behind commercial products would be shared if the knowledge comes directly from indigenous communities or traditional healers.

"The plant diversity of South Africa is very impressive. So if anyone knows plant usage for a particular ailment, they can approach us," said Prof Lall. Once scientific data confirms potential medicinal uses, she explains, the industry can refine the products, put them through clinical testing, and eventually get them onto shop shelves.

To ensure that indigenous knowledge holders are protected and also benefit, Prof Lall uses her government funding to establish greenhouse facilities in communities, and to develop their cultivation and harvesting skills.

"In this way, if industry is interested, they should buy the plants from the community," she said.

Sweet herbs for the lungs?

In the March edition of SAJB, Lall and an international team of researchers, including two of her other UP postgraduate students, Tenille Esmear and Danielle Twilley, also revealed that a sweet indigenous herb called *Helichrysum odoratissimum* might work against lung cancer and inflammation.

This herb is traditionally used to treat coughs and colds, and as a perfume and insect repellent, according to SANBI.

Prof Lall cautioned, however, that both of these SAJB publications describe basic research studies into the *potential* medicinal use of plants.

"We are definitely not telling the public to take these herbs to treat blood clots or cancer yet," she says, adding that much more research is needed before scientists, industry and medicine regulators can establish effectiveness, dosages, safety and recommended uses through clinical trials.

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"Off-the-shelf" malaria models won't work in Africa, say UP researchers

Malaria simulations that don't consider each country's unique population growth dynamics will not be enough to help African nations eliminate the disease, UP mathematicians Dr Stéphane Tchoumi and Professor Jacek Banasiak warn.

Alongside North-West University's Professor Rachid Ouifki, Tchoumi and Banasiak recently published a novel predictive model that plugs in "demographic parameters", like the pattern of births and deaths in a country.

Their model is the first to compare how different natality, mortality and other population dynamic measures might affect the pace of malaria elimination when using transmission-blocking drugs (TBDs).

"In our model, we show that depending on the demography, the impact of the disease is not the same," says Tchoumi, adding that health interventions should be adapted accordingly.

Banasiak says their work is a warning to health officials who make long-term predictions about malaria control: make sure that the assumptions about demographics, such as exponential growth, reflect the actual dynamics of the population.

"Don't simply use off-the-shelf solutions," he says.

Real-world predictions

Unfortunately, while local population data are relatively easy to obtain from sources like the United Nations' population data portal, information about in-country malaria infections and TBD use is difficult to access, says Banasiak.

This is, for instance, the case in Tchoumi's home country of Cameroon, where the malaria burden is one of the highest in the world.

"It is difficult even to collect patient data," explains Tchoumi. He says malaria has done terrible harm to many of his fellow Cameroonians, and believes that mathematical models are critical weapons that decision-makers need to combat the scourge effectively.

Banasiak agrees. Quipping that although some think they are "transporting mosquitoes in abstract spaces," he says that once actual data is plugged in, the theoretical simulation turns into a real-world, helpful prediction for a particular country.

He cautions, however, that mathematical modeling is a tool and, as with any tool, it requires a deep understanding of its limitations and ranges of application.

African models

In his capacity as the DSI/NRF SARChI Chair in Mathematical Models and Methods in Biosciences and Bioengineering, Banasiak has been working closely with the UP Institute for Sustainable Malaria Control.

Banasiak and Tchoumi say that while the collaboration has made major strides in accessing large-scale data about local malaria infections and treatment, red tape in the public health sector, as well as silo-working in academia, are serious frustrations.

Tchoumi says he wants to appeal to the general public, malaria researchers and health officials to put more trust in mathematical models that are suited to their particular environment.

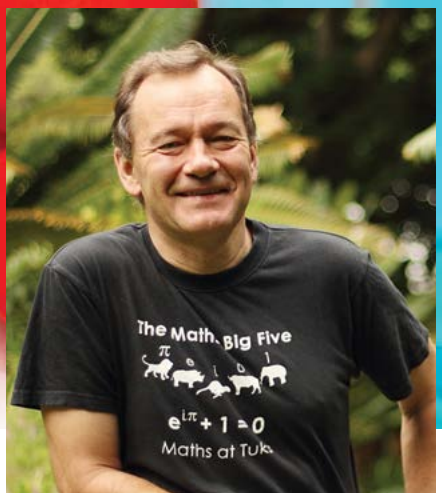
He says given that the African population is expected to double in the next two decades, it is high time to develop models incorporating demography. Such models factor in nation-specific growth models at the same time as the effect of supplying the drugs that prevent the spread of malaria.

This means health officials will have a much better idea of how their interventions will fare in the long term. "We can also see how long it might take to eliminate the disease completely," says Tchoumi.

Tchoumi and Banasiak will now test and retest the model using actual data. At the same time, they are working on cross-border migration models to assess the impact of possible country-to-country malaria transmission.

"A lot of good models are coming from Africa, despite malaria research being underfunded on the continent," says Banasiak.

He says Africans are nevertheless doing the work needed, and UP plays a leading role in connecting malaria research on the continent to disciplines like the arts, engineering, and, of course, mathematics.



Prof Jacek Banasiak


Professor Rachid Ouifki


Dr Stéphane Tchoumi

Arid conditions stimulate plant trait diversity – UP part of worldwide study that offers hope for biodiversity conservation

The University of Pretoria (UP) has been part of a groundbreaking international study to understand how plants found in drylands have adapted to these extreme habitats. The results of this large-scale study, which involved 120 scientists from 27 countries, were recently published in the scientific journal *Nature* and have significant implications for protecting biodiversity as the planet warms and regions become drier.

For eight years, teams collected samples from several hundred selected dryland plots across six continents, enabling the analysis of more than 1 300 sets of observations of over 300 plant species, a first on this scale. The study shows that plants in arid zones adopt various survival strategies and that, surprisingly, this diversity increases with aridity levels. The isolation of plants in more arid zones appears to have reduced competition between species, allowing them to express a diversity of forms and functions globally unique, displaying double the diversity found in more temperate zones.

UP researchers contributed datasets from South African drylands, with sampling being carried out in the vicinities of Graaff Reinet and Prince Albert in the central Karoo and around Lichtenburg in the North-West province.

"These sites provided unique data as South Africa's drylands are particularly rich in plant species compared with many of the other sites included in the study," said Professor Peter le Roux of UP's Department of Plant and Soil Sciences who was involved in the study. "South Africa is very arid, with 85% of the country defined as drylands. We typically think of the Karoo and the Kalahari as being arid, but actually, most of the rest of the country is also a dryland, including large portions of our grasslands and savannas. Despite this, these drylands feature exceptionally diverse flora, including the Succulent Karoo, a biome along the West Coast that usually receives less than 200mm of rain annually yet hosts more than 6 000 plant species. Many of these aren't found anywhere else on Earth."

Drylands are tropical and temperate zones with an aridity value below 0.65, meaning they can potentially lose much more moisture than they receive via rainfall. They cover 45% of Earth's terrestrial area and are home to a third of the global human population. They include sub-humid, semi-arid, arid and hyper-arid ecosystems such as the Mediterranean landscape, steppes, savannas and deserts.

Earth is home to a diversity of plants with highly varied forms and functions. This extraordinary morphological, physiological and biochemical diversity determines how plants adapt and respond to ongoing global changes, with significant consequences for the functioning of ecosystems. Yet, 90% of current knowledge on the functional diversity of plants concerns only agricultural ecosystems and temperate zones.

By contrast, drylands are under-represented in the data. These important zones are now directly threatened by increased aridity, grazing pressure and desertification. How plants respond to such pressures needs to be understood to more accurately predict how these fragile ecosystems will respond in terms of their biodiversity and functioning. This worldwide investigation of the functional diversity of plants in arid zones was carried out to meet this urgent need.

According to Prof Le Roux, the latest assessment of the threat status of South Africa's flora – the Red List of South African Plants, completed by the South African National Biodiversity Institute earlier this year – highlights how climate change is a growing threat to biodiversity. For example, 12% of recently assessed species were considered to be affected by climate change, including several tree aloe species that are characteristic of the very arid Nama Karoo and Desert biomes.

"Understanding the ecology of our dryland ecosystems is critical for managing and conserving these arid environments, as most of our country lives in, and relies on, drylands," Prof Le Roux says.

Conducting the study

This massive study was coordinated by three scientists from the French National Research Institute for Agriculture, Food and Environment, the French National Centre for Scientific Research, and the King Abdullah University of Science and Technology in Saudi Arabia, respectively. All the scientists involved in the study processed samples from the 301 plant species found across 326 representative plots from all continents (other than Antarctica) to characterise the functional diversity of the zones, generating a total of 1 347 full sets of trait observations for analysis. Particular attention was paid to the characterisation of the plant elementome, that is, the diversity of chemical elements and trace elements (such as nitrogen, phosphorus, calcium, magnesium and zinc) found in plants. These often unrecorded traits can exert a strong influence on how plants function. Overall, the study involved more than 130 000 individual plant trait measurements.

A key hypothesis at the start of the study had been that aridity would reduce the diversity of plants, leaving only those species capable of tolerating extreme water scarcity and heat stress. However, the scientists found the opposite to be the case in the most arid rangelands of the planet, where plants instead exhibit a wide range of individual strategies. For example, some plants have developed high calcium levels, strengthening cell walls to protect against desiccation; others contain high concentrations of salt, reducing transpiration. Although fewer species are observed at local scale than in other regions of the planet (in temperate or tropical zones), plants in arid zones display an extraordinary diversity of forms, sizes and functioning – double that in more temperate climatic zones.

This increase in trait diversity occurs abruptly at the point where rainfall volumes drop below the annual threshold of 400mm. This is also the threshold for a pronounced decline in plant cover and the appearance of large areas of bare soil. To explain this phenomenon, the study's authors suggest that the loss of plant cover leads to 'plant loneliness syndrome', where increased isolation and reduced competition for resources allow for high degrees of trait uniqueness and functional diversity that are globally exceptional. This diversity could equally reflect complex evolutionary histories dating back to the initial colonisation of terrestrial habitats by plants more than 500 million years ago, when these habitats presented extreme conditions for living organisms.

The study sheds new light on our understanding of plant architecture, plant adaptation to extreme habitats, historical plant colonisation of terrestrial environments and the capacity of plants to respond to current global changes.

"This project has provided remarkable insights into functional diversity in understudied deserts," says Prof Thulani Makhalanyane, an Extraordinary Professor at UP who was also part of the study. "The unprecedented scale and collaboration with such a large multidisciplinary team has been excellent for our team."

Click on the gallery to experience the drylands where scientists took their samples for analysis, or listen to the *Nature* podcast where the study is mentioned to understand its global significance.

MRI Whale Unit plays key role in launch of global network to protect endangered Indian Ocean humpback dolphin

Humpback Dolphins Tanzania. Credit: Gill Braulik

The Mammal Research Institute (MRI) Whale Unit, based in Hermanus outside Cape Town, is playing a leading role in a new global network aimed at galvanising conservation action for the increasingly vulnerable Indian Ocean humpback dolphin.

Dr Shanan Atkins, a postdoctoral researcher at the MRI Whale Unit, is coordinating the Indian Ocean Humpback Dolphin Conservation Network (HuDoNet), a network of 77 scientists and conservationists from 17 countries along the western Indian Ocean and Arabian Seas who are collaborating on research that provides evidence for positive conservation decisions and actions.

"Most people may have never heard of Indian Ocean humpback dolphins," Dr Atkins explains. "As South Africa's most endangered marine mammal, they are shy and elusive, and inhabit a narrow strip of water on our coastline. Their range extends from South Africa to other countries in southern and eastern Africa, the Middle East, to western India and Sri Lanka, as well as islands like Madagascar and Mayotte. Many of these 23 countries are low-income countries."

In most places, humpback dolphin populations are small and declining because of their proximity to highly populated coastlines. "They are affected by human activities that occur on land, in fresh water and in the ocean. The dolphins die in fishing nets, their habitats are altered by port and harbour construction, coastal development, dredging, and land reclamation. They are susceptible to pollution, such as chemicals and loud underwater noise," Dr Atkins says. She adds that these activities threaten the survival of the dolphins in ways that are challenging to understand and measure, but likely to be impactful.

HuDoNet was launched this year as a way of fostering and facilitating collaborative research and management efforts, and sharing expertise to support conservation initiatives for the humpback dolphins across the member organisations' geographical range. The University of Pretoria, through its MRI Whale Unit, along with the University of St Andrews (Scotland) and Zayed University (United Arab Emirates), were among the founding partners.

Dr Shanan Atkins

Dr Els Vemeulen

Action scope and research challenges

Dr Els Vermeulen, Senior Lecturer and Research Manager at the MRI Whale Unit, which forms part of UP's Faculty of Natural and Agricultural Sciences, works alongside Dr Atkins and the other members of this global network. "HuDoNet is not a research project alone – the ultimate goal is to collaborate and jointly create a conservation action plan for the species across its range; to collaborate, work with governments and share resources, knowledge and experience," she says.

"HuDoNet's goal goes beyond research – it is to use research to inform precise and accurate conservation actions, and to raise public awareness of the plight of this endangered dolphin."

Across the range of countries involved, the dolphin researchers face various challenges:

Ketki Jog, a PhD candidate from Australia's James Cook University who is working in India, reports that, "Our major challenge is a lack of resources."

In South Africa, Dr Vermeulen says, "Due to the elusive nature of these dolphins, data collection is challenging and limited by a lack of resources."

Other challenges include a lack of data, limited technical support, a lack of awareness of the species and its poor conservation status, and a lack of action by the authorities. "It is so difficult to get the authorities involved in conservation matters," says Yusuf Bohadi, a researcher at Kuwait University.

Local research

The UP researchers' primary contribution to HuDoNet is centred around their work on SouSa, a national consortium working for the conservation of the species, also under Dr Vermeulen's lead. She describes the group's fieldwork as entailing predominantly small-boat work for photo-identification and biopsy sampling of humpback dolphins along the coast in Richards Bay (KwaZulu-Natal) and the southern Cape coast.

"I am proud that the MRI Whale Unit is playing a leading role in the establishment of a collaborative network across 23 countries," Dr Vermeulen says. "It is gratifying to help galvanise collaboration and sharing, and to provide inspiration to the younger generation. As part of our UP team, I have been working on the establishment of this network for more than two years, and I am proud that we are at a stage where we have launched and are actively working together across 77 members from very different cultural backgrounds, with the sole purpose of better conserving these endangered dolphins."

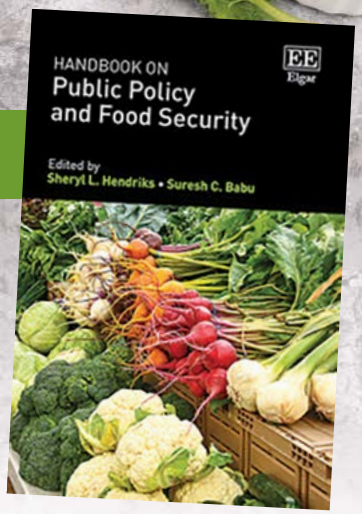
Harbour humpie. Credit: B Atkins

RE.SEARCH is a digital magazine where the University of Pretoria highlight some of its impactful research, knowledge and solutions. Researchers from the Faculty of Natural and Agricultural Sciences (NAS) are featured on pages 2, 8, 10, 24 and 30 in this ninth edition, with this issue's theme being WHAT IF? Visit the Research Matters website for the first, second, third, fourth, fifth, sixth, seventh and eighth editions and more NAS and UP research.

Handbook focuses on better policies around SDGs

Prof Suresh Babu

Prof Sheryl Hendriks



Achieving food security is increasingly about getting food systems to function right. The concept, which cuts through all 17 of the United Nations' Sustainable Development Goals (SDGs), has evolved in recent years, along with policies and programs needed to attain it by 2030.

Technological, institutional, governance, capacity, and policy solutions to achieve them on multiple levels require local action beyond single disciplines, and the input of professionals from different spheres. This is according to the editors of the recently published *Handbook on Public Policy and Food Security*, Prof Sheryl Hendriks, recently appointed director of the Natural Resource Institute of the University of Greenwich, and Prof Suresh Babu, an extraordinary professor in the Department of Agricultural Economics, Extension and Rural Development at the University of Pretoria (UP) and a senior research fellow and head of capacity strengthening at the International Food Policy Research Institute (IFPRI) in the USA.

According to Prof Babu, who has been associated with UP for many years, work on the book started in the early 2020s, when Prof Hendriks was still head of the UP Department of Agricultural Economics, Extension and Rural Development and director of the Institute for Food, Nutrition and Well-being at UP.

In the preface to the 460-page hardback handbook, the two academics explain how they recognised an "urgent need to bring the current developments together in the form of a handbook that can serve as a strand textbook and reference materials for those involved in the fight against food insecurity, hunger and malnutrition", which continually threatens close to a billion people in developing countries, and is further complicated by the increased levels of obesity and micronutrient malnutrition.

"Current disciplinary approaches are narrowly focused on the 17 SDGs, but how the SDGs are framed requires the integration of approaches to understanding how advancing all 17 goals can lead to a more food-secure world. This book addresses a gap in available material, offering multiple disciplines insight into food security analysis across the goals," they explained.

To move beyond agricultural economics towards a food systems approach, they included the multidisciplinary views of experts from universities across the globe (including the University of Pretoria), and institutions of the likes of the IFPRI, International Food Policy Research Institute, Oxfam, the Food and Agriculture Organisation (FAO) of the UN, the Economic and Social Research Institute (ESRI) and the International Water Management Institute.

They say that public policy about food security and development should be seen in terms of six elements: availability, access, utilisation, stability, agency, and sustainability.

"Food security is not static, but constantly in flux. The depth and severity can change over the short and long term. Therefore, it is best to understand the state of food insecurity as a situation along a continuum of experiences that can change at short notice – either improving (becoming more food secure) or deteriorating (becoming more food insecure)," Prof Hendriks and Prof Babu write in one of the 40 chapters.

The direct and indirect impacts on national, local, and household food security of shocks such as COVID-19, conflict and climate change are perplexing to policymakers.

A chapter that looks at food systems in terms of the sustainability agenda highlights that perhaps "the separate trajectories of development and sustainable policies and the lack of a cadre of professionals able to think not only in the box (discipline), outside of the box (beyond their discipline) but without a box (not constrained by discipline boundaries), has deprived millions in developing countries of the realisation of the inalienable right to be free from hunger and malnutrition."

Prof Babu says that the SDG goals are admirable, but the necessary policy and implementation need to be of real practical value for the world as a whole to move faster towards reaching them.

"We've seen how the policy system of many countries has not fully absorbed the goals, and how the institutions that were

supposed to internalise these goals were not doing it fully, or set their own priorities and goal tracking systems. Local capacity is not available everywhere. We need to develop this," he adds.

He believes better economic, educational and energy policies are, for instance, needed in especially developing countries to solve the so-called "food-fuel puzzle". It sees people (and women in particular) struggle to balance their time on household chores such as collecting fuel for cooking and heating purposes and agricultural production with considerations for their health and well-being and the environment. It sees households having to make many choices and trade-offs to survive, with issues such as the impact of indoor air pollution and deforestation, as a consequence, being put on the back burner.

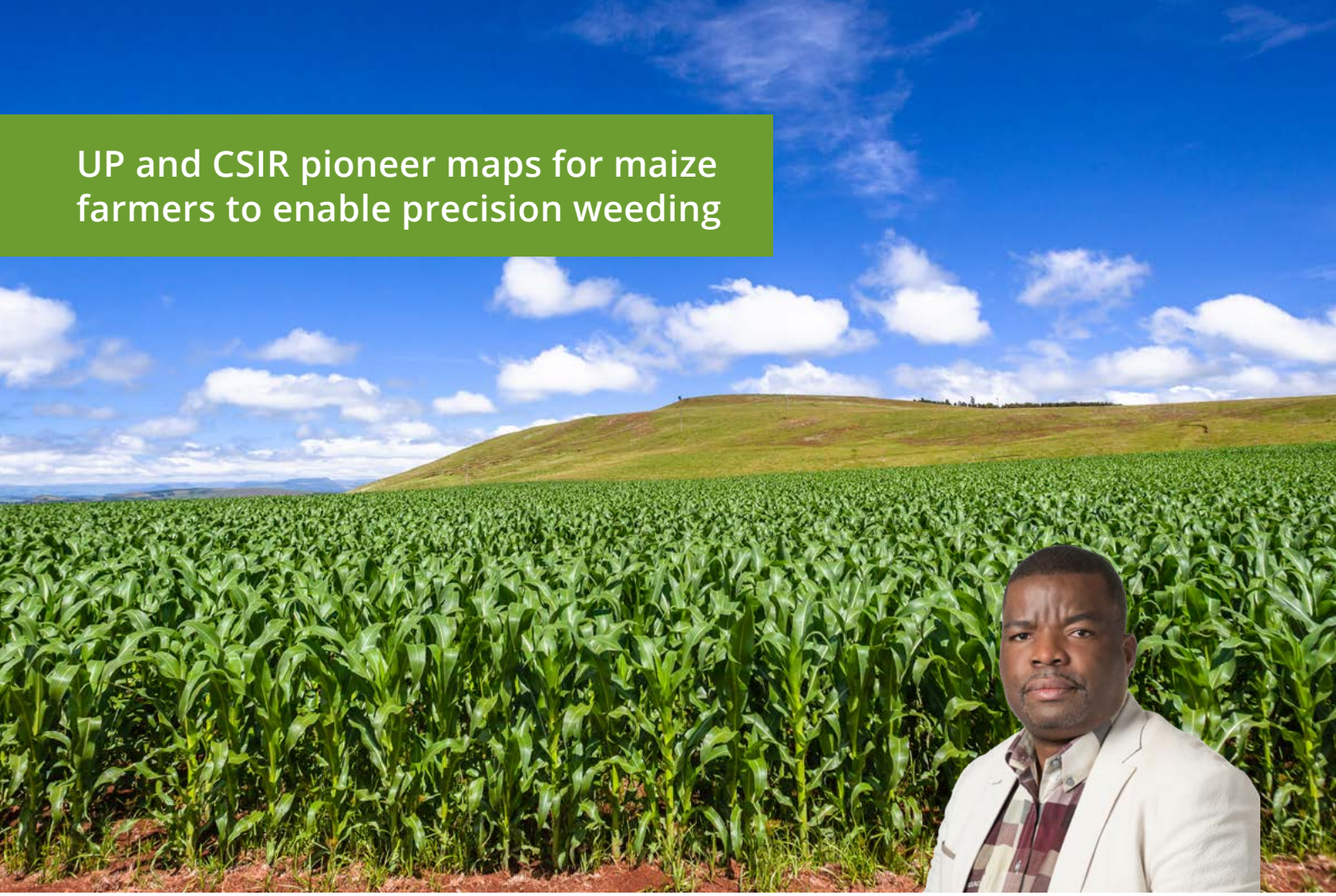
A chapter he co-authored with Prof Shailendra Gajanan, a professor in Economics at the University of Pittsburgh at Bradford in the USA, for instance, points out that more people in Sub-Saharan Africa than in any other region of the world depend on fuelwood and charcoal as a source of fuel, especially for cooking purposes. This dependency is set to grow in future. To combat increasing issues surrounding this, they advocate for introducing adequate policies around subsidies and their effective execution and education programmes to provide people in the region with greater access to more modern cookstoves, such as ones powered by liquified petroleum gas. This has proven successful in Bangladesh, Bhutan, Kenya and Ethiopia.

"The food-fuel debate is an aspect that resonates across all communities, and the dilemma highlights the urgency of governments for quick and immediate top-down action," they write.

A host of UP academics also contributed their insights to the publication. Among them are Dr Selma Karuaihe, Dr Wegayehu Fitawek, Dr Moraka Makhura and Dr Lerato Phali (all lecturers in the UP Department of Agriculture Economics, Extension and Rural Development), Dr Enoch Owusu-Sekyere (a part-time lecturer in the same department), Dr Elizabeth Mkwandawire (research manager of FSNet-Africa at UP), Mr James Mukombwe, a member of the Food Security Research Group in the Department of Agricultural Economics, Extension and Rural Development, and Prof Irma Eloff, former Dean of the UP Faculty of Education and now Chair of the Global Network of Deans of Education (GNDE). Prisca Atieno and Pamela Madududu, Sukoluhle Mazwane, Mancoba Mndzebele, Valiant Odhiambo, Yetunde Olugbade (all UP PhD candidates in Agricultural Economics) and Andrea du Toit (a PhD candidate of the UP Department of Political Sciences) also co-wrote chapters.

The *Handbook on Public Policy and Food Security* was published in 2024 by Edward Elgar Publishing. For more information, click here. Hardback and e-book versions are available.

UP and CSIR pioneer maps for maize farmers to enable precision weeding



Prof Abel Ramoelo

In a first for precision agriculture, University of Pretoria (UP) researchers, in association with collaborators from the Council for Scientific and Industrial Research (CSIR), have produced maps of smallholder farms in Gauteng that highlight maize plants in green and weeds in red. The maps were shared with farmers to enable them to pinpoint and eradicate weeds with more precision.

UP master's student Yoliswa Mkhize wrangled images taken by the Copernicus Sentinel-2 satellite into simple maps that distinguish between weeds and maize. Mkhize was co-supervised by Professors Abel Ramoelo, an expert in Earth observation, and Moses Azong Cho, an extraordinary professor in UP's Department of Plant and Soil Sciences.

"Farmers who use satellite imagery and other remote-sensing technologies can practise 'precision agriculture', " explains Prof Ramoelo, the Director of UP's Centre for Environmental Studies (CFES).

In terms of weed control, this means that instead of spraying an entire crop area, weeds can be removed precisely where they grow as soon as they emerge. Farmers not only save time and money by cutting down the cost and effort required to manage weeds, but also limit the environmental impact of using harmful weed-killing chemicals.

"The innovation here is the timely detection of these weeds, based on locally calibrated data," Prof Ramoelo says. "We can get a new image every five days, provided there is minimal cloud cover."

He adds that while raw data and imagery from Sentinel-2 are free to access, the files are usually too large for personal computers and expensive to process into usable formats, and that scientific expertise is often needed to interpret or convert the data into usable formats such as the maize-weed maps that the researchers have created.

The maps were published in the journal *Physics and Chemistry of the Earth* in collaboration with the CSIR, where Mkhize, Prof Cho and their other co-authors were largely based for the study.

Similar maps could also be generated for other crops in other parts of the country and continent, says Prof Ramoelo. The CSIR is working on an easy-to-use tool allowing farmers to download and view these maps.

Gauteng maize farmers, Mr A Njoro, Mr W Sikhosana and Mr V Mahlangu, gave Mkhize access to collect data on the ground to validate her study.

Prof Moses Cho

Ms Yoliswa Mkhize

"UP is tapping into the CSIR's partnerships with the farmers," says Prof Ramoelo, adding that this collaboration demonstrates the University's emphasis on relevant research that contributes to society. "We are also working with the CSIR on other precision agriculture projects like detecting disease in potato crops; estimating maize water use so that farmers can optimise irrigation with remote-sensing technology; and estimating nutrients to optimise fertiliser use."

Prof Ramoelo adds that remote-sensing goes far beyond precision agriculture. His team at the CFES works with staff and students across UP faculties on other projects around land use and land cover changes, biodiversity monitoring, water resource management, wildfire monitoring, detecting grass nutrients to understand animal grazing patterns, and even climate change impact assessments.

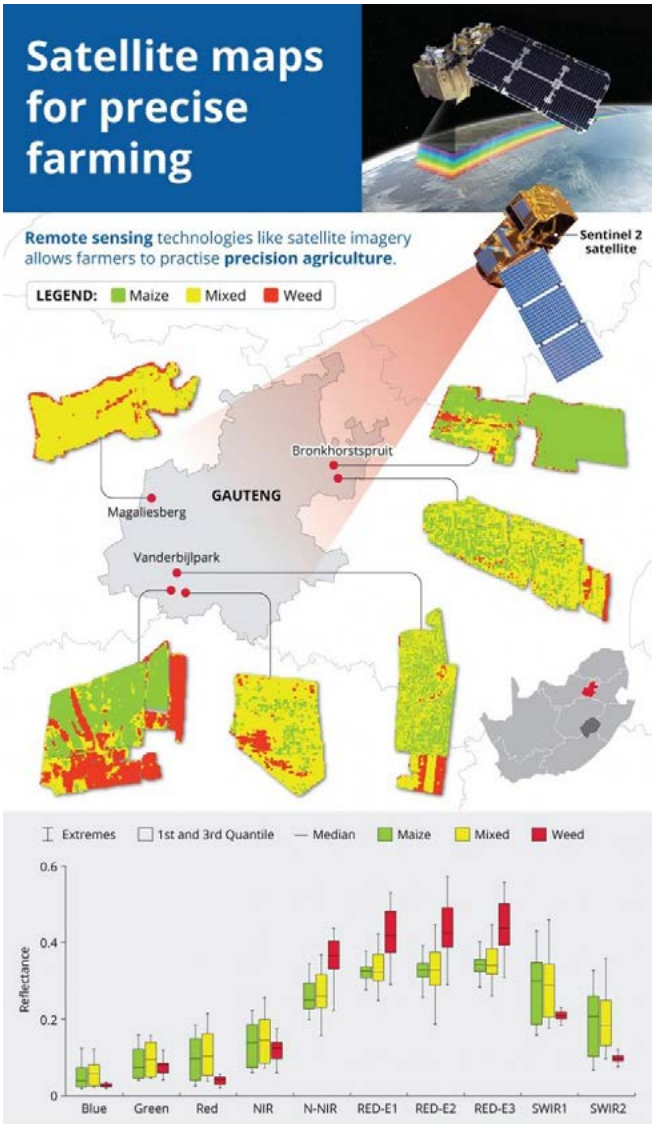
He says demand for satellite data in South Africa and the rest of the continent is booming among researchers and users alike, including farmers. He says it is risky to continue relying solely on European satellite sensors like Sentinel-2.

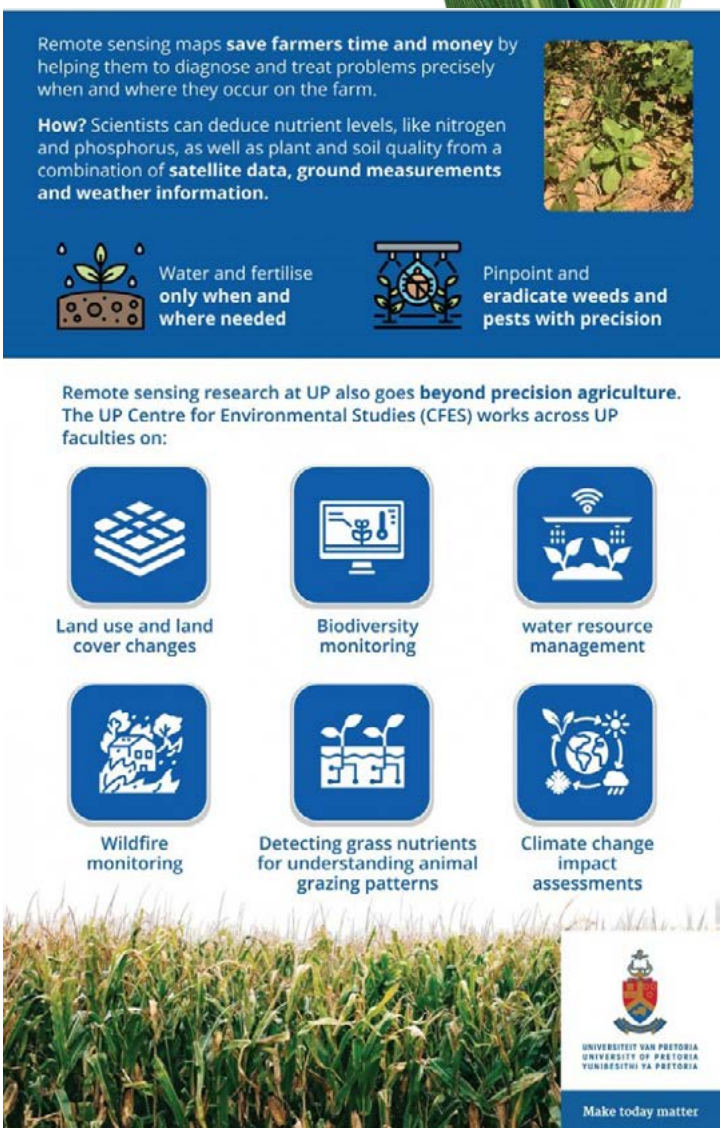
"I see it as a challenge, but also as an opportunity for the South African National Space Agency (SANSA) to start looking at satellite applications for societal relevance, and to encourage the development of our own systems and our own satellites that are launched under the auspices of South Africa," Prof Ramoelo says.

He adds that SANSA and the Department of Science and Innovation are already implementing national policies to support decision-making in the farming sector.

"UP's role is to share innovations at the frontiers of precision agriculture with such organisations, including these simple colour maps that show weeds lurking in maize," Prof Ramoelo says.

Click here to see the maps produced, or click on the infographic to learn more on how satellites can help precision farming.





GLOBAL ENGAGEMENT

NAS researchers shine at SA's 'Science Oscars'

Prof Bernard Slippers (middle) receiving the Management Award

Two researchers from the Faculty of Natural and Agricultural Sciences have been honoured at the National Science and Technology Forum (NSTF)-South32 Awards, dubbed South Africa's "Science Oscars". The awards celebrate exceptional contributions to science, engineering, technology (SET) and innovation and are endorsed by the National Department of Science and Innovation. They are widely acknowledged as South Africa's premier public SET and innovation accolades.

Professor Bernard Slippers received the Management Award for fostering scientific excellence through collaborative team efforts. He holds a professorship in genetics within the Department of Biochemistry, Genetics and Microbiology, and serves as Director of the Forestry and Agricultural Biotechnology Institute at UP as well as Innovation Africa @UP.

"A very big thank you to the NSTF-South32 Awards for the support, but also for these kinds of events, which remind us to celebrate the ecosystems in which we can work," Prof Slippers said. "Scientific achievement is never the outcome of an individual; it's always a property of the ecosystems in which we work. I have been very privileged over my career to work at the Forestry and Agricultural Biotechnology Institute at the University of Pretoria, with fantastic colleagues who have helped me and created an environment within which I can pursue my dreams and help others pursue theirs."

Professor Roger Deane, Director of Wits Centre for Astrophysics, DSI/NRF SKA Chair in Radio Astronomy and Extraordinary Professor at UP, was part of the international team that captured the first image of a black hole. He was part of a group that received the joint Special Annual Theme Award: Fourth Industrial Revolution in South Africa for the work being done by the Inter-University Institute for Data-Intensive Astronomy (IDIA), a collaboration among UP, the University of Cape Town and the University of the Western Cape.

The IDIA's advanced infrastructure enables global collaboration in astronomy, enhancing the ability of researchers to analyse intricate science, engineering and technology data, particularly radio astronomy data, with unparalleled effectiveness.

"Prof Anton Ströh, Former Vice-Principal Research, Innovation and Postgraduate Education, was instrumental in the vision to establish astronomy at UP, and our IDIA membership was a critical step in doing so and enabling all achievements thus far," said Prof Deane.

"These accolades honour our dedicated researchers and underscore our commitment to advancing science, engineering, technology and innovation in our nation. They are also an inspiration to the hundreds of students who benefit from the Giving Day campaign, and serve to motivate our donors from around the world. This is an achievement that reaffirms UP's pivotal role in shaping the future of these fields and our ongoing commitment to pushing the boundaries of knowledge."

Internationally renowned scientific duo, Profs Mike and Brenda Wingfield, honoured by IUFRO

Prof Brenda Wingfield

Prof Mike Wingfield

Two internationally renowned professors from the Faculty of Natural and Agricultural Sciences and founding members of the Forestry and Agricultural Biotechnology Institute (FABI), Profs Mike and Brenda Wingfield, received prestigious awards at the International Union of Forest Research Organizations (IUFRO) World Congress held in Stockholm during July this year.

IUFRO is the world's oldest scientific union, founded in 1892, and it serves more than 15 000 forest scientists worldwide.

Prof Brenda Wingfield received the IUFRO Scientific Achievement Award and was recognised for her pivotal role in driving applied biotechnology in the forestry industry. Her pioneering work in using molecular techniques to diagnose tree diseases has enabled earlier and more accurate detection of pathogens, thereby facilitating the implementation of more effective control measures. She has also mentored over 100 postgraduate students and collaborated with researchers worldwide.

"Winning the IUFRO Scientific Achievement Award is a profound honour that validates my lifelong dedication to studying fungal pathogens and their impact on global forest health. This recognition acknowledges the hard work and perseverance of my students, colleagues and collaborators. It underscores our work's importance in understanding and mitigating the threats of fungal pathogens to forests worldwide. The award inspires me to continue pushing the boundaries of our knowledge and will continue to foster international collaboration in forestry research," Prof Brenda said.

"Over the past three decades, my research has primarily focused on the global movement and evolution of fungal pathogens, particularly those affecting trees. One of my significant contributions is in fungal genomics, where I have worked extensively to decode the genetic makeup of various tree pathogens. This work has been fundamental to identifying new species and understanding the mechanisms underpinning pathogenicity and the interactions between pathogens and their tree hosts."

Prof Brenda has played a pivotal role in fostering collaboration and advancing forestry research through her involvement with IUFRO. She organised the IUFRO Tree Biotechnology Conference in South Africa in 2011, bringing together leading scientists to discuss the latest advancements in tree genetics and biotechnology. Her efforts have facilitated numerous research collaborations and strengthened her position in the global forestry research community.

She added, "I am also one of the founding members of the Forestry and Agricultural Biotechnology Institute (FABI) at UP, where I have served in various leadership roles, including the Director of the DSI/NRF Centre of Excellence in Tree Health Biotechnology and Deputy Dean of Research and Postgraduate Studies. My work has been published in over 450 peer-reviewed papers, and I hold the DSI-NRF SARChI research chair in Fungal Genomics. These achievements underscore my commitment to education, student mentorship and advancing our global understanding of tree pathogens of importance to forest health management."

"Throughout my career, I have been fortunate to receive several prestigious awards. I was honoured with the South African Society of Microbiology Gold Medal in 2018, becoming the first female to receive that award. In 2022, I received the Hartig-Patterson Award for Achievement in Forest Pathology from the IUFRO Research Group 7.02.00 "Pathology." Most recently, in 2023, I was awarded the John F W Herschel Medal by the Royal Society of South Africa. While appreciated, these accolades reflect not only my work but also those of outstanding students and amazing colleagues that I deeply appreciate," she concluded.

Prof Mike Wingfield received the highest honour of IUFRO, namely Honorary Membership. Over the years, he has made a significant impact on the organisation. Prof Mike became involved in IUFRO activities as a young scientist in 1977, first participating in a Working Party dealing with diseases of pines grown in the tropics and Southern Hemisphere. Since then, he has been involved in numerous activities of IUFRO, including in several leadership positions, as coordinator of Working Parties, Research Groups, Congress Scientific Committees and as Co-coordinator of Division 7 (Forest Health), the IUFRO Board and the IUFRO Management Committee. In 2010, Mike became the Vice President responsible for IUFRO Divisions, culminating in his position as IUFRO President (2014-2019). He became the first IUFRO President from the African continent.

During his term as IUFRO's President, IUFRO's focus on improving communication led to a considerably increased visibility of IUFRO. He also initiated a process to establish a closer engagement of IUFRO with the private sector, with Mondi as a first partner. IUFRO celebrated its 125th anniversary during his term as President, and he was deeply involved in leading the celebrations marking this important milestone, including the 125th Anniversary Congress held in Freiburg, Germany. Prof Mike Wingfield has always seen it as one of his most important roles to foster and support the youth in forestry. He takes pride in having been an advisor to numerous MSc and more than 100 PhD students, many of whom now hold very senior positions globally.

During his term as President of IUFRO, further strengthening the Union's relationship with the youth was one of his priorities, which included enhancing IUFRO's ties with IFSA, the International Forestry Students' Association. Among other achievements, he made a grant to the IUFRO-IFSA Task Force on Forests and Education, which was used mainly to further forest education in Africa.

Prof Torto inducted as International Fellow of National Academy of Sciences

Prof Baldwyn Torto, an Extraordinary Professor in the Department of Zoology and Entomology at the University of Pretoria (UP), was recently inducted into the National Academy of Sciences (NAS) as an International Fellow.

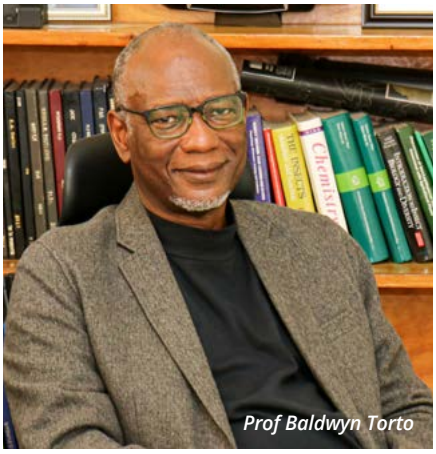
The National Academy of Sciences is a private, non-profit society of distinguished scholars engaged in scientific and engineering research and dedicated to using science and technology for the public welfare. In addition to its role as adviser to the US federal government, the Academy sponsors symposia, monitors human rights abuses against scientists worldwide, promotes the public understanding of science, and publishes a research journal, *Proceedings of the National Academy of Sciences*.

Fellows are elected to NAS based on their distinguished and continuing achievements in original research. "In my case, it was for discoveries in chemical ecology which opened new avenues for vector control and monitoring crop pests and other insects," he said.

"Science is about teamwork, and it includes my extraordinary mentors over years of formal education and as an early career scientist, administrators of research that provided the enabling environment to allow different teams I participated in or led to excel in the field of chemical ecology, especially at the International Centre of Insect Physiology and Ecology (*icipe*) and UP, and of course my supporting and wonderful family and friends," Prof Torto explained.

"Both *icipe* and UP are internationally recognised as leading African scientific research and capacity-building institutions. Their highly successful international capacity-building programmes allowed me to work with some of the best students from various African countries and with some of the most brilliant minds as collaborators and technical staff across different disciplines, including vectors of infectious diseases of public and veterinary health importance, crop pests, and beneficial insects."

He added," One of my PhD students Yusuf Abdullahi, from Nigeria, who was the first to graduate from UP and an alumnus of the Alexander von Humboldt Foundation postdoctoral program, is now an Associate Professor at UP's Department of Zoology and Entomology. Likewise, David Tchouassi, from Cameroon, the first medical entomologist in my team to graduate at UP, is now a Senior Scientist at *icipe*, and recipient of a prestigious Wellcome Trust International Intermediate Fellowship. Other UP graduates, including Vincent Nyasembe from Kenya, is a Research Scientist at the CDC Foundation, Atlanta, US, and Akua Antwi-Agyakwa from Ghana, who worked on crop pests for her PhD thesis, is currently a scientist at the Cocoa Research Institute of Ghana (CRIG) and a recent recipient of a TWAS Seed Grant for New African Principal Investigator (SG-NAPI). These few examples are a testament to UP's commitment to academic excellence and quality research outputs. As a leading institution of higher education in Africa, the *icipe*-UP joint PhD training program has produced, over the years, several globally competitive next-generation scientists. As an extraordinary professor at UP, I am incredibly proud to be part of this research output. I have learned a lot from students and colleagues over the years, for which I am extremely grateful," Prof Torto explained.



Prof Baldwyn Torto

Prof Torto's journey in scientific research spans over 35 years, after graduating from a sandwich programme between *icipe* and African Universities called the African Regional Postgraduate Programme in Insect Sciences (ARPPIS).

"I was in the third cohort of PhD students recruited in 1985 and the first to be trained in chemical ecology, graduating from the University of Ghana in 1988. The German Academic Exchange Service sponsored my PhD study. This year marks 41 years of the ARPPIS programme, and over the years, it has attracted more African universities, such as UP. As the first ARPPIS graduate and Ghanaian to be inducted as an international member into the US National Academy of Sciences, I feel honoured because it is a recognition of my team's outstanding contributions to the global scientific community and a testament to the vision of the founding members of the ARPPIS programme. What an incredible vision by the founding members of ARPPIS, led by the *icipe* founding Director, the late Professor Thomas R. Odhiambo!"

Prof Yusuf elected to the council of International Society for Chemical Ecology

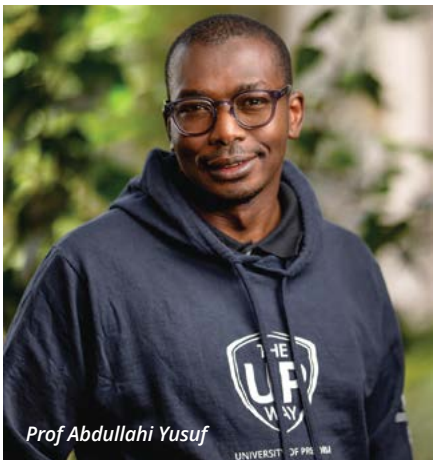
Prof Abdullahi Yusuf from the Department of Zoology and Entomology and a Social Insects Research Group (SIRG) member has recently been elected to the council of the International Society for Chemical Ecology (ISCE).

"Being elected to the council of the International Society for Chemical Ecology is an honour and a call to serve the society. It is a privilege because one has to first be nominated and then elected by the members of the Society. Which is a testament that one is at least known in the field and recognised as someone capable of serving in such a capacity."

Prof Yusuf explained, "Councillors represent various fields of chemical ecology and act in an advisory capacity to the Executive Committee in formulating policies that assist the society in achieving its mandate. This is to promote the understanding of organisms and their environment as mediated by naturally occurring chemical communication signals. Councillors serve a term of four years each, during which they have to attend at least three annual general meetings of the society. There are only 15 councillors, including three immediate past presidents of the society at a given time," Prof Yusuf said.

He is also affiliated with the Forestry Agricultural and Biotechnology Institute (FABI), Innovation Africa and the Centre for Sustainable Malaria Control. Prof Yusuf is also a principal investigator within the South African Research Chairs Initiative (SARChI) in Mathematical Models and Methods in Bioengineering and Biosciences (M3B2).

As a chemical ecologist, he is interested in basic and applied chemical ecology to understand the evolution of organisation in insect societies and explore semiochemicals for managing and controlling insect pests and vectors. His current research focuses on understanding the physiological, behavioural and genetic basis of pheromone communication and reproductive dominance in honeybees and developing semiochemical-based management tools for invasive pests of agricultural importance and vectors of neglected tropical diseases and the use of edible insects.



Prof Abdullahi Yusuf

In 2019, Prof Yusuf received the alumni award for networking initiatives and a Tandem research fellowship from the Alexander von Humboldt Foundation to conduct research in honeybee genetics at the Molecular Ecology Research Group, Martin Luther University, Halle-Wittenberg Germany. In 2021, Professor Yusuf was appointed as Ambassador Scientist of the Alexander von Humboldt Foundation in South Africa. Professor Yusuf holds a C2 rating from the NRF.

Three NAS women on *Mail & Guardian's* 200 Young South Africans for 2024

Three women affiliated with the Faculty of Natural and Agricultural Sciences (NAS), Luyanda Mthethwa, Oudi Kgomongwe and Gugu Kubheka, are on *Mail & Guardian's* 200 Young South Africans for 2024.

Ms Luyanda Mthethwa, a University of Pretoria (UP) alumna and a sustainability manager at PwC, was recognised by the Mail & Guardian as one of the 200 Young South Africans in the **Mining and Manufacturing category**. She graduated in 2017 and enrolled for an honours degree at UP – "I was drawn by the institution's wide curriculum offering in environmental science."

"Being on the list for the Mail & Guardian's 200 Young South Africans is such a humbling experience. I wouldn't have thought I would have been awarded this a few years ago. I have always just worked hard and tried to make a positive impact. So, this award represents the culmination of years of hard work, dedication and passion for my field. It is an honour, a validation of my efforts, and an appreciation for those who have supported me in getting here. It motivates me to continue pushing boundaries and to inspire others who may be following a similar path. Professionally, this recognition provides a platform for me to further advocate for the causes and initiatives I am passionate about, potentially reaching a wider audience and making a difference in people's lives."

"This accolade reinforces my commitment to excellence and innovation in my work, encouraging me to continue striving for impactful contributions in my field."

Ms Oudi Kgomongwe, another graduate from UP, was also featured on this prestigious list in the **Governance category**. She is a scientific manager at the Department of Water and Sanitation. She graduated with a BSc (Hons) in Geology from UP in 2013 and has an MSc in Hydrogeology from the University of the Witwatersrand.

"As a woman in science, young girls and young women need to see more female science, technology, engineering and mathematics (STEM) professionals to signal to them that a career in STEM is possible."

"Deliberate efforts must be increased to support and fund STEM education for girls in disadvantaged areas in South Africa. Breaking down barriers for women and girls accelerates development and progress across the board in the country. Science caters to my innovative and problem-solving energy and keeps me moving past the barriers of my previous challenges in life and work. Had I not studied something in science, I would have studied something along the lines of international development and history. This is not far off from my core values of supporting people and the planet in ending extreme poverty and tackling climate change."

Dr Gugu Kubheka, a postdoctoral researcher at the South African Nuclear Energy Corporation (NECSA), has been included in the **Energy category**. She joined UP from 2020 to 2022 as a postdoctoral fellow in the Department of Chemistry under the mentorship of Prof Patricia Forbes. Her research focused on developing novel analytical methods for environmental sensing and monitoring. She co-supervises and mentors PhD and MSc candidates at UP and Rhodes University, respectively.

"I am humbled and honoured by this recognition. I believe that science, technology, engineering and mathematics (STEM) education should be promoted, and young girls, in particular, should be supported and motivated to pursue careers in this space."

"In addition, public schools ought to be resourced with adequate infrastructure, study materials and qualified educators to deliver science in an effective and inspiring manner with its potential contribution towards sustainable development well demonstrated. Over and above school engagement programmes, strategic marketing programmes should be initiated in conventional media and on social media to cover the lack of exposure of young women in STEM," she concluded."

Prof Kijko honoured as a ScholarGPS Highly Ranked Scholar

Prof Andrzej Kijko, Director of the University of Pretoria Natural Hazard Centre, was recently honoured as a ScholarGPS Highly Ranked Scholar. His prolific publication record, the high impact of his work, and the outstanding quality of his scholarly contributions have placed him in the top 0.05% of all scholars worldwide.

"I see it as recognition of my life work as a scholar and researcher. In short, it acknowledges the contribution to the world science and economy," Prof Kijko said.

ScholarGPS®, an American company based in California, is a ranking of over 30 million academic, industrial, and government scholars from more than 55 000 institutions in over 200 countries. It selects researchers based on how relevant and vital the problems the researchers are solving are and their impact and contribution to world science and the economy.

Prof Kijko published over 200 scientific papers. Many of his colleagues published more than he did, but they are seldom quoted and have a minimal impact on science and the world economy. Following the criteria applied by the SCHolarGPS, this reward is about recognising how essential problems are solved. The impact and contribution are measured not by the number of publications but by what problems were solved and how important they are. The importance of the issues is measured by their applications and how often the papers are quoted and read. Prof Kijko's publications have been cited in scientific literature over five thousand (5 000) times and read more than a hundred thousand (100 000) times.

His hazard and risk assessment methods and computer programs are applied worldwide. They are used in nearly 100 countries to assess critical structures' seismic and tsunami risks, such as nuclear plants, airports, big dams, mines, oil platforms, bridges, pipelines, and tailing facilities. One of the latest applications includes assessing seismic hazards to the 40 billion euro investment on the Trans Adriatic Pipeline, allowing access to the European market through natural gas reserves in the Caspian Sea."

Prof Kijko's seismic and tsunami hazard assessment techniques are recognised and recommended by the International

Prof Andrzej Kijko

Atomic Energy Agency (IAEA), the U.S. Department of Energy, and the U.S. Nuclear Regulatory Commission. They are studied by mathematicians and entered academic textbooks. They are routinely used by insurance and reinsurance businesses responsible for millions of USD investments.

Dr Vermeulen appointed to South African National Committee of the Scientific Committee for Antarctic Research

Dr Els Vemeulen

Dr Els Vermeulen, Research Manager of the Mammal Research Institute (MRI)'s Whale Unit, has been appointed to the South African National Committee of the Scientific Committee for Antarctic Research (SCAR).

"Having been elected to SCAR is a great recognition not only for myself and the work I have dedicated my life to but also for the MRI Whale Unit and its leading role in baleen whale research in South Africa. Due to this, I am in a unique position to be able to leverage decadal datasets of baleen whale research initiated by the late Prof Peter Best and lead the unit forward as a nationally important and globally relevant research group on these charismatic megafauna. Being nominated to contribute to SCAR is, therefore, a strong testament not only to the current research of the unit but also to its long-standing history," Dr Vermeulen said.

This prestigious appointment recognises Dr Vermeulen's significant contributions to marine mammal research and her commitment to advancing scientific understanding in Antarctic and Southern Ocean science.

According to Dr Vermeulen, "One of the largest research themes in the unit relates to the role of large whales in Southern Hemisphere Ocean ecosystems, with a very strong relevance to the Southern Ocean and Antarctic environment. With my appointment, I envisioned significantly strengthening South Africa's strategic position in baleen whale research in the Antarctic while contributing to developing a strong national Antarctic research program. At the same time, I aim to contribute significantly to promoting international collaboration, especially through my position in the Scientific Committee of the International Whaling Commission (IWC), the global governmental body tasked with managing and conserving large whales. SCAR and IWC already work together globally, and I aim to strengthen South Africa's position and contribution within this framework. At the same time, I wish to contribute to the conservation and management of our ocean resources, especially in the Antarctic, and aim to do so through scientific advice to the South African government on matters related to the Antarctic region, ensuring that policies are based on the latest scientific advice."

She added, "Both the chair and vice-chair of SANC are women, and I feel privileged to be able to contribute to SANC and learn from these leading female academics."

Dr Vermeulen is a member of the International Union for Conservation of Nature (IUCN) Cetacean Specialist Group, IUCN Red List Authority and an annually Invited Participant to the Scientific Committee of the International Whaling Commission. In addition to her research expertise she has a strong capacity to bring together diverse experts across various fields to advance overarching global goals in cetacean research, as evidenced in her leadership in the IWC-SORP theme on southern right whales, the Southern Right Whale Consortium (SRWC), the South African Humpback Dolphin Consortium (SouSA), and the Indian Ocean Humpback Dolphin Network (HuDONET).

Tilana Marais awarded 2024 Brian Koepen Memorial Scholarship in Food Science

Tilana Marais

Tilana Marais, an MSc student in the Department of Consumer and Food Sciences, was recently awarded the 2024 Brian Koeppen Memorial Scholarship by the South African Association for Food Science and Technology (SAAFoST).

"It is a great honour and motivation to receive this scholarship for my MSc degree. I believe postgraduate students benefit greatly from support and motivation in whatever form it presents itself. It encourages us to continue learning and contribute to an improved world for future generations," Tilana said.

Her MSc research at the University of Pretoria focuses on the shelf life of whole grain maize meal, aimed at preserving riboflavin, improving the bioavailability of iron and zinc, and delaying the onset of rancidity during storage. Using wholegrain rather than refined maize meals in school feeding programmes in African countries may enhance performance and brain development. The result is prospects, career opportunities and poverty alleviation for individuals and families. The research forms part of a larger Rockefeller Foundation-funded project supported by the Fortified Whole Grains Alliance to improve child health, well-being and performance.

Tilana is no stranger to acolades. She was awarded a SAAFoST matriculant bursary in 2019 and completed the degrees BSc Food Science and BSc Hons Food Science, with distinction in 2021 and 2022, respectively.

UPGL renews association with AfricaBP Open Institute for Genomics and Bioinformatics

The University of Pretoria Genomics Lab (UPGL) recently presented the second annual Oxford Nanopore Technologies (ONT) sequencing workshop in partnership with DIPLOMICS and the African BioGenome Project (AfricaBP) Open Institute for Genomics and Bioinformatics.

This workshop was part of the AfricaBP workshop series in Southern Africa and aimed to provide a practical experience of the ONT sequencing platform to interested students and researchers. Participants were selected from the University of Pretoria, the University of Venda, the University of KwaZulu-Natal, the Sefako Makgatho Health Sciences University and the South African National Biodiversity Institute, representing multiple research programmes with a broad biodiversity focus.

The workshop programme provided an in-depth theoretical background on ONT technology, project design requirements, data analysis, and troubleshooting. With the practical component encompassing most of the program, participants prepared DNA sequencing samples for analysis on the UPGL's PromethION P2 Solo instrument. Being involved in all aspects of the sample preparation process gave participants a solid foundation for planning their own sequencing projects using the ONT platform.

With Biodiversity being a strong focus of the workshop series, the UPGL provided DNA samples from species involved in the DIPLOMICS-funded 1KSA initiative (www.1ksa.org.za). Aiming to sequence 1000 genomes of South African species of significant biodiversity interest, the 1KSA project is a major priority for DIPLOMICS and their funding agency. As a local partner in the project, the UPGL coordinates the provision of DNA samples, assists with DNA isolation troubleshooting, performs sequencing and makes the raw data available to sample providers. Finally, a draft genome assembly is provided by DIPLOMICS. To create public awareness, the 1kSA species are showcased on the 1kSA website as a species card, and the significance and impact of the work are told with short videos.

Presenting the workshop, providing continuous social media updates and pictures, and providing support for the University of North-West workshop were great advertising opportunities for UP's Faculty of Natural and Agricultural Sciences and the UPGL. A report on the scope and impact of the 2023 workshop series was published in *Nature Genetics* in May 2024 with the UPGL members as co-authors. The report and analysis on the 2024 workshop series are currently being compiled for publication in 2025.

Successful second international modelling and epidemiology summer school in South Africa

The Faculty of Natural and Agricultural Sciences (NAS) and the Department of Plant and Soil Sciences, collaborating with the National Research Institute for Agriculture, Food and Environment (INRAE), France, recently successfully hosted the second annual international modelling and epidemiology summer school.

This hybrid summer school was hosted during May on the Hatfield Campus with presenters Prof Serge Savary (INRAE; France), Prof Laetitia Willocquet (INRAE; France), Prof Paul Esker (Pennsylvania State University, United States), and Prof Neil McRoberts (University of California, Davis, United States) and Dr Federica Bove (Università Cattolica del Sacro Cuore), Dr Sonam Sah (ICAR-NIASM, India), Dr Manjari Singh and Dr Giorgia Fedele (Universita Cattolica del Sacro Cuore, Italy).

The summer school aimed to enrich postgraduate students, academics, and researchers with modelling and epidemiology expertise, build scarce skills, enhance the knowledge platform, and expose participants to critical thinking and problem-solving skills in plant disease epidemiology. Engaging in presentations, lively discussions, and hands-on training sessions were common features of this year's edition of the summer school. The topics covered included spatial disease distribution and spread, epidemiology and host plant resistance, temporal disease progress, yield loss assessment and modelling, and a combination of plant disease, crop, and fungicide models for disease management. The participants also had hands-on sessions using R packages for plant disease epidemiology and a seminar on scientific writing.

A total of 28 participants from the University of Pretoria, University of the Free State, Council for Scientific and Industrial Research (CSIR), Seoul National University, South Korea, and Università Cattolica del Sacro Cuore, Italy, were involved. Modelling and plant disease epidemiology are important topics in plant health as subjects intended for predicting crop yields and informing crop production amidst many biotic and abiotic factors that interact with crops. Therefore, schools must be organised regularly to enrich and empower students and scientists with the necessary skills to handle plant health issues in the future.

A heartfelt word of thanks to the organisers of this course: Prof Lise Korsten (Co-Director of the Department of Science and Innovation, Centre of Excellence in Food Security), Dr David Nsibo and Thabang Msimango (PhD candidate), as well as to the sponsors of the course: Grain SA, Bayer, and NAS.

Thabang Msimango reflects on her Fulbright scholarship at University of Maryland

PhD Candidate in Biotechnology, Thabang Msimango, recently returned after being a visiting Fulbright scholar in the USA.

She is a member of the Produce Safety and Quality research group in the Department of Plant and Soil Sciences. This research group is also part of the Department of Science and Innovation and the National Research Foundation Centre of Excellence in Food Security. Their research focuses on bacterial pathogens that may contaminate leafy green vegetables.

"My supervisor, Prof Lise Korsten, suggested I should apply for the scholarship. I had heard about Fulbright before but did not think I would be awarded such a prestigious scholarship. Once I started the application, the prospect of working with a risk assessment expert on my PhD project motivated me even more."

"I was hosted by Dr Abani Pradhan and the Department of Nutrition and Food Science and worked on developing a quantitative microbial risk assessment (QMRA) model which can be used to predict or estimate the risk to a consumer that eats lettuce that may be contaminated by E. coli O157:H7W This model considered both the formal and informal lettuce production and supply chains."

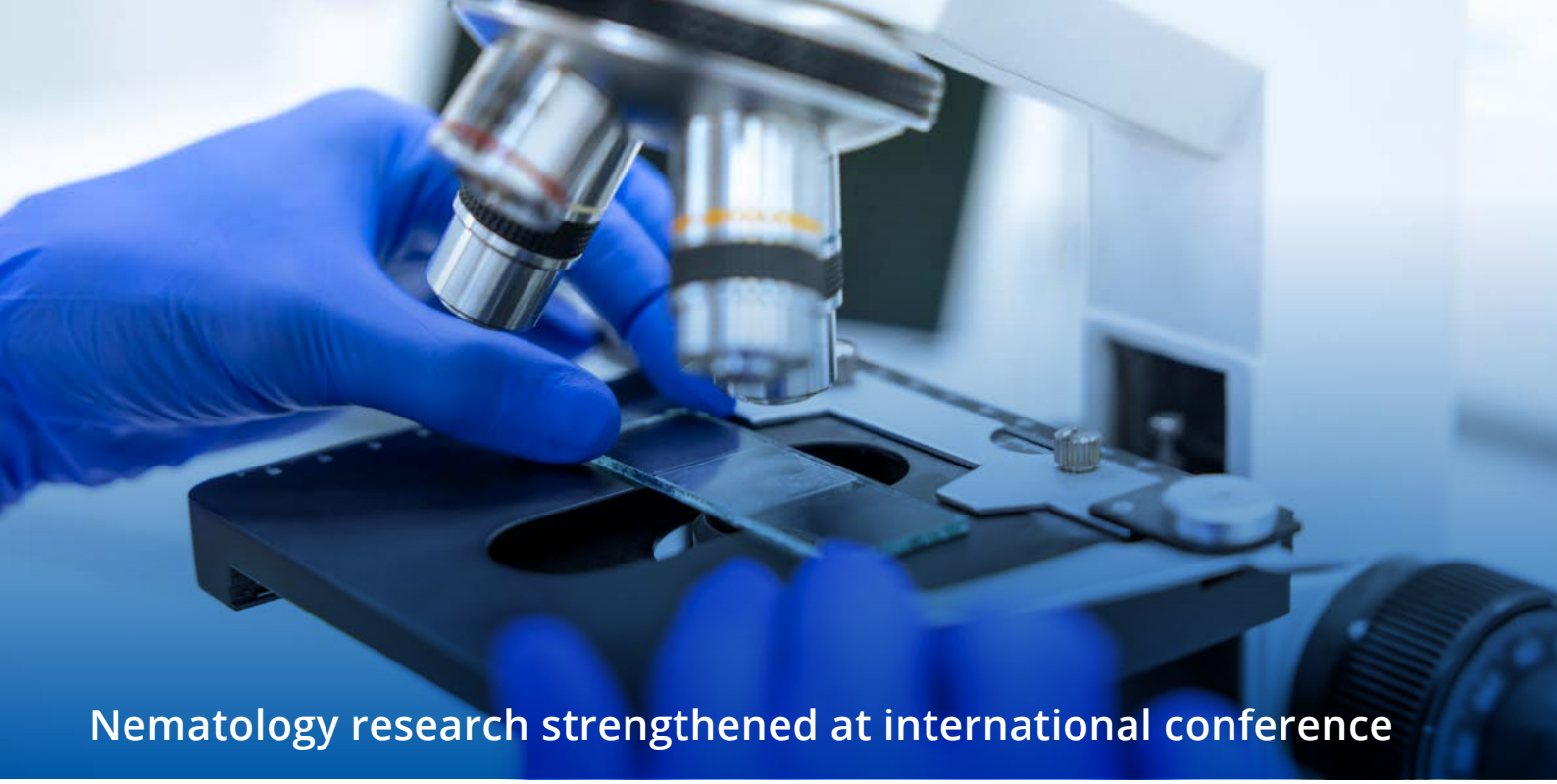
"I had access to the software used to develop the QMRA model, as well as the knowledge and expertise. This helped me make good progress on my research project. I could present my work at a conference and prepare a manuscript to be submitted for publication."

Thabang added, "The biggest challenge for my research project, in general, was having an idea and not knowing where to start and if that idea was good and would be a worthwhile contribution to the scientific community and the development of the country and continent. I overcame these challenges by contacting experts in the field who could help. I always had to remind myself that even a little progress is still progress and focus on the bigger picture. It is also important to focus on the step before you and how the finished project will contribute to food safety in South Africa."

"The sense of community and support amongst international students and scholars was great. Many resources are available to assist international students and are easily accessible on campus. The international student office had an "international coffee hour" where students could meet once every week and have coffee. This is where I met students and scholars from around the world, and they became really good friends, and we were each other's support system. We would meet over the weekends or holidays and do fun activities together. There are also student associations for Africans, Indians, etc., so you can always find your group of people, and there is always help and support available."

Thabang Msimango

"The Fulbright experience has reinforced my belief in the importance of collaboration. At some point in our academic careers, we will need to be assisted by someone with more experience or knowledge in a certain subject or research area. Collaboration may be the only way in which you will get assistance. Collaboration also works both ways, so one day, you may have to help someone else. Diversity and inclusion are very important to advancing higher education institutions and others. I have to commend Fulbright on ensuring that a diverse group of students and scholars can experience studying and doing research in other countries," Thabang concluded.



Nematology research strengthened at international conference

Dr Tshima Ramakuwela, a new Department of Plant and Soil Sciences appointee tasked to establish Nematology as part of the Plant Pathology research focus, recently attended the Instituto de Ciencias de la Vid y del Vino (Institute of Grapevine and Wine Sciences)'s congress. This Conference celebrated the 100th anniversary of the first description of the entomopathogenic nematode (EPN) Steinernema kraussei by Gotthold Steiner in 1923.

Dr Ramakuwela was joined at the conference by Prof Brett Hurley and Innocent Rakubu (PhD candidate) from the same Department and affiliated with FABI.

This is the first conference to focus exclusively on using entomopathogenic nematodes as biocontrol agents for plant pests and diseases. The symposia included competent experts in different fields to summarise existing knowledge and provide valuable insights and perspectives on systematics, diversity and biogeography, behavioural ecology, survival, virulence and immunity, mass production, safety and regulation, and application technology.

Dr Ramakuwela presented an invited paper titled 'Entomopathogenic nematodes take root in South Africa' while Mr Rakubu presented two posters titled "Efficacy of entomopathogenic nematodes on pupae of Eucalyptus snout beetle, Gonipterus sp. n. 2' and 'Host-finding strategies of five South African entomopathogenic nematodes species'. The significance of these contributions and research in this field is underscored by EPN research being relatively new in South Africa. Currently, no indigenous EPN product is registered under Act 36 of 1947.

Dr Ramakuwela said, "The conference enhanced knowledge about the use of EPN symbiotic metabolites, the application of which can be extended from pest and disease control to pharmaceutical and medical applications."

Innocent Rakubu and Dr Tshima Ramakuwela

She added, "An additional twist in EPN research was presented on the discovery of EPN virulence factors in addition to studying the EPN and the symbiotic bacterial metabolites. There was also an interesting discussion about using quantum carbon dots to tag and trace EPN infective juveniles (IJ). This has potential application in persistence studies. Hence, the fate of EPN IJs is important for sustainability of pest control and environmental impact studies."

Dr Ramakuwela added, "This meeting strengthened collaboration with Prof Selcuk Hazir and Dr Harun Cimen from Adnan Menderes University in Turkey, who work on EPN symbiotic bacteria and their metabolites. Similarly, Dr Helge Bode from DSMZ- German Collection of Microorganisms and Cell Cultures would like to continue working on identifying and profiling symbiotic bacterial metabolites from SA indigenous species. This is an important collaboration as we initiate research on using EPN bacterial metabolites for plant parasitic nematodes and plant pathogens at UP."

"Knowledge gained will facilitate the establishment of Nematology as a research field at UP and subsequent training of students through research projects, Dr Ramakuwela concluded.

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ICTP and FABI partner hosted workshop on Biophysics of Spore Dispersal

The International Centre for Theoretical Physics (ICTP) in Italy, the Forestry and Agricultural Biotechnology Institute (FABI) and Innovation Africa @UP partnered to host a unique workshop on the Biophysics of Spore Dispersal: Ideas for Stopping Plant Disease in June. The workshop was organised by Prof Tjaart Krüger, Prof Anne Pringle (University of Wisconsin-Madison) and Prof Bernard Slippers.

Growing food (in)security is a significant concern in the developing world. The workshop aimed to stimulate research on basic phenomena of the biophysics of spore dispersal but also asked how research might be used in applied contexts. Reducing chemical use for pest management is an urgent need in Africa and globally, as well as in terms of cost, food safety, and environmental sustainability. Research on this topic can guide more accurate use of fungicides in the short term and explore less toxic alternatives in the long term.

The workshop was aligned with the strategies aimed at developing biophysics research on the African continent. Furthermore, the workshop was also a strategic step to enhance collaboration between the recently established National Institute for Theoretical and Computational Science (NITheCS) and ICTP, which aligns with their recent MoU. The aim was to have intensive engagements on building biophysics on the African continent and ask whether the biophysics of pathogen spore dispersal (which is hardly studied) offers potential targets for the disruption of plant disease.

Considering these twin aims, the workshop included lectures and discussions around the following topics: Introduction to biophysics, Introduction to mycology and biology of spore development and release, and Environmental factors influencing fungal spore development, release, and dispersal. It concluded with Basics of fluid dynamics and the physics of spore dispersal; and Application of physics of spore dispersal to the management of *Sclerotinia sclerotiorum*, a global plant pathogen with a wide host range and strong impact.

The main workshop was attended by 24 participants from South Africa, Botswana, Cameroon, Ivory Coast, Finland, Italy and the USA. The first day of the workshop was open and attended by 52 people in person and more than 70 virtually. Participants represented an interdisciplinary group involving Plant Pathology, Mycology, Physics, Mathematics, Plant Sciences and the Arts.

Mr Jan Hendrik Venter, Director of Plant Health: Department of Agriculture, Land Reform and Rural Development, opened the workshop. The remainder of the day included eight more talks from leading international experts from South Africa, Finland, Italy and the USA. The day concluded with a discussion on the way forward with Biophysics of Spore Dispersal as an emerging field, focusing on its relevance to African plant health in particular. Recordings of the talks are available here.

During the rest of the week, core participants explored key open questions on the biophysics of spore dispersal and generated ideas about how this knowledge could be used to stop plant disease. With this aim, the participants worked in small groups to develop project ideas based on the core themes identified. Project ideas taken up by these groups included biophysics and mathematical modelling of spore dispersal, spore morphology influences on plant pathogen ecology, case studies of a key pathogen (experimental model system) *Sclerotinia sclerotiorum*, and development of capacity, networking and funding opportunities. Participant groups working on core themes gave presentations to the group and received feedback for further development. Working groups incorporated the feedback and developed project management plans to implement the projects beyond the workshop.

Each workshop day, they also included an activity related to some workshop element. These activities, for example, included a 'plant disease walk', where participants engaged with experts in real-world settings on the Future Africa campus and experimental farm, observing plant diseases and reflecting on the ideas generated at the workshop. The third day involved a workshop on microscopy, including digital microscopy of spore shape (using the first digital microscope set up in Africa). The final day included visiting the Javett @UP Art Centre, as the Art-Science interface was a discussion topic throughout the workshop.

The workshop had many outcomes and opportunities. These included, for example, a raised awareness and inspiration amongst students and established researchers about the value and potential of Biophysics of Spore Dispersal for plant health; Connecting African and international networks and capacity on the topic of Biophysics of Spore Dispersal; Capacity development and knowledge sharing on critical issues in Biophysics of Spore Dispersal; Development of a roadmap for building and managing an international network, anchored in Africa, on Biophysics of Spore Dispersal; Advancing support for Biophysics in Africa; Identification of research gaps and questions, and progress on developing ideas towards projects and proposals, as well as teams around these ideas; Identification of potential partners and funding sources for Biophysics of Spore Dispersal. The projects emerging from the meeting have significant potential to impact plant disease management (potentially influencing modelling, breeding, treatment of disease, decision-making of application of chemicals, new chemical options), biosecurity (monitoring of plant pathogens) and the bio-economy (novel economic opportunities linked to the plant health and biosecurity topics mentioned); Development of Science Art and Communication abilities, as well as creative problem-solving methods and skills.

The participants were very positive about their experience at the workshop. Some of their comments were:

"The workshop far exceeded my expectations because gaining a basic understanding of biophysics completely changed my perspective on the disease cycle and the occurrence of infection in the field."

"The workshop met and exceeded my expectations in the shared motivation and already developing community spirit, as well as in the level of concreteness of the outputs."

"More than I expected. Super cool to be part of the start of biophysics @UP centring around and relating to plant pathology."

"I'd like to thank all the participants for their kindness. These days spent at Future Africa will remain forever engraved in my heart. Beyond the biological and physical knowledges of fungal spore dispersal and their consequences, I lived in a pleasant and friendly environment. I learned a lot in such a short time."

ENHANCED ACCESS AND SUCCESSFUL STUDENT LEARNING



Culinary arts students host unique dinner with Indigenous and orphan crops



University of Pretoria (UP) students from the Department of Consumer and Food Sciences recently hosted an innovative culinary experience for food and plant enthusiasts, friends and colleagues who had gathered at the University's Future Africa Institute.

The Indigenous and Orphan Crops Dinner was held in collaboration with the Future Africa Indigenous and Orphan Crops Collection of the Manie van der Schijff Botanical Garden and the Botanical Society of South Africa, and featured innovative dishes that contribute significantly to enhancing the genetic diversity of the food system.

For the event, which was part of their fourth-year B Consumer Science and Event Management exam outcomes, the Culinary Arts students sourced ingredients from the gardens at the Future Africa Institute and those on the Hatfield Campus in partnership with the team that oversees the indigenous and orphan crops collection.

Foraging, harvesting and sourcing indigenous and orphan crops present obvious difficulties as these varieties are not readily found in commercial markets and are instead found in the wild or gardens like the ones at UP. After obtaining the crops, the students were tasked with integrating them into menus. This process involved various factors, from storage, pre-preparation and cooking to exploring sensory elements like unfamiliar tastes, flavours and textures. These aspects required thorough consideration to guarantee a satisfying dining experience and sensory journey. When attendees were not taking pictures, they were engaged in lively conversations, exchanging questions about the recipes and discovering edible possibilities from unfamiliar crops.

The event aligned with Culinary Arts lecturer Dr Hennie Fisher's call to celebrate and utilise indigenous and orphan crops, especially within the hospitality sector. Dr Fisher supervised the students as they dazzled guests with delicious and visually appealing dishes.

"The global food system is heavily reliant on very few species, with just six of the world's 400 000 plant species accounting for 57% of the 9.5 billion tonnes of primary crop production in 2021," Dr Fisher said. "This reliance on a few key species leaves the food system vulnerable to environmental shocks and disease outbreaks, both of which are predicted to increase in frequency and intensity in the near future due to anthropogenic climate change.

"By adding more indigenous and orphan crops to plates, the genetic diversity of the food system is increased, thereby building resilience to external stresses, as many of these unique plant species are well adapted to local (often adverse) conditions and pests. In addition, including nutrient-dense indigenous and orphan crops offers opportunities for addressing 'hidden hunger' and reinforcing and, in many cases, rebuilding cultural and social connections with the food system."

Hospitality Management student and kitchen manager Tamara Nwaokoye stressed the need for a comprehensive approach to handling indigenous and orphan crops. Besides sourcing ingredients, students needed to understand and apply the unique culinary characteristics of various crops, considering sensory complexities like those presented by num-num fruit, broom cluster figs, Cape Ash berries, waterberries, marula, raisin-tree fruit and others. Logistical challenges concerning kitchen infrastructure and equipment also had to be addressed, and extensive recipe testing was vital to determine the specialised processing and cooking methods or equipment needed for the ingredients. Additionally, attention was given to accommodating dietary restrictions and allergies so that all the guests could enjoy the dining experience.

"It took some time to work out the tastes and other important aspects, but we pulled it off in the end," said student Andiswa Zondi. "I'm proud because this was also an opportunity to showcase teamwork. As fourth-year hospitality students responsible for the event, we received support from students studying food retail management, and consumer and food sciences. It's been an emotional roller-coaster since the planning phase, but we were thrilled to see our friends, families and lecturers so proud of us."

"I feel amazing about all this food going out and the research being done to raise awareness about indigenous and orphan crops," student Bianca Boshoff added. "I received numerous questions and could share many culinary techniques. It was a bit stressful, especially when we were running around during the dinner, but I felt proud and relieved when it was over and we weren't cleaning the kitchen. We're happy."

FIND OUT MORE
To learn more about the individual plants, a series of posts detailing the species used in the dinner will be published on the Future Africa Indigenous and Orphan Crops Collection page on various social media platforms:

FutureAfricaGarden
FutureAfricaGarden
futureafricaioc

For more on the Botanical Society of South Africa or to get involved in their projects and events, email gauteng@botanicalsociety.org.za or visit www.botanicalsociety.org.za

Newlyweds share their UP PhD graduate journey

Building a life together as newlyweds is already a challenge for most. Add to that studying for a doctorate takes 'couple goals' to a new level. However, for Jean-Pierre Stander (28) and René Stander (27), who both graduated with PhDs in Mathematical Statistics at the 2024 Spring Graduation ceremonies in the first week of September, it only made them stronger.

Navigating the challenges of building a life together and managing academic responsibilities required sacrifices, but mutual support and understanding strengthened their relationship, turning potential obstacles into opportunities for growth. "As a newly wedded couple, we had to adjust to living together, building a life together, and working. We knew we had to make sacrifices to be able to spend time on our academic responsibilities. With the same goal in mind, it was easier to make these sacrifices," Jean-Pierre says.

The pair first crossed paths while studying actuarial science as undergraduates. "We met in class in the second year of our undergraduate degree, so we got to know each other while studying the same degrees with the same subjects," René adds.

Their academic journey continued into their master's degrees, which laid the foundation for their PhD pursuits. René, with aspirations of an academic career, saw the doctorate as an essential step. For both, continuing their studies was a logical progression, driven by a passion for their field and a desire to avoid the complexities of returning to university later in life.

The PhD journey is known for its emotional highs and lows, and Jean-Pierre and René experienced this firsthand. Fortunately, their mutual support made a significant difference. "When one of us struggled, the other was ready to support. Having experienced your own down helped in knowing how to motivate one another. Studying in the same field allowed for opportunities to talk through ideas and be each other's 'soundboard' about ideas," Jean-Pierre explains. The couple also relied on their support network of family and friends, and made sure to take breaks together to debrief and recharge. This approach helped them maintain their well-being and focus on their research.

Despite their distinct research focuses, they supported each other's work and remained actively engaged in their individual projects.

UP played a crucial role in their academic journey. Under the guidance of their supervisor, Prof Inger Fabris-Rotelli, they received valuable support and motivation. "She kept us motivated to keep going and to help us graduate at the same time. Through the University of Pretoria, we had the invaluable opportunity to attend local and international conferences, which exposed us to experts in our research field, and [allowed us to] have a platform to present our research and obtain feedback and ideas from other researchers in the field."

Dr Jean-Pierre Stander and his wife, Dr René Stander.

One of the highlights of their time at UP was the chance to present their research at various conferences. Looking ahead, René plans to build a career in academia, while Jean-Pierre aims to apply his research skills and problem-solving abilities in industry, where clear communication of complex ideas is crucial. They also plan to continue collaborating on research projects, with a current project involving co-authoring a paper.

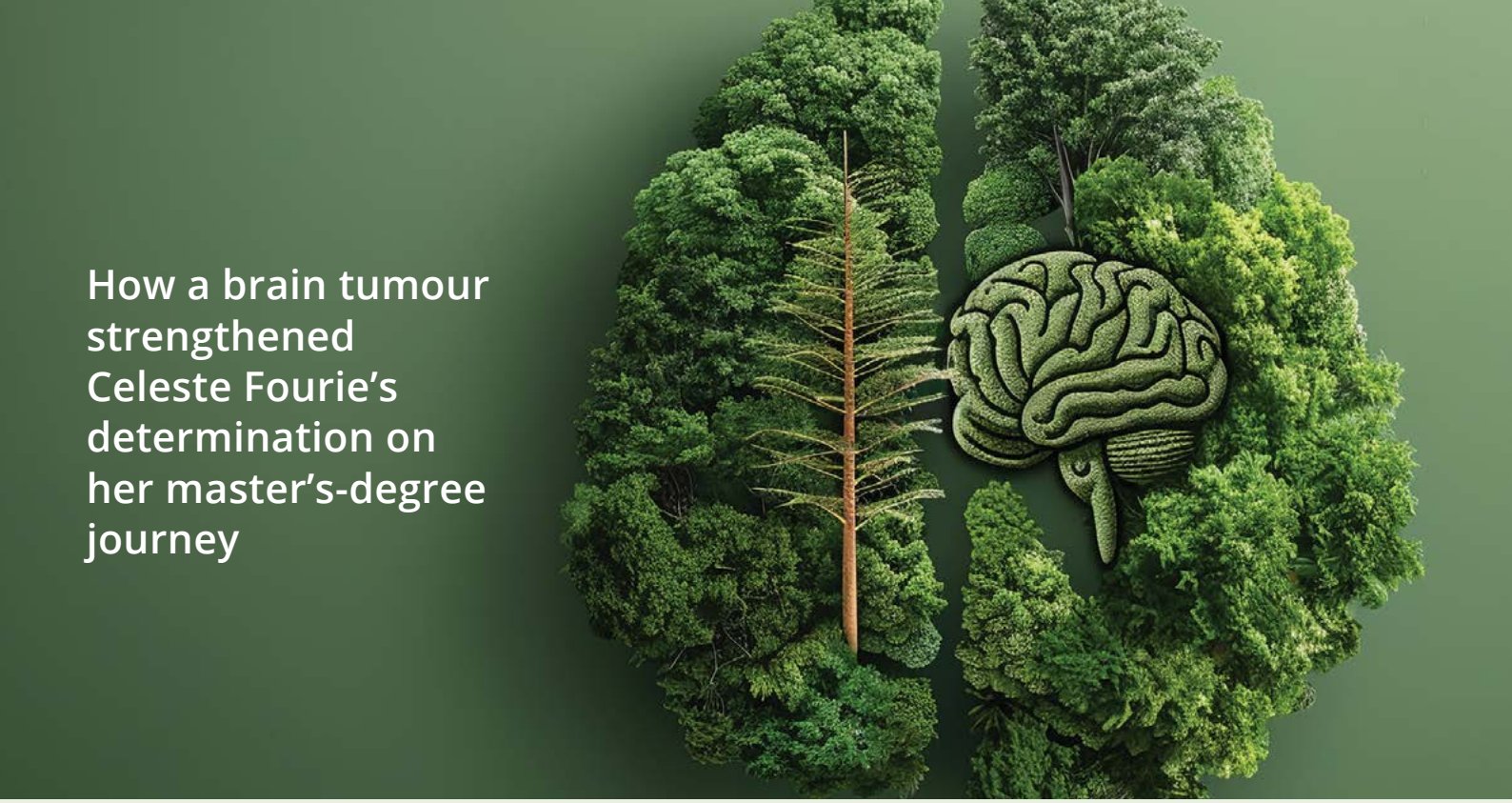
For couples considering doing advanced degrees together, Jean-Pierre and René offer this advice: communication and understanding are key. They add that it's important to share household responsibilities and be aware of each other's stress levels; planning deadlines to avoid simultaneous pressures can also help maintain balance, and supporting each other through challenges and celebrating achievements together can make the journey more rewarding.

To celebrate this significant milestone, the couple spoilt themselves on a well-deserved vacation at their favourite destination, the Kruger National Park. "And for the future... we are patiently awaiting the arrival of our first-born next year," René concludes.

NAS Spring 2024 graduation statistics

173	123	36	77	10	50
Total degrees conferred	Total postgraduate	PhD degrees conferred	MSc degrees conferred	Hons degrees conferred	Undergraduate degrees conferred

How a brain tumour strengthened Celeste Fourie's determination on her master's-degree journey



Celeste Fourie discovered she had a brain tumour while studying for a master's degree in meteorology at the University of Pretoria (UP) in 2022.

Fourie (30) had to pause her studies to undergo surgery and subsequent treatment. Despite resuming her studies in 2023 while still dealing with severe headaches and other complications, her determination never wavered. She persevered through the challenging times and completed her MSc in July 2024 with a mark above 70%.

"I was overcome with joy and tremendous relief," she says. "With all the challenges, I was happy to reach the finish line. But hearing that I achieved it with a mark over 70%... words fail to describe the joy I felt."

Her journey, marked by a brain tumour diagnosis and subsequent recovery, not only reshaped her approach to her studies but also provided a profound lesson in perseverance. "My main concern at that point was to have a full recovery from my surgeries so that I could continue my studies. I knew that I wanted to complete my studies no matter what obstacle was placed in my way. But to complete my studies, I realised I had to pause my studies to recover entirely from my surgeries first."

Celeste confirms that adjusting to life after brain surgery presented a unique set of challenges. Everyday tasks that were once second nature now required considerable concentration. "The most challenging part was finding a new 'normal'. After the brain surgery, several mundane daily tasks required concentration. Learning to have compassion and grace for myself during my recovery, and applying it to my studies, was challenging. I would quickly get upset when I could not do things 'as before,' but I took it one day at a time with patience, grace and compassion."

Staying focused on her studies during treatment was incredibly challenging. Her academic goals were a vital source of motivation, making the idea of abandoning her studies after brain surgery unthinkable. By keeping her objectives clear and reminding herself of her purpose, she found the strength to persevere through the most difficult days. Her mantra, "You did not overcome brain surgery just to quit now!" became a powerful testament to her resilience.

Celeste elaborates that her family played a pivotal role in her journey. While they could not directly assist with her MSc, their emotional and practical support during her recovery was invaluable. Additionally, the understanding and flexibility from UP came in handy; and her mentor provided a balance of encouragement and constructive feedback. "The University was extremely helpful and understanding. They did not pressure me, and allowed me to work at my own pace. My mentor, Prof Liesl Dyson, was always available and motivated me to keep on going at my own pace. She was very kind and gentle, but also firm, to make sure that I developed the best research I could."

One of the most daunting aspects of her academic journey was handling feedback from her mentor. The challenge of revising and improving upon weeks of work was emotionally taxing. However, breaking down the feedback into manageable steps and addressing one comment at a time helped her stay motivated and eventually led to the successful completion of her degree. "The best way to overcome this challenge is to take one comment or feedback at a time. If you look at everything as a whole, you'll be overwhelmed, but by taking one comment at a time, you'll be done before you even realise it," she advises.

Celeste Fourie

Now brain tumour-free, she is determined to use her qualifications to support others in her field and community. Her goal is to inspire and assist individuals who may be discouraged by their own challenges. She hopes to demonstrate that with dedication and resilience, academic and personal goals are achievable, no matter the obstacles.

Celeste's advice to those navigating health challenges while pursuing their academic goals: "Do the best you can every day. If one day you can only write a single sentence, then you've given your best. Your best will look different every day, so keep your focus on today, as tomorrow will be a completely new day."

Four-time UP graduate adds PhD to her name

Four-time University of Pretoria (UP) graduate Nina Parry has earned a PhD for her research in applied entomology, focused on the initial steps for developing rearing and processing methods for black soldier flies in start-up bioconversion facilities.

Bioconversion refers to the process of using biological organisms, such as insects or bacteria, to convert organic materials (often waste products) into useful products.

"It was a long road, and it did not initially feel real when I was told that I had passed my PhD," says Parry, who received her PhD during the University of Pretoria (UP) 2024 Spring Graduation ceremonies in the first week of September. "It took a couple of weeks to sink in."

Parry is no newcomer to UP graduations – she already earned three UP degrees before this most recent graduation: a BSc Entomology in 2013, an honours *cum laude* in the same field in 2014, and an MSc Entomology in 2017 *cum laude*. She currently works as a science teacher, which she's passionate about.

Parry says there are many potential applications for her work. "It is a rapidly growing industry, with a lot of research happening to support that growth," she explains. "Bioconversion using insects like *Hermetia illucens* [the black soldier fly] has tremendous potential to revolutionise waste management and animal feed production, following principles of a circular economy, where waste is reduced and nutrients are recycled, rather than lost in landfills, for example."

Parry says black soldier fly larvae "are voracious generalists that feed on virtually any organic waste material, and the adults are a short-lived fly species that is not associated with humans, cattle or buildings, generally preferring to hang out near compost heaps, where they often lay their eggs".

She says scaled production needs to be cost-effective, high quality and reliable to produce larvae at the necessary scale to compete with traditional animal feed ingredients.

"Each step of production of larvae for animal feed is complex and can be costly, with bottle necks that slow things down. Additionally, the industry is new, and there are many pitfalls start-up bioconversion companies can fall into that could limit growth. I wanted to address those steps as much as possible in my research."

One of her dreams is to work as a lecturer at a university someday. "Right now, my priority is teaching science to my high school learners. I often talk about my experiences as a scientist to inspire them and give them context about science and how to be more curious about how the world works. One day, I would like to step back into research and further pursue my goals to improve and learn more about using flies for bioconversion."

Parry says completing her studies at UP was a "no-brainer" as UP is a world-class institution with one of the best entomology departments in the country. Additionally, with her previous postgraduate degrees, she's built a very strong relationship with her supervisor, Prof Chris Weldon at the Department of Zoology and Entomology, and he was prepared to work with her again for her PhD.

Nina Parry

She reveals that funding issues almost prevented her from realising her dream.

"Funding became limited early on in my project, partly due to COVID-19, and investment in the bioconversion facility I was working for was limited. I had to change my project and approach to accommodate the changes and use the resources I had available."

Parry says her future plans are still in the air. Still, she might continue to work as a teacher, apply for work as a post-doctoral fellow or lecturer, or consider starting up her own bioconversion facility.

"It is difficult to say for sure, but one way or another, I am excited, and I will do my best to make it a success."

Animal Science Department stuns at SASAS Annual Congress

The Department of Animal Science recently participated in the South African Society for Animal Science's (SASAS) annual congress held in East London. From postgraduate students winning a national debate competition to seasoned professors receiving prestigious awards, the Department and its alumni stunned the congress!

SASAS runs an annual quiz and debate competition for final-year and postgraduate students. This year, UP's Department of Animal Science entered two teams for both categories, with the first team being Elri Botha, Mpho Digashoa and Frans Malan. The Department's second team comprised Jennifer-Lee O'donovan, Stefan Corbett, and Rudolf Beneke. The students are studying MSc Production Physiology and Product Quality, MSc Livestock Production, MSc Animal Nutrition or MSc Animal Breeding and Genetics. The teams were coached for the debate by Rimbilana Shingange, a lecturer in the Department.

Both teams won their rounds in the preliminary rounds of the debate tournament, which were held online. The first team successfully defended using genetically engineered production animals over naturally selected production animals, and the second team proved that climate-smart agriculture is not promoted enough in South Africa. Due to the odd number of teams selected for the first preliminary rounds, UP's first team was unfortunately not able to proceed to the semi-finals; however, the second team did and thus spoke in the final debate round in person at the congress, where they proved that there are more impactful disadvantages to exporting live animals by sea for slaughter at remote destinations against the other finalists of the competition, the University of Stellenbosch. The Stellenbosch team advocated that the economic benefits of shipping live animals for slaughter are paramount to the livestock producer and the country that is shipping the animals and that the cases wherein livestock have been found in unethical conditions on the way to or aboard livestock carrier ships are few and far between and should not affect the entire industry. The UP teams countered these arguments by proving that even in the instance that receiving countries are willing to pay a premium for these livestock, the livestock should not be subjected to the conditions on these transport carriers, such as fluctuating temperatures, build-up of toxic gases and limited physical space, mainly when these conditions result in chronic stress for these animals and ultimately reduces the quality of their meat products. Both UP teams showed commendable dedication and progress, practising weeks in advance and going from fear of speaking for 30 seconds to speaking beyond three minutes.

Danielle Alberts, a PhD Animal Science candidate in the Department, was awarded a Bronze Medal by SASAS. This award recognises meritorious research, and in her case, her dissertation, which is relevant to animal science. She thanked her supervisor, Prof Este van Marle-Köster, for always believing in her and motivating her. She is excited to see what the future holds and what else she can contribute to the field while studying at the University of Pretoria.

Prof Abubeker Hassen, a professor in animal nutrition in the Department, was also awarded a Silver Medal by SASAS in the Research Category. SASAS awards this prestigious medal for research achievements in a particular year that pertain to exceptionally deserving and original research efforts or meritorious contributions published in recognised and refereed scientific journals. He is grateful for this recognition from his peers.

Tony Ferreira, an alumnus of the Department, also received the first runner-up award of the African Feed Manufacturer's Association (AFMA)'s Student Nutrition Award for his work on commercial phytase enzymes in broilers. Another alumna, Dr Ida Linde, also received the David Uys trophy. This prize is awarded to the best paper published in the *South African Journal of Animal Science* (SAJAS) by a paid-up SASAS member in 2023. The paper titled *"Differential gene expression in the Longissimus dorsi of Nguni and Bonsmara bulls finished on low and high energy diets"* reported parts of her PhD project, which was completed under the supervision of Prof Este van Marle-Köster and was co-authored by M.M. Scholtz, M.G. Gonda, J.L. Gonzalez-Hernandez and M. D. MacNeil.

Postgraduate students and staff also presented six different research abstracts at the congress. The Department is proud of everyone who contributed to the congress, acknowledges and thanks all organisations and companies who sponsored the congress and hopes to provide more opportunities for students to interact with academia and industry.

From left: Stefan Corbett, Jennifer-Lee O'Donovan, Rimbilana Shingange and Rudolf Beneke

From left: Prof Este van Marle-Köster, Danielle Alberts, Tony Ferreira and Prof Carina Visser

Prof Este van Marle-Köster and Danielle Alberts

Prof Abubeker Hassen

Celebrating International Day of Plant Health

Hands-on learning: Students examine morphological features of fungi under the microscope during the facilities tour at the 2024 event.

12 May officially marks the day the global community celebrates the UN-designated **International Day of Plant Health (IDPH)**. On 10 May, the Faculty of Natural and Agricultural Sciences held a momentous event ahead of the global IDPH celebration. This year's theme, "Plant Health, Safe Trade, and Digital Technology", brought together a diverse group of attendees, including academic staff, students, industry leaders, and company representatives.

The Dean of the Faculty, Prof Barend Erasmus, officially opened the event, emphasising the importance of bridging the gap between academia and industry to produce graduates who are ready to meet industry needs. Prof Dave Berger, Head of the Department of Plant and Soil Sciences, welcomed the attendees and posed a pivotal question: "How can we use digital technology for safe health?" This set the stage for insightful talks and discussions throughout the day.

A range of experts from academia and industry shared their perspectives, research findings and case studies on the application of digital technology and safe trade in plant health. Key presentations included: The future of digital technology in advancing plant health: Africa's perspective (Mr Michael Mutekeri from Regina Analytics); Digital technology and its use in ensuring optimum crop yields (Dr Nicky Creux from UP) and Chemical industry's perspective on innovative strategies for sustainable plant protection (Dr Elbe Hugo from Syngenta). Other presentations were Integrated disease management for sustainable plant protection (Dr Belinda Janse van Rensburg from Agricultural Research Council), Bridging the gap between industry and academia in ensuring sustainable plant protection (Prof Jacquie van der Waals from Citrus Research International), and Plant Health and safe trade: South Africa's perspective (Ms Isabella Bezuidenhout, South African National Seed Organization).

Approximately 90 learners from the LEAP Science and Maths School and Mamelodi Secondary School collectively attended the event, receiving a rich educational experience as part of the IDPH learner programme. They attended seminars on plant biotechnology and plant pathology and went on facility tours, including the FABI diagnostic clinic and phytotrons, sequencing facility, and plant pathology's diagnostic MALDI-TOF and digital drop PCR facilities.

The event also featured an exhibition where various companies and organisations presented their products and services. Participants included Anatech, Inqaba Biotech, Thermofisher, Starke Ayres, Lasec, ARC, and SANSOR. Research from various sections of the Department of Plant and Soil Science, including Plant Biotechnology, Medicinal Plant Science and Plant Pathology, were showcased alongside contributions from the Citrus Pathology Research Group and FABI.

The day ended with a dynamic panel discussion highlighting digital technology's critical role in promoting plant health. Attendees had a delightful, informative experience, emphasising their interest in "the significant work done by each stakeholder to improve plant health". The panel called for greater collaboration between researchers, industry, and policymakers to harness the power of digital innovations. Chairs of the organising committee for the event, Dr Nsibo and Dr Bophela-Dimpe, stated, "Plants play critical roles in sustaining life. Everybody, therefore, must protect them so that they can sustain the life of humanity.

Looking Ahead

The University of Pretoria's celebration of IDPH 2024 was a testament to the power of collaboration and innovation in advancing plant health. The event highlighted the University's role in leading research and education and underscored the importance of digital technology in shaping the future of agriculture. As we move forward, the insights and connections forged during this event will play a crucial role in addressing plant health challenges on a global scale.

The success of the IDPH 2024 at UP was made possible by the dedicated efforts of the organising committee members, Dr David Livingstone Nsibo, Dr Khumbuzile Bophela-Dimpe, Ms Jane Fourie, Dr Jarishma Gokul, and Dr Tshimangadzo Ramakuwela.

Three #ChooseUP bursaries to NAS students

Three female Grade 12 learners won #ChooseUP bursaries on 17 August 2024 (aptly in Women's Month) to study in the Faculty of Natural and Agricultural Sciences (NAS) next year. The names of the winners, Melodie Viljoen, Isane Bezuidenhout and Jodi Volkwyn, were selected by the Dean in a lucky draw. We look forward to welcoming you to NAS next year.

From left: Melodie Viljoen, Isane Bezuidenhout, Prof Barend Erasmus (Dean: Faculty of Natural and Agricultural Sciences), Jodi Volkwyn, Prof Paulette Bloomer (Deputy Dean: Teaching and Learning) and Ms Xolile Kunene (Head: Student Adminstration).

NAS supports Eskom Expo for Young Scientists with bursaries

The University of Pretoria (UP) has a long and proud tradition of being a sponsor of the Eskom Expo for Young Scientists International Science Fair (ISF). The 2024 event, hosted in Johannesburg in September, was no exception.

The Faculty of Natural and Agricultural Sciences (NAS) awarded three bursaries, valued at R105 000, to two Grade 11 learners and one Grade 12 learner.

The three NAS bursaries of R35 000 each have been awarded to Binyameen Mohamedy (Grade 11) from the Gauteng South Region, Ismail Hamzah (Grade 11) from the Northern KZN Region and Banele Madiba (Grade 12) from the KZN Far North Region.

The Eskom Expo for Young Scientists International Science Fair (ISF) 2024 celebrated the exceptional talent of young innovators by recognising the Special Award winners. These bright minds, hailing from South Africa and beyond, impressed judges with their ground-breaking projects that tackled real-world challenges through science, technology, engineering, and mathematics (STEM). Each winner demonstrated remarkable creativity, critical thinking, and dedication, setting a high standard for future generations of young scientists.

Binyameen Mohamedy and Prof Barend Erasmus, Dean of the Faculty of Natural and Agricultural Sciences

Ismail Hamzah and Prof Barend Erasmus, Dean of the Faculty of Natural and Agricultural Sciences

Banele Madiba and Prof Barend Erasmus, Dean of the Faculty of Natural and Agricultural Sciences

Future scientists awarded as exceptional achievers

More than 60 prizes were awarded at the Annual Exceptional Achievers Function for the Faculty of Natural and Agricultural Sciences students in June this year.

Dr Khumbuzile Bophela, from the Department of Plant and Soil Sciences, was the programme director. Dr Charissa Button, University of Pretoria's (UP) first PhD graduate in Astrophysics, was the guest speaker.

Neale Berkenbosch, who completed his BSc degree in Chemistry, received the Vice-Chancellor and Principal's medal for maintaining a weighted average performance (94%) during his three years of undergraduate studies. He not only obtained first place on the Dean's List for third-year students with 96,5% but also won the Department of Physics Prize for the best third-year student in Physics. Neale topped that off by winning the Department of Chemistry Prize for the best third-year student in Analytical Chemistry.

Omiwole Ayomide was not only first on the Dean's List in the BSc Extended Programmes with 84,17% but won the ECP's Exceptional Achievers Award for the best female first-year student in the BSc Extended Programme. Emily Hawkes was first on the Dean's List in the first-year category with 95,53%. In the second-year student category, Zerwick Johannes de Lange (BSc Physics) earned the top spot with 96,56% and walked away with the Department of Chemistry Prize for the best second-year student in Physics. P Patoussias was the best student in the category for fourth-year students with 85,6% and won the Omnia Fertilizer Prize for the best final-year student in Plant Production,

Watch the virtual event here.

Neale Berkenbosch and Prof Barend Erasmus, Dean of the Faculty of Natural and Agricultural Sciences.

Prof Catherine Sole delivers her inaugural address

The Faculty of Natural and Agricultural Sciences proudly hosted the inaugural address of Prof Catherine Sole, Professor in Systematic and Evolutionary Entomology in the Department of Zoology and Entomology, on 8 October 2024. The title of her address was *Invertebrate diversity documented through speciation and biogeography*. Her inaugural address was in person; therefore, no recordings are available.

An inaugural address is an auspicious event in the life of a senior academic following their promotion to full professorship or appointment to a position of academic leadership. After the graduation ceremony at which one's doctoral degree is conferred, the inaugural address is probably one of the most memorable occasions for any full Professor.

From left: Prof Barend Erasmus (Dean: Faculty of Natural and Agricultural Sciences), Prof Catherine Sole and Prof Caroline Nicholson (Registrar).

UP academics contribute to AGRIOS' Plant Pathology textbook

Three researchers from the Faculty of Natural and Agricultural Sciences and Forestry and Agricultural Biotechnology Institute (FABI) contributed to the textbook AGRIOS' Plant Pathology (6th edition). This textbook was the brainchild of Professor George N. Agrios, who had an illustrious career as a plant pathologist at the University of Florida, USA.

Chapters on diseases of a comprehensive range of plant hosts are a new feature of this edition. It includes invited contributions from **Prof Mike Wingfield** from FABI and **Prof Irene Barnes** of the Department of Biochemistry, Genetics and Microbiology and FABI, who contributed the chapter entitled "Diseases of plantation trees in the tropics and Southern Hemisphere". This is the first time Forest Pathology has been featured in AGRIOS, with a second chapter covering Forest Trees in the Northern Hemisphere. **Prof Dave Berger**, Head of the Department of Plant and Soil Sciences and FABI, contributed to the "Diseases of maize/corn" chapter.

Plant Pathology is underpinned by accurate identification and effective control of plant diseases in farmers' fields. However, the discipline has undergone significant advances in the past twenty years. Genomics and molecular biology have revealed molecular mechanisms of plant immunity and pathogen effectors that manipulate host cells. Next-generation sequencing allowed researchers to get complete gene catalogues for plant hosts, pathogens, and associated microbiomes. Marker-assisted selection has accelerated disease resistance breeding. Gene editing enabled precise modification of plant genes, resulting in pathogen-resistant crops. Monitoring of disease shifts due to global travel and climate change has improved with molecular diagnostics, remote sensing and AI. Integrated pest management and biological control are increasingly popular approaches to disease control.

It was, therefore, timely to update the textbook AGRIOS' Plant Pathology, which has served as the reference for plant pathologists worldwide from the first edition in 1969 to the 5th edition in 2005. It has even been described as the "bible" of plant pathology and translated into 11 languages. After Prof Agrios' passing in 2010, there was a hiatus until the 6th edition (873 pages) was published this year. This single reference will significantly advance the BSc (Agric) Plant Pathology degree curriculum, other plant health-related modules and postgraduate research at the University of Pretoria.

Prof Dave Berger and Prof Irene Barnes

NAS shines at UP2U workshop and Flexible Futures conference

The recent UP2U workshop and Flexible Futures conference in August successfully brought together educators, researchers, and industry professionals to reimagine assessment in higher education, particularly in the context of AI.

Presentations from the Faculty of Natural and Agricultural Sciences (NAS) showcased innovative approaches and practical solutions, contributing to the ongoing dialogue on enhancing educational practices in the age of AI. This emphasised the University of Pretoria (UP)'s commitment to fostering innovation and excellence in higher education.

UP2U Workshop

The UP2U workshop, themed "Reimagining Assessment in Higher Education," was a prelude to the Flexible Futures conference. This hybrid event invited learning design practitioners to reconsider their roles in assessment. The workshop focused on the evolving landscape of assessment practices, highlighting opportunities and challenges from a learning design perspective. Participants shared research papers, case studies, and innovative ideas, enriching the discussions with unique insights.

Flexible Futures Conference

The Flexible Futures conference continued the dialogue on "Reimagining Assessment in Higher Education: Navigating the intersections of integrity, quality, and Artificial Intelligence (AI) in Higher Education." The event featured a series of presentations and discussions addressing the integration of AI in assessment strategies. The conference provided a platform for meaningful exchanges on how AI can enhance assessment practices while maintaining academic integrity and fairness.

During the panel discussion by the different Deputy Deans for Teaching and Learning, Prof Paulette Bloomer highlighted AI in formative assessment by addressing the question: How can AI tools be utilised to provide ongoing feedback and support to students, helping them improve continuously? She included several examples of innovative approaches in NAS, such as Geology's "BackUP!" sessions in some modules achieved via Blackboard ULTRA quizzes and Gradescope by Statistics and Actuarial Science, to provide timeous and consistent feedback on grading. Other examples included colleagues from Geography, Geoinformatics and Meteorology who created their own tools for grading cartography assignments; Physics and Chemistry trialling adaptive learning systems; and Consumer and Food Sciences adopting Mentimeter and Kahoot for in-class engagement.

Dr Hennie Fisher from the Department of Consumer and Food Sciences explored how inter-departmental collaboration can drive curriculum transformation. Using the example of the chicken breast, Dr Fisher highlighted practical integration opportunities that can enhance educational outcomes.

Ms Michelle Bheemraj from the Office of the Deputy Dean for Teaching and Learning presentation focused on optimising the interface between Learning Management Systems (LMS), AI, and human intelligence. Her talk included engaging, hands-on demos of AI tools that captivated the audience, showcasing practical applications of AI in assessment. She also focused on learning theories and pedagogical approaches, providing a comprehensive view of how AI can be integrated into educational practices.

Dr Lizette Diedericks from the Department of Consumer and Food Sciences discussed integrating theory and practice to enhance academic integrity. She emphasised the use of artefact-based assignments as a means to uphold academic standards and foster genuine learning experiences. She furthermore highlighted the value of transdisciplinary research enriching teaching and learning.

The last presentation by a NAS staff member was by Dr Paul van Staden from the Department of Statistics, who presented an innovative approach to teaching probability through gamification. Using the board game Snakes and Ladders, he demonstrated how programming and simulation can make learning statistics and data science more engaging and effective.

Prof Paulette Bloomer

Ms Michelle Bheemraj

Dr Lizette Diedericks

Dr Hennie Fisher

Dr Paul van Staden

TRANSFORMED AND INCLUSIVE COMMUNITY

NAS march to raise awareness for women

Staff and students from the Faculty of Natural and Agricultural Sciences marched on the Hatfield Campus on 7 August as part of Women's Month activities, raising awareness for women in science and women in higher education. The march participants also had the opportunity to interact and give their opinions about what Women's Day means.

NAS makes a difference in communities with Buckets of Hope initiative

The Buckets of Hope initiative, a heart-warming collaboration with SA Harvest, has recently concluded, leaving a lasting impact on our communities. SA Harvest, a leading organisation in the fight against hunger, spearheaded the initiative to pack and distribute buckets of essential, non-perishable food items and supplies to vulnerable families across Johannesburg, Durban, and Cape Town.

In joining hands with the Rethink@NAS Outreach Committee, the Department of Consumer and Food Sciences reached out to the Faculty of Natural and Agricultural Sciences (NAS) departments to rally support for this cause. The response was overwhelmingly positive, demonstrating the collective commitment to fighting hunger and supporting our communities. Whether through packing buckets, donating time, or contributing funds, every department played a crucial role in the success of the Buckets of Hope initiative.
Aimed to address food insecurity and promote community solidarity, this initiative was well aligned with SA Harvest's mission to rescue surplus food and convert it into nutritious meals for over 200 beneficiary organisations countrywide.

Honouring community spirit and the impact of your involvement

The Buckets of Hope initiative was more than just a food distribution project; it was a testament to the spirit of unity and compassion inspired by Nelson Mandela's legacy. By participating, departments contributed to a broader movement of kindness and community support, embodying the values of empathy and solidarity. It is important to remember that with each donation, a bucket was packed, supporting the needs of households and families in dire need. The collaborative efforts of the NAS departments were instrumental in making this possible, thereby demonstrating the power of collective action.

Looking Forward

As we reflect on the success of the Buckets of Hope initiative, the Rethink@NAS Outreach subcommittee and the Department of Consumer and Food Sciences would like to extend their heartfelt thanks to everyone who participated and supported the cause. Your contributions have made a meaningful difference in the lives of many and have reinforced the importance of community engagement in addressing societal challenges. Although the initiative has concluded, the spirit of giving and community support it inspired will continue to resonate. We encourage everyone to carry forward this spirit of compassion and consider future opportunities to contribute to similar causes. We have proven that working collectively can create positive change and support those in need.

Celebrating women of NAS

The Faculty of Natural and Agricultural Sciences is home to many women, ranging from academic, management, and professional staff, who perform their daily jobs and excel in their careers. As Women's Month in South Africa, we focused on a few female staff members during August.

Ms Rimbilana Shingange

Lecturer: Department of Animal Science

Q: What has been the highlight of your career?
A: In October 2022, I received an email from the NATHouse Executive Committee saying that students had nominated me for the Best Senior Year Lecturer Award. Of course, most people would be excited to receive such communication; however, it was a priceless moment for me. This is because I had started lecturing in the Department of Animal Science only in February of 2022, and to be acknowledged by students in this way was an affirmation of my dedication and passion for education, a field I never envisioned myself in. It meant that my students appreciated my efforts to create engaging, effective, and inclusive learning experiences, and it was the best motivation I could have hoped for.

Q: What inspires you?
A: It's important to me that as someone in a position of authority, I intentionally and inter-sectionally see all of my students for who they are and who they strive to be. If I can positively represent some aspect, quality, or trait they see in themselves, they can then identify and transform other aspects of themselves that they may see as undesirable; this transformative capacity inspires me.

Q: What challenges have you experienced in your career?
A: As a young, black woman in an older white-man-dominated discipline, imposter syndrome very often caused me to doubt my belonging at the front of a lecture hall or seated in a staff meeting. Over time, though, I understand more and more that, as people, we have the uncanny ability to internalise and make permanent that which is temporary. Maya Angelou said, ' We are all in process and should do the best that we can, knowing that we are transient,' this notion has helped me contextualise my experiences and use them for growth.

Q: What message do you have for the women of South Africa?
A: Society expects women to be accountable in ways that other members of society, particularly men, aren't: Women are disproportionately responsible for domestic duties, surprisingly expected to sacrifice their bodily and mental health and image to bear children, and wholly liable for the emotional state of many around them. Thus, women often internalise their inability and unwillingness to fully meet these expectations (both valid reasons) as personal failures. Sihle-siphon Nontshokweni wrote, ' All of my ugliness is mine, and so is my courage'. So, women must, unapologetically, strive to create the lives they want for themselves because they are the only ones who experience what it is to be them.

Mrs Ria Swart

Departmental Administrator: Department of Chemistry

Q: What has been the highlight of your career?
A: As a departmental administrator, one of my responsibilities is to guide, support, and personally engage in the career development of the postgraduate students in our department. Witnessing their growth into young academic and research professionals is one of the most rewarding aspects of my career.

Q: What inspires you?
A: My love for God inspires me. By serving others, I serve my Heavenly Father. My work culture's essence is finding the best ways to solve people's problems.

Q: What challenges have you experienced in your career?
A: Looking back, my biggest challenge was raising my two children as a single parent and overcoming cancer while still managing my professional and personal responsibilities.

Q: What message do you have for the women of South Africa?
A: I advise all young women to strive for maximum independence as it will empower them with freedom and control over their lives.

Ms Thanyani Mafumo

Departmental Administrator: Department of Agricultural Economics, Extension and Rural Development

Q: What has been the highlight of your career?
A: Obtaining my degree while working full time and a mother of two beautiful children. It was not an easy journey; I had to sacrifice the time I could spend with my family to catch up on my studies.

Q: What inspires you?
A: A drive to become the best at what I do and help others is what inspires and motivates me every day.

Q: What challenges have you experienced in your career?
A: To juggle multiple projects, deadlines, and requests while dealing with interruptions and family matters. I prioritise my work based on urgency, importance, and deadlines to cope with this situation.

Q: What message do you have for the women of South Africa?
A: Let all that you do be done in love, and take care of yourself in all aspects of your life, such as health and wellness, including mental health.

Dr Nadine Sonnenberg

Senior lecturer in the Department of Consumer and Food Sciences.

Q: What has been the highlight of your career?
A: As bland as it may seem, and almost ten years since, I would have to say my highlight was the day I submitted my PhD. There are many other amazing highlights following the PhD, which certainly carry more weight from an academic perspective. Still, from a personal perspective, I have never been so happy finishing something riddled with seemingly insurmountable challenges all along the way. I am sure many people with a PhD can relate because life still happens whether you are busy with a PhD or not! To this day, the lessons I learned from that experience shaped much of my thinking and understanding that perseverance and sheer faith can make the impossible possible no matter how high the odds are stacked against it.

Q: What inspires you?
A: The "unexplained". Whether we are natural or social scientists, there are always some unexplained problems or issues at the core of what we do, which justifies the time and effort we devote toward generating scientific results that can, to some extent, offer explanations and/or solutions for those problems. Yet, regardless of how deep we dig, there will always remain that which is "unexplained" and allows us to stay curious, to continue investigating, and humbly accept that there are limitations to what we know.

Q: What challenges have you experienced in your career?
A: Like many other women in science, my challenge has always been balancing my role as a mom and following a career in Academia. In my case, it's being a single mom to a 15-year-old autistic girl, and as I always jokingly maintain, the combination of puberty and autism is not for the faint-hearted! But in this, I recognise immense blessing and gratitude for my chosen career path because it allows me to continue pursuing those things I am passionate about and, with that, a certain amount of flexibility in how and when I engage those pursuits.

Q: What message do you have for the women of South Africa?
A: We live in a performance-driven society, where every day, we are, in one way or another, reminded of what we have not yet achieved and where we have not yet succeeded. There will always be someone doing things better and achieving higher accolades, but each woman has a unique story to tell, and there is an inspiration to find in each of these stories, no matter who you are and what you do. While others might not always grasp the full scope and background of your story (which is also okay!), we, as women, need to sometimes take a moment and reflect on what we managed to get right as opposed to all those things we have not yet achieved and then draw inspiration from that to continue our journey forward, mindful of the prescribed norms and role models, but not to the detriment of our well-being.

Ms Dandalene Robinson

Senior Administrative Officer: Centre for Environmental Studies (Department of Geography, Geoinformatics and Meteorology)

Q: What has been the highlight of your career?
A: I have met and interacted with extraordinary people at the University throughout my nearly 20 years working here. I can mention an instance when I assisted a student who did not have anywhere to stay or sleep, and I assisted her with the help of colleagues. What made it a fantastic, worthwhile experience was when she returned after six years to inform me because of the assistance, she obtained her degree and made it. This experience warmed my heart and kept me pushing and getting up every morning until now. Another perk is my ability to further my studies and improve my work.

Q: What inspires you?
A: My Heavenly Father, husband and children, and being able to contribute towards making a difference, be it at work or through the community.

Q: What challenges have you experienced in your career?
A: As an administrator, your role is often overlooked, which can become challenging because of the many diverse personalities and roles in the workplace. This is when I need to remind myself that I have something to contribute and bring value to the working environment. Despite being an administrator, I firmly believe in bringing excellence to every area of my work and everything I tackle.

Q: What message do you have for the women of South Africa?
A: We are just not women; we are warriors, caregivers, and emotional rocks. God created us as He saw there was a need for women. We are extraordinary beings who can endure any challenge, persecution, or adversity. We should never lose our ambition or give up on our dreams. No matter how challenging life can be at the workplace, home or wherever we find ourselves.

Ms Renate Zipfel

Manager DNA Sanger sequencing facility and Co-manager UPGL

Q: What has been the highlight of your career?
A: My highlights are seeing the joy and sense of achievement in our students' faces when they get good results or achieve a goal after working hard and struggling to get there.

Q: What inspires you?
A: I am naturally curious, and working in the biological sciences offers a never-ending opportunity to learn and marvel at the miracle of life. My colleagues and the UP students – it is a privilege to support them and contribute to their success. My husband, Manfred Zipfel who, never gives up, and no matter how tough life gets, he will always find something to smile about.

Q: What challenges have you experienced in your career?
A: The biggest challenge in my career was finding a niche where I could fit in and contribute. After my MSc in Genetics, I realised that I am not a typical academic but like to work in a strong research and academic environment. I appreciate that my technical position at UP is rather unique and that I had to grow into this position and carve a space for myself. I want to acknowledge and thank UP, NAS, and particularly my mentors, colleagues, and students at UP, as well as, recently, the support from DIPLOMICS and the ACGT teams who provided that opportunity. I hope to be able to continue to grow and contribute towards the success of other people. The concept is summarised in the saying 'Pay it forward'.

Q: What message do you have for the women of South Africa?
A: I hope that my message is universal and not only for women. Be authentic – you are unique. Be the best you can be today, and know tomorrow may be different. Take opportunities to grow into the best person you can be. When you know better – do better.

Prof Mapitsi Thantsha

Associate Professor: Chair of Microbiology Division (Department of Biochemistry, Genetics and Microbiology)

Q: What has been the highlight of your career?
A: There are many highlights in my career. Well, maybe that is because I am grateful for every accomplishment, no matter how small it seems. If I had to choose three, the first would be to receive thank you messages and appreciation from my students. These small messages confirm that I have contributed positively to students' lives, which I intend to do through my interactions with them. Secondly, when I was nominated for a teaching and learning award. I received the nomination as a token of appreciation and an endorsement from the students. Secondly, obtaining my second and improved NRF rating. This served as a confirmation of my research's importance, relevance and quality. Thirdly, obtaining the Fulbright scholar funding allowed me to spend an extended time outside South Africa and gain some international teaching, learning and research exposure and experience.

Q: What inspires you?
A: I am generally inspired by other people's success. I am not competing with them; they are chasing their dreams, and I am chasing mine. However, when they get it right, I am motivated to run my own race, optimistic for a positive outcome. When it comes to work, two things: Seeing the students I taught or supervised graduate, especially those who struggled, I encouraged them not to give up. As they walk across that stage, their vibrant faces and broad smiles give me the energy and courage to continue doing what I do. Also, after leaving my laboratory, my students get employment or succeed in new projects (e.g., furthering studies, starting a business, etc.). The message I get is, 'Mapitsi, you did not train or teach them to become you nor dependent on you; you helped them to become the better versions of themselves, their independent selves'. Their success is my success.

Q: What challenges have you experienced in your career?
A: The need to juggle personal (single mother) and work life. The expectations regarding outputs do not change just because you have a small baby; you are expected to consistently perform according to the set criteria. Financial constraints, both for personal and work. It would be easier if one could afford to pay for help with some of the family/parenting responsibilities. In the publish-or-perish world of academia, the ever-dwindling research funding is frustrating and can be demoralising. As one advance, one is expected to build international networks and develop one's international profile. That isn't easy to obtain without funds. It is not easy to send an email and get a collaborator, but meeting people in person goes a long way towards building networks/collaborations. Pity that does not happen without funding.

Q: What message do you have for the women of South Africa?
A: There are opportunities but plenty of challenges in the field. Be courageous when starting, even if it is small. Stay your course, one step at a time. Those small steps count and will get you where you are heading. Don't be too relaxed, but don't be too hard on yourself; try to find a balance. Whatever you do, give it your best. Do not be afraid to make mistakes; mistakes are essential lessons and growth opportunities. You are a woman. Please don't shy away; be proud, don't feel inferior about it. You are a woman, a whole human! You can do anything you put your mind to.

First NAS Heritage Day picnic

RETHINK@NAS hosted its first faculty-wide NAS Heritage Day Picnic on Friday, 27 September, on the Hatfield Campus. The event aimed to foster a sense of belonging among staff, while celebrating the rich diversity of cultures within the Faculty.

In addition to encouraging cultural exchange, the picnic also sought to promote inclusivity, unity, and collaboration by allowing participants to engage with one another in a fun and relaxed environment. The event featured a range of exciting activities, including the popular "30 Seconds" board game played in groups of four, a challenge where attendees guessed South African greetings in different languages, and a lively "Shazam" game where various genres of classic South African music hits were played, where participants raced to identify the artist and song title, with the fastest responses claiming victory.

Winners are (from the left): Dr Parveen Beebeejaun-Boodoo, Mrs Art Hlatshwayo, Ms Nokwazi Khoza, Mr Pieter Rossouw, Ms Sihle Njwambe, Mrs Shado Mahlangu and Mr Johannes Maselela with Ms Kwazi Mtsweni (RETHINK@NAS Coordinator).

Women's Month talk with Prof Namrita Lall

During Women's Month, RETHINK@NAS hosted a Women's Month talk featuring Prof Namrita Lall, holder of the South African Research Chair Initiative (SARChI) in Indigenous Knowledge Systems (IKS) at the University of Pretoria (UP). She is also on the Essential Science Indicators list of the top 1% of publication outputs (citations) in Pharmacology and Toxicology.

She has made a significant contribution to the field of medicinal plant science. Several medicinal plants with valuable biological activities have been discovered, leading to the granting of several national and international patents.

Prof Lall won the UP Exceptional Supervisor's Award in 2021 and is currently the President of the International Society of Ethnopharmacology and the founder of the African Phytomedicine Scientific Society. During her talk, she reflected on her remarkable academic journey as an accomplished female scientist who has successfully broken the proverbial glass ceiling.

Prof Lall candidly shared the challenges she faced and how she overcame each obstacle, inspiring and motivating other women in the field of science to pursue their ambitions with resilience and determination.

SCIENCE AND ENGINEERING OPEN DAY

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INSTITUTIONAL SUSTAINABILITY

UP part of FAMA project which aims to improve gut microbiota in Africa

The University of Pretoria (UP) is one of the partners in the Food and Microbiota in Africa (FAMA) project, which aims to assess the role of traditional African foods in improving gut microbiota and reducing the triple burden of malnutrition in South African and Senegalese populations.

The total funding for all partners in France and Africa is €1,079,188 (about R20 million) for 18 months. At UP, the project is led by Prof Naushad Emmambux with contributions from Prof Lise Korsten, Prof Elna Buys, Dr Jarishma Gokul, Dr Nwabisa Mehlomakulu and Dr Adeline Pretorius. One MSc student and two postdoctoral fellows are also working on the project.

This project further aims to promote the food system's inclusivity, sustainability and resilience. The project was formulated to employ an innovative approach to bridging the critical research gap on the nexus between traditional African foods, African gut microbiota and nutrition/health.

The research team has adopted several approaches to clarifying these issues: multiscale, multi-sectoral, interdisciplinary, and balanced approaches to providing targeted solutions within the context of the food system. In its scope, the proposed study will involve the applications of microbiomics, consumer behaviour, food environment and public policy.

The project was designed within the TSARA initiative (Transforming Food Systems and Agriculture through Research in Partnership with Africa). The TSARA initiative is a convergence of experts from ten African institutions, *CIRAD and **INRAE, consisting of academic researchers and civil society and private sector members.

The proposed research team leverages existing scientific collaboration among partners through previous projects and the Centre of Excellence in Food Security (CoE-FS).

The research partners are UP, the University of the Western Cape, the African Research Council (ARC), the Council for Scientific and Industrialised Research (CSIR), LARTES-IFAN UCAD (Senegal), *CIRAD (France), **INRAE (France) with two non-research partners, Siyazisiza Trust and Puratos, for South Africa.

By the end of the project, food system actors will, therefore, have better knowledge and skills on the health and environmental and socioeconomic benefits of African traditional foods.

Prof Naushad Emmambux

For more information, please get in touch with Prof Naushad Emmambux at naushad.emmambux@up.ac.za

**CIRAD is the French agricultural research and international cooperation organisation working for the sustainable development of tropical and Mediterranean regions.*

***INRAE is France's National Research Institute for Agriculture, Food and Environment, created in 2020 and was formed by the merger of INRA, the National Institute for Agricultural Research, and IRSTEA, the National Research Institute of Science and Technology for the Environment and Agriculture.*

Department of Statistics partners with United Nations Volunteers

The Department of Statistics at the University of Pretoria (UP) is partnering with the United Nations Volunteers (UNV) to develop and validate a Global Volunteer Index Framework, which will be published and integrated into the next edition of the State of the World's Volunteerism Report (to be published in December 2025).

The Global Volunteer Index will provide timely and reliable volunteer work data and statistics to measure people's voluntary contributions to the 2030 Sustainable Development Goals. The project will be led by Prof Samuel Manda as Project Director and Prof Sollie Millard as Co-Director.

The project will be for 20 months, starting 15 October 2024. In partnering with a UN body, this project will enhance the University's standing as an international leader in translating cutting-edge statistical sciences research excellence into volunteer work settings and practice.

According to Prof Manda, Head of the Department of Statistics in the Faculty of Natural and Agricultural Sciences (NAS), "The project will provide an incomparable tool to measure volunteer work and its impact on communities and national economies worldwide. I am delighted that UNV chose to partner with us on this project, which has national, regional, and international importance and impact. This will cement UP position as a reputable world-leading university in research innovation and transition that impacts communities nationally and globally. This project will support the development of research in volunteer work," Prof Manda concluded.

In August 2024, the United Nations Volunteers (UNV) team visited the Department of Statistics at the University of Pretoria for a technical meeting on the Framework proposal. From left: Prof Samuel Manda (Head: Department of Statistics), Anthea Hurling (UNV Country Coordinator, South Africa), Prof Sollie Millard (Department of Statistics), Dr Tapiwa Kumuruko (Chief of the Voluntary Advisory Services @UNV Bonn), Prof Barend Erasmus (Dean: Faculty of Natural and Agricultural Sciences) and Ms Jessika Naidoo (NAS Research Manager).

Department of Statistics part of Consortium to improve Biostatistics research capacity in Africa

The Department of Statistics at the University of Pretoria (UP) was awarded USD 325 652 (about R5,7 million) as part of the DELTAS Africa Sub-Saharan Africa Consortium (SSACAB II) for Advanced Biostatistics training through the Wits Health Consortium.

This forms part of the Wellcome Trust and the United Kingdom's Foreign, Commonwealth & Development Office (FCDO) awarding the Sub-Saharan African Consortium for Advanced Biostatistics (SSACAB II) research funding totalling USD 4.4 million.

Prof Samuel Manda, Head of the Department of Statistics at UP's Faculty of Natural and Agricultural Sciences (NAS), is the Co-Principal Investigator in the Consortium. UP is leading the data triangulation and evidence synthesis theme through cutting-edge research, postgraduate training and postdoctoral fellowships in biostatistics methodology and application.

The project already started in May 2023 and will end in April 2027. In Phase I of finding (2015-2019), the Consortium received funding from the same funders to improve biostatistical capacity according to the needs identified by African institutions through collaborative masters and doctoral training in biostatistics.

The consortium consists of six African and two northern partner institutions (Wits University, University of KwaZulu-Natal, Moi University, University of Pretoria, KEMRI - Wellcome Trust Research Programme, London School of Hygiene & Tropical Medicine, University Medical Center Utrecht, University of Abomey) and twenty collaborating institutions with the University of the Witwatersrand, Johannesburg as the Lead Institution.

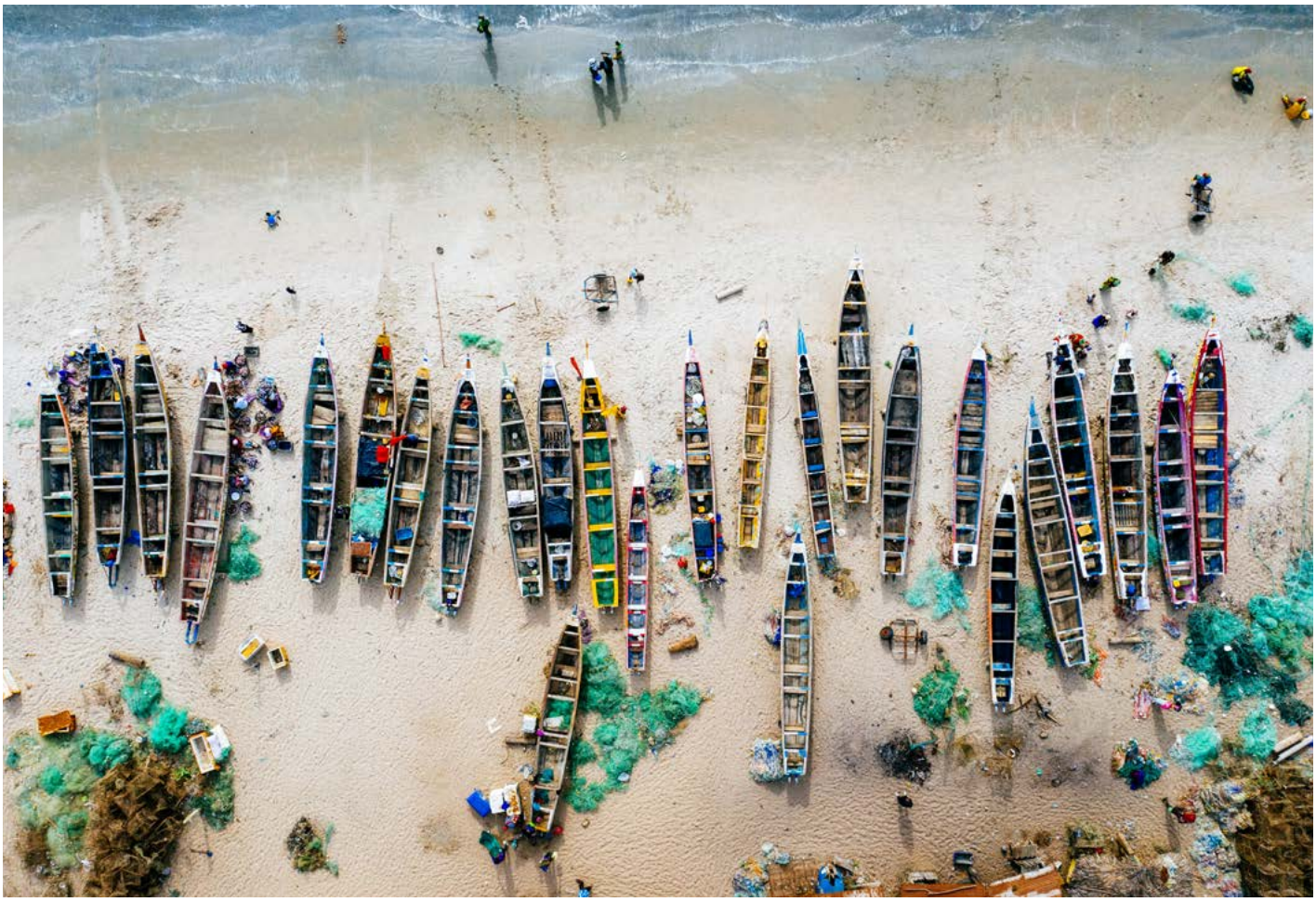
The main goal of SSACAB II is to build regional nodes of biostatistics excellence tackled through seven cutting-edge biostatistical research questions relating to urgent health needs in Sub-Saharan Africa.

With an extensive network of academic and research institutions comprising the SSACAB research and teaching consortium, its presence at NAS enhances the University's research and academic reputation through research opportunities and publications. In particular, networking and global engagement will foster the university's institutional growth by attracting postgraduate students in biostatistics research. Indeed, there is already growing interest in students seeking postgraduate training at the university.

Prof Samuel Manda

Launch event of SACCAB II in Nairobi in October 2023.

UP joins Asia-Africa BlueTech Superhighway in using climate-smart technologies to reduce fish loss and waste



With the world population reaching 9.8 billion by 2050, providing affordable, safe, nutritious food for all is an enormous challenge. Aquatic foods offer viable and sustainable nutrition solutions.

However, coastal communities and the associated habitats face a significant threat from climate change, aggravated by a lack of access to technology and enabling policy environments.

Under the leadership of Prof Naushad Emmambux from the Department of Consumer and Food Sciences, the University of Pretoria (UP) is contracted to work with the Asia-Africa BlueTech Superhighway (AABS), focusing on the expansion of climate-smart technologies to reduce fish loss and waste and add value.

The AABS project is between the International Center for Living Aquatic Resources Management (ICLARM), also known as WorldFish. It is a project of the UK's Climate and Ocean Adaptation and Sustainable Transition (COAST) program of the Blue Planet Fund.

According to Prof Emmambux, UP will join forces with principal investigator Dr Aditya Parmar from World Fish in one of four synergistic work packages on Climate-Smart Technologies for Reducing Aquatic Food Waste and Loss. UP's work will focus mainly on the small fisheries along the coast of Mozambique. According to the FAO, much of the current catch (20-50%) is lost to spoilage due to a lack of affordable and accessible post-harvest processing facilities.

The four synergistic work packages of the project include:

- Digital Coasts
- Integrated Multitrophic Aquaculture
- Climate-Smart Technologies for Reducing Aquatic Food Waste and Loss
- Incentives for Marine Conservation and Fisheries Management

AABS is a seven-year project to be carried out in two phases, with Phase 1 (2023-2027) being implemented over four years in Nigeria, Kenya, Mozambique, Bangladesh, and Tanzania. The total budget for the project is £44.5 million.

"The UP project will investigate the development of a small off-grid powered modular processing prototype drying unit suitable for fitting into a shipping container that will focus on hurdle technology, hygienic design, and the indirect solar drying of fish. The prototype processing unit will collaborate with Engineering 4.0 (Faculty of Engineering, Built Environment, and Information Technology)," explained Prof Emmambux.

He added, "An MSc student from the Department of Consumer and Food Sciences will also work on novel drying technologies, for example, infrared and microwave, to produce high-value food products. In addition, a postdoctoral fellow will explore the potential of seaweeds as food and food ingredients.

More information can be found at Asia-Africa BlueTech Superhighway WorldFish (worldfishcenter.org) or Prof MN Emmambux at naushad.emmambux@up.ac.za

Research on alternatives for mushroom peat is underway

The Mushroom Research Group at the University of Pretoria, led by Prof Lise Korsten from the Department of Plant and Soil Sciences, is currently developing a new casing material based on sugarcane bagasse. The concept includes using other industrial by-products and microbes to develop a new product prototype. The alternative casing material will replace peat used in mushroom growing.

Commercial production of white button mushrooms (*Agaricus bisporus L.*) requires the application of a casing soil layer on top of spawned compost. In South Africa, more than 90% of the mushroom production comprises white button mushrooms. Previously, local peat was used as casing soil until its mining was restricted in 2007. Consequently, the industry started importing peat from Ireland and Europe.

However, in addition to price increases and exchange rate fluctuations, environmental concerns associated with peat mining have become a critical global challenge. Most importantly, peat use in Europe is anticipated to be phased out from 2027 to 2031. Therefore, finding replacement materials to grow white button mushrooms is critical and requires the development of locally available, cheap and sustainable alternatives.

Prof Korsten explains, "The current project will run from April 2024 to December 2025 and is funded by the Lichen Growing Medium (Pty) Ltd. The research group envisages further expanding research activities in rapid pathogen detection, characterisation and effective disease control strategies, including using a biocontrol consortium."

The mushroom research group was established 20 years ago, focusing on developing alternative casing materials for the industry. The initial casing research was conducted from 2002 to 2012 and resulted in a patented alternative material to peat. It later developed into a fully fletched mushroom disease diagnostic programme for the industry. This was supported by the South African Mushroom Farmers Association (SAMFA) and the National Research Foundation (NRF).

White button mushroom production is a precise and skilled art that ensures a crucial nutritious food source's health, safety, quality, and economic viability, contributing to food security and well-being. Critical skills in edible fungi science and technology should be developed to ensure sustainable production of quality, safe mushrooms from the farm-to-plate.

Prof Lise Korsten

SOCIAL RESPONSIVENESS AND SOCIETAL IMPACT

Celebrating Heritage Month with indigenous leaf vegetables

The UP Giving Garden Project's recent food-tasting event celebrated the cultural heritage of indigenous crops and fostered a sense of community, inclusivity and belonging.

In celebration of Heritage Month, the University of Pretoria's (UP) Transformation Office, in partnership with the Manie van der Schijff Botanical Garden's Future Africa Indigenous and Orphan Crops Collection (MvdSBG FA IOCC) and the Department of Consumer and Food Sciences hosted a food-tasting event as part of their preparations for their Giving Garden Project. The event took place at the EAT@UP dining hall and offered over 300 students and staff the chance to taste indigenous leaf vegetables grown on UP's campuses.

The Giving Garden Project marks the beginning of what the partnership hopes will be a long series of successful collaborative initiatives.

"The Giving Garden was started to make crops from the Future Africa Indigenous and Orphan Crops collection accessible to home growers and community gardeners," curator Richard Hay explained.

The idea is to expose people to these plants and help them grow their own food, bridging the knowledge gap for those outside agriculture. Through cultivating different crops, the project aims to provide a platform for participants to grow their own food and learn gardening skills in the process. Overall, the Giving Garden project not only focuses on the accessibility of different crops for domestic consumption but also "allows us an opportunity to initiate a project that drives inclusion by establishing access to a nutritious food system while also providing a skills transfer opportunity to the University community", explained Tumelo 'Duke' Rasebopye, a diversity and inclusion specialist at the Transformation Office.

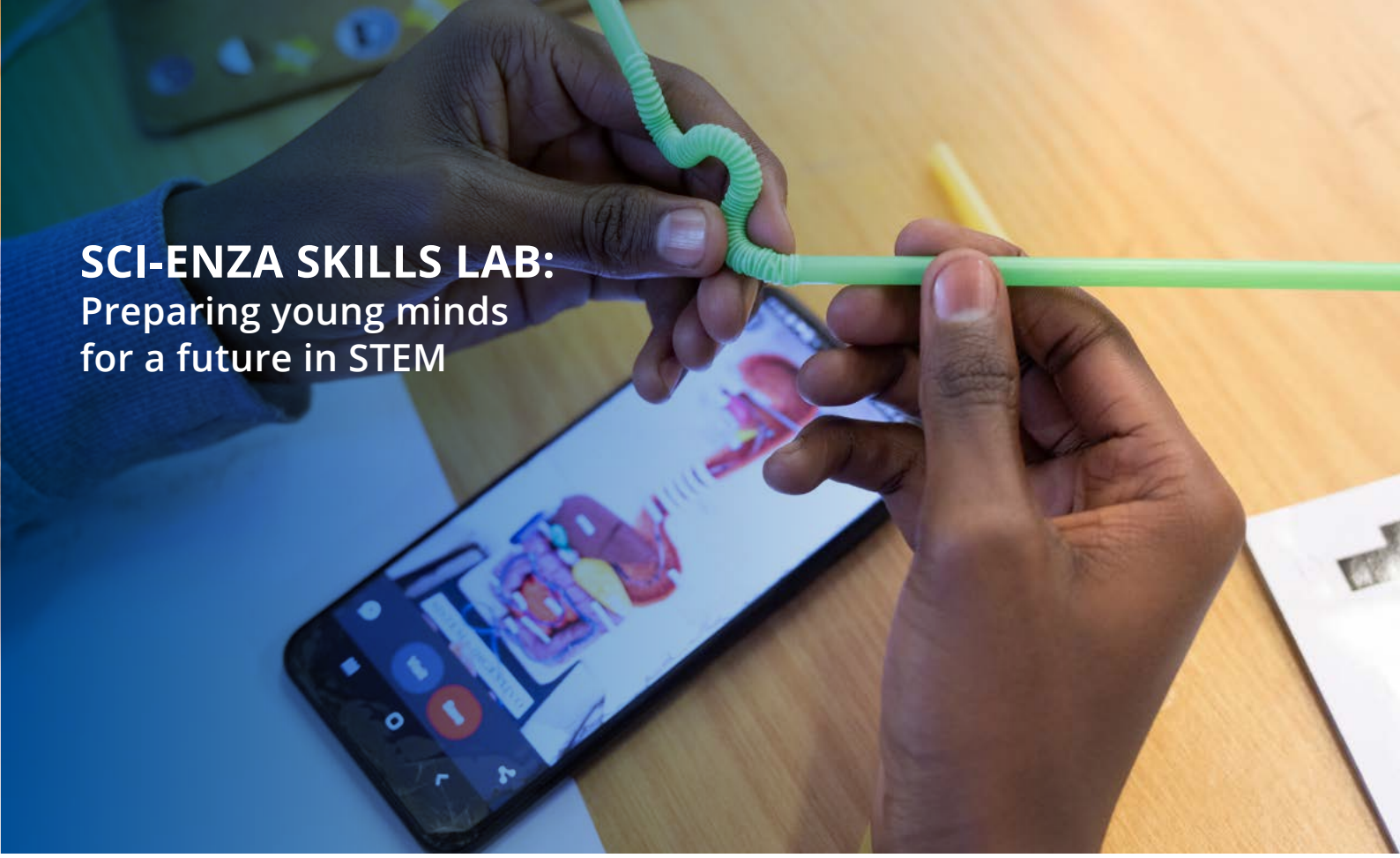
Indigenous crops, particularly leafy greens, are celebrated for their rich nutritional profile. With over 100 edible indigenous plant species documented in South Africa, these crops are known for being high in iron, calcium, vitamins A and C, and omega-3 content. They provide an affordable alternative to expensive grocery items and significantly reduce diet-related diseases. Their adaptability to harsh environmental conditions, resistance to pests and cultural significance make them a valuable addition to the University's gardens.

The event showcased four types of indigenous leaf vegetables provided by the MvdSBG FA IOCC and prepared by Consumer and Food Science students as part of their practical coursework. The tasting also presented an opportunity for transdisciplinary research between the partners. Attendees were invited to provide feedback on their dining experience and share their preferences through a questionnaire available in both English and Sepedi. The questionnaire considered several factors, such as ranking the colour of the leafy vegetables, their smell, taste and level of bitterness. The results will guide the selection of preferred crops for cultivation in UP's gardens, making these nutritious vegetables accessible to the on-campus community.

Furthermore, the event was a step towards a greater appreciation and integration of indigenous crops into mainstream food systems. It also aimed to contribute valuable data for ongoing research and support the attainment of broader food systems sustainability. The event highlighted these crops' cultural and historical significance, particularly for populations in South Africa, where they are traditional staples, such as *imifino* in Zulu, *morogo* in Sesotho and *muroho* in Tshivenda.

In line with the Transformation Office's commitment to inclusion and addressing historical injustices, the event included the involvement of staff from Hygiene and Cleaning Services, Landscaping Services, and Security Services, as well as undergraduate students who are often not contributors to the University's research activities. This effort was part of a broader initiative to foster equity and inclusion through transdisciplinary collaborations within the UP community. Dr Hennie Fisher, a senior lecturer from the Department of Consumer and Food Sciences, mentioned that the project afforded undergraduate students an opportunity to see where the ingredients they usually use come from.

Across the interviews, a shared emphasis emerges on the Giving Garden Project's role in promoting sustainable food production, inclusivity, skills-building and education while fostering respect for the process of food cultivation and providing university communities with access to nutritious food systems. Overall, the project's food-tasting event was a success. It celebrated the cultural heritage of indigenous crops and fostered a sense of community, inclusivity and belonging.



SCI-ENZA SKILLS LAB:
Preparing young minds for a future in STEM

Sci-Enza, the University's science centre, proudly launched its first Skills Lab session in July. It is an innovative programme designed to equip learners in grades 7 to 9 with fundamental skills for success in STEM (Science, Technology, Engineering, and Mathematics).

This exciting initiative addresses a crucial gap in early STEM education by providing young learners with the skills and knowledge they need to thrive in their future academic and research endeavours.

In today's rapidly evolving world, the demand for skilled young people in different fields has never been greater. However, many students enter higher education without a solid foundation in the essential skills required for success in these disciplines. This gap often leads to challenges in understanding complex concepts, conducting research, and applying critical thinking to solve real-world problems.

The Sci-Enza Skills Lab is designed to bridge this gap by focusing on key areas vital for success outside the classroom. Our program emphasises critical thinking, problem-solving, research skills, communication, collaboration, time management, technological proficiency, mathematical skills, emotional intelligence, resilience, and curiosity. By nurturing these skills early on, we aim to create a generation of learners who are well-prepared for their studies and equipped to excel in their future careers.

During the July holiday programme, our first Skills Lab session introduced learners to the concept of design thinking, a crucial skill for future academics and researchers. Design thinking encourages a human-centred approach to problem-solving, fostering creativity, innovation, and practical application of theoretical knowledge. Through hands-on activities and collaborative projects, students learned to empathise with users (the person experiencing the problem), define problems (from a user perspective), ideate solutions, prototype, and test their ideas. This immersive experience enhanced their understanding of the design process and highlighted the importance of creativity and empathy in scientific and technological advancements.

By launching the Sci-Enza Skills Lab, our science centre is positioning itself to support STEM education and is committed to shaping the future of young learners. This initiative underscores our dedication to providing high-quality, accessible, impactful educational experiences. As a university-affiliated science centre, we leverage our expertise, resources, and network to offer academically rigorous and engaging programs.

The Sci-Enza Skills Lab is more than just a programme; it is a commitment to empowering the next generation of scientists, engineers, and innovators. By fostering essential STEM skills from an early age, we ensure that our learners are not only prepared for the challenges of higher education but are also inspired to pursue careers that will drive future scientific and technological breakthroughs.

Join us in this exciting journey of discovery and learning. Together, we can inspire young minds and pave the way for a brighter, more innovative future in STEM.

Dogs reigned in Sci-Enza's holiday programme

Every dog has its day. The dogs had their days in the robotics and coding holiday programme at Sci-Enza, where grade R to grade 6 learners delved into a world of coded creations. The event, aptly titled "Robotic Adventures – A World of Coded Creations," offered participants an opportunity to assemble, code, and bring their Lego creations to life.

The highlight of the programme was an engaging meet and greet with, SmWoef. The technologically advanced robotic dog is an innovative research tool for data collection, particularly in harsh environments or spaces that are not easily accessible to man. Accompanied by his controller, Similo Siyenga from UP's Faculty of Engineering, Built Environment and Information Technology, he demonstrated a few tricks up the robotic dog's paws that come in handy during his expeditions.

SmWoef was an excellent introduction to the robotics and coding week, as his demonstration served as inspiration to the young learners as they embarked on their own robotic adventures. The robotic dog's impressive tricks and capabilities showcased the potential of robotics in real-world applications, sparking curiosity and creativity among the young participants.

The eager learners got to build their four-legged companions with Sci-Enza's Lego kits and programmed their creations to have a few tricks of their own. The hands-on experience allowed the children to explore the fundamentals of robotics and coding in a fun and interactive environment. The thrill of seeing their creations come to life was evident on the faces of the learners as they tested and refined their robotic puppies. This practical approach to learning provided the children with a sense of accomplishment and a deeper understanding of the principles behind robotics and coding.

By the end of the programme, the young roboticists had gained valuable skills and developed a deeper appreciation for the wonders of technology. The "Robotic Adventures" programme was a resounding success, igniting a passion for STEM in the hearts of the participants. The event underscored the importance of hands-on learning and the impact of early exposure to science and technology. Sci-Enza's commitment to fostering a love for STEM through innovative programs like this continues to inspire the next generation of scientists, engineers, and tech enthusiasts.

Sneaked a peek into the invisible world

From the macroscale to microscales to nanoscales, learners had a whole world in their tiny hands during the Small Wonders holiday programme at Sci-Enza.

Every school break, Sci-Enza hosts a STEM-related theme holiday programme that allows kids to delve into and uncover the marvels of science through various activities.

The Small Wonders programme focused on the science of small things through activities like a Chemistry puppet show and molecular structure building workshop. These activities helped learners understand the fundamental components of matter, which are the foundation for various scientific disciplines like physics, chemistry, materials science, and nanotechnology. The programme also included hands-on experiments to examine the properties of nanoscales, highlighting the potential for technological progress. Learners used human eye aids like magnifying glasses, microscopes, and culture mediums to study minuscule scales. The programme included activities covering scientific disciplines like microbiology, molecular biology, and genetics, focusing on vital building blocks of life like cells, proteins, and DNA. Activities included DNA extraction, DNA modelling, and cell modelling through craft.

Since Sci-Enza also serves as a platform to showcase research and the researchers with its audience, learners had a colourful and interactive session with Dr Markus Wilken from the Department of Biochemistry, Genetics and Microbiology, who engaged the learners about genetic inheritance. They also had the pleasure of meeting and talking to Sicelo Rakhetsi a representative of ZEISS bringing one of their cutting-edge Binocular Stereozoom Microscope, Model Stemi 305 that learners interacted with to have a closer view of their collected items.

The six-day programme left the grades R-6 with minds filled with scientific knowledge, hands with newfound skills and memories of educational, interactive and fun-filled experiences.

Microscopes donated to Mamelodi Secondary School

The Department of Zoology and Entomology recently donated eight microscopes and consumables to Mamelodi Secondary School (MSS) to assist the learners with lab experiments. Mr Alfa Masangu and Ms Beauty Mthembu from the school visited the campus to collect this generous donation.

From left: Prof Adrian Shrader (Acting Head: Department of Zoology and Entomology), Mr Alfa Masangu (Departmental Head for Life Sciences: MSS), Ms Beauty Mthembu (Life Sciences teacher: MSS), Ms Marna Ferreira (Technical Assistant: Department of Zoology and Entomology) and Ms Sihle Njwambe (Faculty Officer).

NAS shines at UP's Women in Science Symposium

When successful women scientists stand up as role models, young girls take notice. Seeing other women succeed in science, technology, engineering and mathematics (STEM) can be a significant motivator.

This is according to the three youngest speakers – a school head girl, a first-year student and a top student leader – at the University of Pretoria's (UP) 6th Women in Science Symposium held at UP's Future Africa Campus.

Their message was that while some strides have been taken towards addressing gender disparities in scientific fields, these are not enough. However, women themselves can speed up the progress towards parity.

Dia Singh, a first-year UP actuarial science student who passed matric in 2023 with ten distinctions and a 95% average, underlined the need for established STEM academics to interact with young girls. "The presence of visible role models is essential," she said, calling on female scientists, engineers and mathematicians to reach out to young girls through programmes offering mentorship, scholarship and hands-on STEM experiences.

Singh spoke from personal experience, noting that while UP's mathematics professors are mostly male, her statistics professor is a woman – Prof Inger Fabris-Rotelli, the session moderator. "She is incredible; very inspiring," Singh said.

"As women, we need to understand that when we actively, collectively work together to help each other rise, so much more can be done," said Khanyisile Mahlangu, chairperson of the UP Temporary Student Committee.

Unfortunately, this does not always happen, she said, commenting that "pull-her-down syndrome", often ironically referred to as 'PHD', is real. "What hurts the most is when women do it to each other," she said.

Two real-life examples supporting this were given during the question-and-answer session. One concerned a member of the audience who is married, pregnant and a PhD candidate. She said she had been discouraged from attempting a PhD while pregnant, to the shock of a UP professor in the audience.

In the other example, the session moderator, **Prof Fabris-Rotelli from the Department of Statistics**, said many universities' travel policies do not accommodate breastfeeding mothers whose academic duties include conference attendance. These policies prohibit funding for family, which means no funding is available for a breastfeeding mother to take her baby to a conference. "It's all our institutions, and I think these are the conversations we have to have," the professor said.

Ms Dia Singh

Prof Inger Fabris-Rotelli

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