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Newsletter of the Faculty of Natural and Agricultural Sciences

May 2023







EUP and UP sign first contract research chair for UP Biodiscovery Centre with M2Bio Sciences



The agreement was cemented with the official signing ceremony on 12 May 2023 between Prof Barend Erasmus, Dean of the Faculty of Natural and Agricultural Sciences, Mr Jeff Robinson, CEO and Chairman of M2Bio Sciences and Dr Elmar de Wet, CEO, Enterprises University of Pretoria.

The UP Biodiscovery Centre, led by Prof Vinesh Maharaj, NAS Deputy Dean for Research and Postgraduate Education and a renowned bio prospector, will conduct natural product research and development for commercial purposes. The M2Bio Sciences Research Chair will conduct research focused on science and evidence-backed premium health and wellness products over the next four years. An integral part of the research is to use Artificial Intelligence (AI) for the discovery of natural product lead compounds that can be developed as pharmaceutical and food ingredients.

"We need to emphasise the value of Al in African research. It is important to digitise the great research and developments on the continent. Although I am not a scientist, I have a big passion for science," Mr Robinson stated at the event.

He also believes that product development must be backed by scientific research – there must be concrete evidence for our claims. "There is so much potential and talent in South Africa; I am wondering why there are not more companies cooperating with universities to do research."

Prof Erasmus echoed these sentiments, saying, "There are three important elements of partnerships, especially evident in today's agreement: "the nature, aspirations, and the vision of the people involved in this partnership. The three partners, UP/NAS, M2Bio Sciences and Enterprises UP, responded well to this great opportunity. It is important to note that NAS has many more unique value propositions as our diversity, ranging from the basic sciences to the agricultural sciences, encompasses the whole (agricultural) value chain."

Prof Maharaj added that the partnership brings industry and academia closer and contributes to creating a more significant impact on society through translational and transdisciplinary research. "

In his final remarks, Mr Robinson said that they are excited to work with Prof Maharaj with his stellar knowledge – this translational research ties in with the University's transdisciplinary research and is guided by society's needs.

Dr Elmar de Wet, CEO of UP Enterprises, concluded the event by stating, "The world has more than enough problems, and our scientists, in partnership with industry, can facilitate the solutions and make it happen."

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Read more about our ground-breaking research



RE.SEARCH is a digital magazine where the University of Pretoria highlight some of its impactful research, knowledge and solutions. The Faculty of Natural and Agricultural Sciences (NAS) features prominently (pages 21, 26, 28, 30, and 34) in this fifth edition, with this issue focusing on IMPACT. Visit the Research Matters website for the first, second, third and fourth editions and more NAS and UP research.

SYMPOSIUM

NAs is hosting its first Research Symposium on 29–30 August 2023.

For more information, contact Prof Vinesh Marahaj at vinesh.maharaj@up.ac.za



Message from the Dean

Prof Barend Erasmus

The middle of the year is also an excellent time to reflect. In keeping with the Vice-Chancellor's call for the deliberate implementation of our strategies, we see that we are performing well, and our 2023 plan is on track in most areas of focus. We will continue to consolidate where possible, implement the recommendations of the quinquennial quality review, build on the successes and adapt to the constraints we face. I hope you also take this opportunity to reflect on your own environment, professionally and personally.

Agriculture, food security, global food systems and sustainable development are some of the burning issues affecting people in Africa and the rest of the world. The University of Pretoria, as a leading global university, aims to make a difference and show its support for this by, among others, awarding honorary doctorates to two internationally renowned leaders in these fields.

Prof Louise O. Fresco was honoured for her outstanding intellectual and public contribution to the sphere of African and global food systems and equitable, sustainable development, with an emphasis on Africa (page 18). Prof Richard Mkandawire's honorary degree was bestowed on him in recognition of his outstanding contribution to transforming Africa's agricultural food systems and empowering youth on the continent (page 17).

UP awarded 11 908 qualifications during its Autumn graduation ceremonies, with 1 323 graduates hailing from NAS. Our PhD output was remarkable again; 67 of the 201 PhDs awarded (more than 30%) were from NAS (pages 27-28).

Another honorary doctorate from UP also made headlines. Prof CR Rao, who received his honorary doctorate in Statistics in 2004, received the International Prize in Statistics at the age of 102 (page 21).

In this issue, we also feature the newly established UP Biodiscovery Centre. The centre aims to harness African biodiversity using high throughput technologies to provide relevant solutions.

The Biodiscovery Chair, funded by M2Bio, will be based at the newly formed centre and implemented in collaboration with Enterprises UP (front page story). It is hard to believe that the first semester is nearly a thing of the past. So much has happened in the Faculty and the University – in-person autumn graduations, continuously improved national and international rankings, new international collaborations and developments on the teaching and research frontiers. Exams kicked off, and those of us not engaged in exam administration and marks consolidation look forward to some time off over the winter break.

Teaching and learning remain a high priority, and therefore, crucial role players in our students' academic careers are showcased in this edition – our Student Faculty Advisors (page 30). Your dedication to our students is highly appreciated. Our students not only excel academically, but we have two sports stars – footballer Ncumisile Shongwe and swimmer Erin Gallagher (page 32).

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 3). We feature many research highlights relating to food security and conservation focus areas in NAS. Our global engagement is evidenced by the awards to NAS staff and students.

We pay our respects to those who lost loved ones and colleagues in 2023. Prof Sue Nicolson is one of them (<u>page 43</u>).

To all the NAS students, who are writing examinations, I wish you well in your preparations and assessments. To our NAS staff, collaborators, funders, donors, and colleagues at UP, we thank you for your continued commitment and support and wish you a productive end to the first semester.



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Please send your comments on the newsletter or suggestions/ideas for articles to martie.meyer@up.ac.za



Chairman: M2Bio Sciences) and Mr Jaco Snyman (Research Solutions Business Manager Enterprises UP).

WHY A BIODISCOVERY CENTRE AT UP?

Due to its geographical position, South Africa is reported to be the third most biologically diverse country in the world. Approximately 10% of the world's known species and 15% of known coastal and marine species are found in South Africa. Moreover, South Africa comprises nine unique vegetation types, of which three have been declared global biodiversity hotspots. The country also has a long tradition of medicinal use of plants. It is estimated that at least 70% of all South Africans consult one of the more than 200 000 Traditional Healers in the country. As a result, Biodiscovery and product development initiatives will offer South Africa an opportunity to grow its economy through the pharmaceutical, agricultural, cosmeceutical and food industries.

The University of Pretoria is actively involved in the discovery of natural products that can be developed as pharmaceuticals, herbal medicines, cosmetics and veterinary products based on South Africa's biodiversity and indigenous knowledge/traditional knowledge. Research is conducted at various departments contributing to multiple aspects of the Biodiscovery value chain.

The research includes the systematic investigation of 24 000 indigenous plants as part of a long-term project aimed at discovering drugs, nutraceuticals and cosmeceuticals from South Africa's indigenous plants with a focus on HIV, malaria, TB, neglected tropical diseases, cancer and diabetes. This is done in collaborative programmes with holders of indigenous knowledge, such as traditional health practitioners. The University, through its various departments, is also key team members of the South African Department of Science and Innovation (DSIs) Biodiscovery Platform (African Traditional Medicines, Nutraceuticals and Cosmeceuticals) and manages the University of Pretoria research component.

The University is assisting the Department of Environmental Affairs in implementing the Biodiscovery component of the National Environmental and Marine Biodiversity Act (NEMBA) by creating a National Repository of Natural Products. The Chemistry department at the University is now increasing and diversifying its natural product repository, building its synthetic capacity and skills. This will ultimately lead to Chemistry's leading role in the South Africa Bio-Economy as natural product chemistry is a critical resource for a successful Biodiscovery programme.

TECHNOLOGY PLATFORM OF THE BIODISCOVERY CENTRE

A platform for creating a natural product library for high throughput screening

of samples has been established. The primary platform has thus been completed and continues to grow daily. Over 11 000 dry ground plant samples collected from various parts of the country are stored, and approximately 5 000 extracts and their semi-purified fractions have been created to date and stored at -20 °C. Such a library provides access to many South African plant samples opening the possibilities for novel Biodiscovery findings.

A digital, searchable database is also under development. It will allow those working in the centre to rapidly access and mine the information on the plants, their extracts, fractions, and isolated compounds. UPLC QTOF MS/MS analysis is conducted daily on samples that provide sufficient biological efficacy through screening programmes leading to chemical fingerprinting of the samples. Various databases such as Dictionary of Natural Products, Waters UNIFI™, Metlin/ Metfusion, and Chemspider are used in this process. In addition, targeted purification of the lead compounds is undertaken by semi-preparatory HPLC MS/ UV providing sufficient quantities of pure compounds for structure elucidation by NMR.



Captive elephants' body language shows they are affected by tourist walks and rides



By analysing the elephants' body language and how often they made certain movements, <u>they found</u> that these animals were affected by specific tourist interactions, like walks and rides.

"This has important implications for the management of elephants in animal tourism venues, and has already led to the Knysna Elephant Park discontinuing rides in 2018," said Primrose Manning of the <u>African</u> <u>Elephant Research Unit</u> at the Knysna Elephant Park, who led the study.

Interestingly, the elephants were less affected by high numbers of tourists, touching, and feeding. This is most likely because the elephants could freely choose to walk away from these interactions, and because they favoured food, said <u>Professor</u> <u>André Ganswindt</u> from UP's <u>Mammal</u> <u>Research Institute</u>.

These findings could give handlers a new assessment tool to manage elephant wellbeing, just by observing these so-called "self-directed behaviours" (the scientific



term for behaviours that animals choose to exhibit when, for example, their environment is perceived as stressful).

"It would provide the ability for the observer to gain an instantaneous insight into the elephants' state of mind and to identify stressors in real time. It could also potentially replace other less effective methods such as monitoring stereotypic behaviour, which are repetitive, functionless actions only displayed in captivity," explained Manning.

"Stress is not a bad thing per se," said Prof Ganswindt. "The physiological response to a perceived stressor allows the animal to make energy available to deal with whatever situation they find themselves in. It is a powerful coping mechanism."

Other scientists had previously linked selfdirected behaviours to stressful situations in primates, so Prof Ganswindt and his colleagues hoped to identify similar behaviours that could indicate potential stressful situations for elephants.

Although the elephants expressed some self-directed behaviours during tourist



interactions, these coping mechanisms likely support the animals' well-being and mitigate physiological responses. This theory is supported by the fact that the researchers did not find a link between the behaviours they observed and a stressrelated biochemical marker measurable in the elephants' dung.

"In fact, this biochemical marker, known as faecal glucocorticoid metabolites, indicates rather distinct periods of perceived stress, and the circumstances experienced by elephants in the Knysna Elephant Park, Western Cape, does not seem to fall into that category," explained Prof Ganswindt.

But even in an overall lower impact environment, the seven monitored elephants appeared more distinctively affected when visitors were allowed to walk or ride them.

Prof Ganswindt said more research is needed to link behavioural observations with other biological or chemical stressrelated markers so that "self-directed behaviours" can be formally established as a reliable, affordable and non-invasive tool to assess elephant welfare.

Moo-nlight Sonata: study finds that cows soothed by classical music produce more milk

A <u>University of Pretoria (UP)</u> <u>study</u> has shown that playing soothing classical music to dairy cows lowers their stress levels and increases their milk production. The findings, which were published in the journal <u>Domestic Animal</u> <u>Endocrinology</u>, are the result of research by <u>Lize-Mari</u> <u>Erasmus</u>, a former member of UP's <u>Camerata choir</u>, who has a <u>Master of Science (MSc) degree</u> in <u>Agriculture (Animal Science)</u> cum laude from the University.

Erasmus' MSc studies allowed her to combine her two passions: music and animals. Before embarking on a career in animal sciences, she had obtained a <u>Bachelor of Music degree at UP</u>, with Choral Conducting as one of her majors.

Hers is the first study of its kind in South Africa to investigate the influence of classical music on the stress levels and milk production of cows.



"The health and welfare of dairy cows go hand in hand with efficient and sustainable dairy production," she says about the value of providing farm animals with enriching environments. The <u>World Organisation</u> for Animal Health (OIE) describes animal welfare as a human responsibility, and includes all aspects of animal life, including proper management, housing, disease prevention and treatment, humane handling and responsible care.

"Providing cows with an enriching, stimulating environment, such as through music, is one way of improving their living conditions and, in the process, looking after their mental needs too," Erasmus says.

In order to oversee the experimental phase of her project, Erasmus spent four months at <u>Innovation Africa @UP's Future Africa</u> <u>Institute</u>, where a herd of Holstein cows are kept. "Not many studies have been conducted within the setting of a commercial dairy farm such as the one at Future Africa," she notes.

Nine Holstein cows were divided into three groups of three, and over the course of four months, each group was exposed to three treatments. One group of animals was exposed to classical music every day for 24 hours wherever they were on the farm; another group wasn't exposed to any music at all; and in the third group, the cows heard classical music only when they were being milked.

Erasmus says she could sense from their slightly agitated behaviour that the cows that were exposed to music needed time to adapt to their "new normal", which they did within two weeks.

She included works from well-known composers such as <u>Wolfgang Amadeus</u>



Mozart, Edvard Grieg, Arcangelo Corelli and Jacques Offenbach, as well as compositions such as Ludwig van Beethoven's Moonlight Sonata, Camille Saint-Saëns's The Carnival of the Animals and George Frideric Handel's Water Music. It was played over a speaker system on shuffle mode to ensure that the animals did not learn to associate a particular sequence of music with a particular part of the day, such as milking time.

About her choice of slower pieces of classical music, Erasmus says: "Previous research has found that dairy cows prefer slow music to fast-paced music, and



instrumental music such as the classics rather than rock or Latin music."

In order to determine the stress levels of the cows, and with the help of <u>UP's</u> <u>Endocrine Research Laboratory</u>, she regularly tested how much glucocorticoid (a hormone that is produced in stressful situations) was found in the dung and milk of the animals in the different treatment groups.

"Cows exposed to constant music had the lowest stress-related levels of glucocorticoid in their dung," she explains. "They were noticeably calmer when being milked, which is generally a stressful time of the day because of all the activity."

Up to two litres more milk per milking session were obtained from the cows when they were constantly surrounded by music all day and night.

"The findings indicate that auditory stimuli as a form of environmental enrichment have economic benefits to the producer," Erasmus says. "It could mean that milk producers might be able to keep fewer cows, yet still be profitable. I believe consumers will respond positively if they know that the milk they use comes from cows who are kept on a farm where environmental enrichment of the animals' surroundings is a matter of priority."

Erasmus' research was supervised by <u>Professor Esté van Marle-Köster</u>, Head of the <u>Department of Animal Science</u> at UP, with <u>Prof André Ganswindt</u>, Director of the <u>Mammal Research Institute</u> in <u>UP's</u> <u>Department of Zoology and Entomology</u>, as co-supervisor.

"Prof Van Marle-Köster loves classical music too, and was immediately interested when I first presented her with the idea of studying the influence of classical music as a way of improving the welfare of cows," Erasmus says.

Are we protecting Africa's rainforests at the cost of our grasslands?

Many palm oil companies have agreed to stop cutting down rainforests, but now their expanding palm plantations may threaten grasslands and dry forests in Africa and South America.

UP's Extraordinary Professor Catherine Parr says we must protect these habitats since human communities, as well as important plants and animals, depend on them for survival.

In a recent *Nature Ecology & Evolution* publication, Parr and other researchers reported on the unintended harmful consequences of "zero-deforestation" commitments by palm oil producers.

Zero-deforestation policies are meant to reduce carbon emissions and protect rainforest biodiversity. But it now seems the threat will merely be shifted to other natural habitats, for which such protections are not yet in place. "The unique biodiversity that occurs in tropical grassy and dry forest biomes, such as the Llanos and Beni savannah in South America, and the Guinean savannah in West Africa, is at risk from palm oil expansion if we don't revise the policies meant to protect them," says Parr.

The researchers came to this conclusion after looking at habitats all over the world that are climatically suitable for palm oil plantations to expand into. They specifically noted how much land would not be protected by zero-deforestation commitments made by palm oil companies.

Of this unprotected land, grasslands and dry forest habitats make up over half (57%), and most of these vulnerable areas are in Africa and South America.

Parr and her international colleagues focussed on mammals that would be threatened by palm oil expansion into these habitats. "Our results show that there is an urgent need to strengthen policies to protect open grassy ecosystems and dry forest habitats, which differ from moist forests protected by zero-deforestation commitments."

The researchers suggest that to prevent unintended consequences of zerodeforestation commitments, and to minimise the environmental impacts of oil palm expansion, policies and governance for sustainable development and conservation must expand to include all tropical biomes, not just rainforests.



In search of a biocontrol solution for the Shot Hole Borer

Since it was discovered in KwaZulu-Natal in 2017, the **Polyphagous Shot Hole Borer** (PSHB) (Euwallacea fornicates) has spread rapidly into every province in South Africa except Limpopo, and has infested thousands of trees in urban areas, native forests and more recently in fruit crops.

This tiny invasive ambrosia beetle, native to Southeast Asia, has set alarm bells ringing as it can infest a wide variety of tree species - including seemingly strong, healthy trees - and can spread far and wide with the aid of human activity. In addition, it bores into the sapwood of trees and brings a damaging fungus, Fusarium euwallaceae, along with it.

The economic impact of PSHB in South Africa is still in its infancy but is expected to run into the billions if allowed to continue unchecked. The environmental effects are also potentially huge as a number of native trees are susceptible to infestation.

One of the management options being explored by scientists at the Forestry and Agricultural Biotechnology Institute (FABI) at the University of Pretoria (UP) is to identify a natural enemy of PSHB in its native range and then introduce it into South Africa, where it could play a role in controlling the PSHB population.

This led to a recent trip to northern Vietnam by Prof Brett Hurley (UP Professor in Zoology and Entomology), postdoctoral fellow Dr Wilma Nel of FABI and PhD candidate Garyn Townsend to collect material from trees infested by PSHB to find, identify, rear and testing natural enemies. The visit was highly successful, and the team brought PSHBinfested Acacia back to the FABI quarantine facility after obtaining the required permits from South Africa and Vietnam.

The plan is to monitor the material for the emergence of natural enemies, specifically parasitoids, which could be reared and deployed in South Africa as an effective biocontrol agent for PSHB. This lengthy process involves extensive testing to ensure that the introduced species is sustainable and does not cause any collateral damage to native species in South Africa.

The project has been made possible through the funding of the Department of Forestry, Fisheries and the Environment and collaboration with the Vietnamese Academy of Forestry Sciences, specifically Prof Pham Quang Thu.

Dr Wilma Nel and Garyn Townsend, with collaborators in Vietnam, collecting PSHBinfested material.



According to a recent article in the South African Journal of Science by a group of FABI scientists, the South African PSHB invasion represents the largest outbreak of this beetle in its invaded range anywhere in the world. It has infested 130 plant species in urban, agricultural, and native ecosystems in South Africa, including 44 previously unreported hosts.

In South Africa, PSHB is currently mostly confined to urban environments, but its presence has also been confirmed in the natural forests around Knysna and George, where it is feared it could do extensive environmental damage.

Virgilia oroboides, a native tree species found in the southern Cape natural forests, is a reproductive host for PSHB.

"It is an important pioneer forest species in the southern Cape that protects forests from severe climatic fluctuations and fire and houses a large number of native organisms. Elimination of this single species could have irreversible consequences for native forest integrity," the scientists write.

PSHB control measures using pesticide sprays have been effective in laboratory conditions but are currently not considered practical in the wild. Therefore, deployment of a biocontrol agent is the best management option at this stage, provided a suitable candidate can be found and the necessary authorisation for its release in South Africa obtained.

So far, the only agricultural crops that appear to be affected by PSHB are pecan and macadamia. Still, they are not reproductive hosts, so the impacts are expected to be limited. Other orchard



RESEARCH



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Prof Brett Hurley, Dr Wilma Nel and Garyn Townsend with collaborators at the Vietnamese Academy of Forestry Sciences in Hanoi, Vietnam.

crops that may be vulnerable to PSHB are cherry, apple, citrus, peach, guava, olive, grape and prune crops.

Initial surveys in invaded urban areas of Johannesburg, Knysna, George and Somerset West indicate that a high percentage of English oak, London plain trees, box elder and other maples will die when infested by PSHB. The cost of disposing of these urban trees and replacing them will be considerable.

Urban trees play a vital role in providing shade, moderating temperatures and creating an attractive environment that enhances the quality of life and boosts the hospitality and tourism sectors. They also provide refuge for numerous birds and insects.

How to detect PSHB infestation:

The first signs of PSHB infestation are tiny holes penetrating the bark of trees and leading directly into the sapwood. These random holes, less than 1mm in diameter, look like shotgun pellets could have caused them - hence the common name 'shot hole borer'.

Lesions, wet patches and gum exudation may be visible on the outside of the tree, and a pinkish-brown stain caused by the associated fungus may be seen spreading from the gallery into the vascular tissues below the bark. PSHB colonisation of reproductive hosts often results in wilting and death of the infested branch - or the entire tree.

The FABI team has had much success with introducing biocontrol agents for several tree pests in South Africa in the past. This experience will be invaluable in finding an effective biological enemy for PSHB. The stakes are high as this tiny hitchhiking beetle continues to spread across southern Africa.



The team in the FABI quarantine facility, where the collected material is being monitored for emergence of natural enemies of PSHB.

"The Polyphagous Shot Hole Borer ... pest invader spreading rapidly across South Africa."

Article by W. Nel, B. Slippers, M. Wingfield, N. Yilmaz & B. Hurley in South African Journal of Science, April 2023. SA Forestry Online.



Global project to develop next-generation radio astronomy tech set to boost SKA research at UP

University of Pretoria (UP) scientists involved in the Square Kilometre Array (SKA) telescope project are poised for a major boost in their research efforts as a result of next-generation technologies developed by a new global radio astronomy initiative.

The RADIOBLOCKS project aimed to enhance world-leading research infrastructures in radio astronomy and commenced in March 2023. The project will take a holistic view of how radio telescopes arrays capture, process, synthesise and analyse cosmic signals, and develop components, technologies and software that are applicable to a wide range of instruments to apply to a wide range of instruments to enable the next significant discoveries in radio astronomy.

The European Commission has granted the project €10 million to develop these "common building blocks" for technological solutions enabling a broad range of new science.

For South Africa, the new technologies obtained through the project will be critical for including the Square Kilometre Array (SKA) telescope project – an international effort to build the world's largest radio telescope, for which South Africa is a co-hosting region – as part of a VLBI (very long baseline interferometry) network of telescopes.

"These technologies will enable us to probe the finest and faintest details of

many different scientific phenomena, which are not reachable without the SKA," says UP lecturer Dr Jack Radcliffe, RADIOBLOCKS lead at the University.

For UP, the project will support the efforts of researchers to make the incorporation of the SKA within the VLBI arrays a reality.

"Through the SKA-VLBI simulations task force, the RADIOBLOCKS programme will help to produce end-to-end simulation packages that can inform and assist the development of new technologies and investigate the exciting science possibilities for when the SKA becomes part of a VLBI array," Dr Radcliffe says. "The technologies and collaborations formed through this programme will ensure that its impact is not limited to just Europe, but also to the development of radio astronomy across Africa."

The RADIOBLOCKS project involves 33 major European research infrastructures for radio astronomy and industry and academia partners from 10 European countries, Japan, the Republic of Korea and South Africa. The Engagement with the industry to co-develop advanced technologies will increase the partners' technological levels and strengthen their market positions.

The four-year RADIOBLOCKS project is coordinated by the Joint Institute for Very Long Baseline Interferometry as a European Research Infrastructure Consortium (JIVE ERIC) and major European research infrastructures for radio astronomy. It will receive funding from the European Union's Horizon Europe research and innovation programme.

"The project brings together world-leading academic research and industry experts from across Europe and beyond to co-develop, then exploit new technologies to maximise the science capabilities of current and future radio facilities," says Professor Rob Beswick, Head of Science Operations and User Support for e-MERLIN, the UK's National Radio Astronomy Facility, Deputy Director of the UK SKA regional centre and RADIOBLOCKS lead at the University of Manchester.

The project aims to develop common needed blocks:

- to develop new correlators, which can efficiently exploit powerful new commercially available accelerator hardware. This development will directly benefit the large radio arrays from metre to sub-millimetre wavelengths;
- in cutting-edge front-end technologies, addressing the generation and real-time handling of wide-band and multi-band data, in particular for the creation of novel detectors and components;
- for multi-pixel receivers, ranging from centimetre to sub-millimetre wavelengths, suitable for large single-dish facilities, with particular relevance for future collaborations with pan-European and global research infrastructures (such as the SKA-VLBI); and
- for data (post)processing, testing prototype workflows functionality and demonstrating usage of end-to-end simulation tools.
- The project builds on the highly consolidated RadioNet consortium, which has successfully integrated a unique array of capabilities and contributed to the continued advances in radio astronomy. These advances are recognised as essential in answering critical questions in astrophysics.

RESEARCH

'Rainfall extremes are becoming more probable in parts of SA' – UP meteorology experts



With climate change affecting the intensity of rainfall, experts at the <u>University of</u> <u>Pretoria (UP)</u> have investigated if there are observable changes in the probability of significant to extreme daily rainfall across South Africa.

This research is especially relevant, as many areas in the country are prone to localised flooding. UP researchers found that the amount of rainfall in certain parts of South Africa has increased or become more extreme over the past 50 years or so.

These investigations were part of a <u>study</u> led by <u>Charlotte McBride</u> of the <u>South African Weather Service</u> and a PhD candidate in UP's <u>Department</u> of <u>Geography</u>, <u>Geoinformatics and</u> <u>Meteorology</u>.

McBride explains that one of the consequences of human-induced climate change is the increase in frequency and/ or intensity of some weather and climate extremes. These can include heatwaves, heavy rainfall, floods, droughts and tropical cyclones.

"South Africa is currently focused on flooding, as this is what is happening at the moment," she says. "However, during 2018 and the Day Zero debate – when Cape Town was set to run out of water – the public focused on drought. South Africa has a variable climate, with droughts and floods a common feature of this variability."

As surface temperatures increase due to climate change, so the water content of the atmosphere changes. These increases in the water-holding capacity of the atmosphere equate to about 7% per degree of warming. With more moisture available, the nature of rainfall events will likely become more intense with increased rainfall rates. However, changes in extreme rainfall patterns are thought to be highly regionalised.

South Africa's annual rainfall distribution is diverse and increases from below 200mm in the west to above 1 200mm a year in the east. To investigate if rainfall patterns are changing, the researchers analysed the daily time series of 70 manual rainfall stations between 1921 and 2020; this was divided into an early sub-period (1921 to 1970) and a later period (1971 to 2020). After comparing the rainfall figures in these two periods, it became evident that most rainfall stations showed an increase in their 1 – 50- and 1 – 100-year return period values.

The two periods had more or less the same number of rain days (more than 1mm), but the rainfall amounts on any given rain day for certain parts of the country increased or became more extreme in the latter period.

"We then mapped the change between the two periods as a ratio for each station," McBride explains. "This gave us an idea of where areas are experiencing higher or lower rainfall values for the specific return periods."

Some stations over the eastern parts showed increases of more than 100mm in the later period compared to the early period, when considering the 1 – 50- and 1 – 100-year return period values. For example, the Letaba district rainfall station in Limpopo experienced an increase of more than 35%. Another example is Hlobane in KwaZulu-Natal, where the 1 – 50- and 1–100-year values have essentially doubled.

This means that these areas and others highlighted in the research, such as the western interior and southern parts of the country, are likely to experience more extreme rainfall, which is probably a "feature of climate change over those areas".

With reference to the blue areas in maps A (1 - 50-year return period) and B (1 - 100-year return period), a figure greater than 1.5, for example, indicates an increase in the return period value of about 50% or more.

"South Africa is projected to become warmer and thus experience an increase in droughts," McBride says. "However, this does not mean that the risk of severe storms – including tropical cyclones and intense thunderstorms – will not be expected to occur. With the atmosphere heating, it can hold more water vapour. More water vapour means more rainfall. So we can expect the intensity of rainfall to increase."

"There is much work being done internationally and in South Africa on climate change using <u>Numerical Weather Prediction</u> data," says <u>Professor Liesl Dyson</u>, <u>Associate</u> <u>Professor in Meteorology</u> at UP.

While these products are of great value and provide insight into what could happen in a future climate, they remain proxies of reality.

"The value of the presented research is that it uses real, observed rainfall data over South Africa for an extended period," she adds. "These results are based on what we know has happened over the past century and show that rainfall extremes are generally becoming more probable and increasing in South Africa. Researchers using Numerical Weather Prediction data could also make use of these results to verify that the models they employ accurately capture the current situation, thereby placing a higher value on the reliability of projections in the future."

<u>Click here</u> to view an infographic for more information.

Source: Weather and Climate Extremes

Africa's understudied human gut microbiomes could be a rich source of therapeutics



Africa's overlooked, understudied microbiomes have huge potential for microbially derived therapeutics, and possibly even new antibiotics. Before the continent can tap into these possibilities, however, a vast amount of research needs to be done to close the knowledge deficit.

"Data on African microbiomes is quite low and in terms of the knowledge produced, we are on the backfoot. There are a lot of areas that need to be studied because microbes are at the centre of everything. We cannot achieve the Sustainable Development Goals without focusing on microbes," said Professor Thulani Makhalanyane, Department of Science and Innovation/ National Research Foundation South African Research Chair in Marine Microbiomics in the Department of Biochemistry, Genetics and Microbiology at the University of Pretoria.

He was delivering the 31st University of Pretoria Expert Lecture on 4 May, titled 'Unlocking the secrets of the invisible universe within and beyond us: A call to discover Africa's microbiomes'.

In his lecture, Prof Makhalanyane focused on the human gut microbiome, which has been shown to directly influence physical and mental health, including cardiovascular, digestive, endocrine and neurological health.

He said international research has highlighted the positive impact on the human gut microbiome – and therefore on human health – of diets high in fibre and fermented foods.

"A lot of these studies have often been done in populations that do not necessarily have diets such as the ones we have in Africa and do not have the extent of diversity that we have in Africa. So by screening African populations, we've got a higher potential of finding novel prebiotics, probiotics and other antibiotics just by harnessing the power of our gut microbiomes." He singled out two fermented foods widely eaten in South Africa, amasi and mageu as having the potential for gut microbiomederived therapeutics that could be used to treat people with gastric ulceritis and other gut microbiome disturbances.

Why African microbiomes are different and novel

Making the case for a major focus on the study of African microbiomes, Prof Makhalanyane said the little research that has been done to date on African human gut microbiomes has produced exciting results.

A UP project conducted several years ago had compared the gut microbes of people in Pretoria, where processed foods are commonly consumed, to those of people living in rural locations in Venda. The results showed higher levels of microbial diversity and interaction in the gut of rural networks than in urban networks. "This indicated a lot more synergies in the gut microbiomes of rural people, which is a proxy for better health," Prof Makhalanyane said.

The research also sought to understand whether differences in microbial diversity were linked to functional differences, such as in resistance to antibiotics. "There were a lot more resistance genes in the urban locations compared to the rural individuals," he said. "This further confirms that a high-diversity ecosystem equates to more stability."

Going further, the researchers compared the gut microbiome data of rural and urban South Africans to data available in international databases. "This showed a high degree of novelty and high potential to explore the gut microbiomes of urban and rural individuals."

Closing the African knowledge gap

Pointing to the scarcity of African human gut microbiome research, Prof Makhalanyane said there was a significant knowledge deficit. While a recent generalised internet search for microbiome papers had yielded over 88 370 papers on the topic, a search for African papers had produced only 446. The gap is also clearly evident in the number of patents granted in the gut microbiome field, with 88% of patents linked to six countries, predominantly China, the United States and Japan. Africa barely features.

"There are a lot of areas where we need to do African microbiome research," he said, mentioning the implications of microbiomes on human and animal health, biodiversity, agriculture and conservation, among others.

"You cannot really start to look at how to start to conserve different ecosystems if you do not look at microbiomes. Equally, you can look at the status of a microbiome and use it as a proxy towards determining whether a system is at a point of being disturbed or altered."

Prof Makhalanyane said UP has developed a roadmap on African microbiome research and has already started setting up collaborations in other African countries, such as Cote d'Ivoire. "Another thing we need to do as Africans is propose policy interventions and documents to advise our respective governments on the importance of looking at microbiomes."

The roadmap also looks at microbiome research infrastructure – which is often not available on the African continent – in the form of network hubs for sequencing throughout Africa.

Microbiomes and the next health crisis

During question time, Prof Makhalanyane was asked about the importance of microbiome research in this time of pandemics.

His response was immediate: "If you look at the literature, people predict that the next great pandemic is the crisis of antimicrobial resistance. With that, there is a clear need to look at deriving much more novel antibiotics that are able to circumvent this crisis that we are likely just about to go into. That is one clear importance of studying the gut microbiome."

Watch the lecture here.



Aloe plant could impede life cycle of malaria-carrying parasite

Ms Sephora Mianda Mutombo

Experts at the <u>University of</u> <u>Pretoria (UP)</u> are a step closer to finding a drug that could prevent transmission of the malariacarrying parasite <u>Plasmodium</u> <u>falciparum</u> by thwarting its life cycle.

Sephora Mianda Mutombo, a PhD candidate in the <u>Department of Chemistry</u> at UP, was the lead author of a <u>study</u> published in the <u>Journal of Ethnopharmacology</u> that investigated the indigenous succulent <u>Aloe</u> <u>marlothii</u> for its ability to kill or stop the proliferation of malaria parasites.

The study found that natural active ingredients in the roots of this aloe species have anti-plasmodial properties that have the potential to kill all the phases of the malaria-carrying Plasmodium falciparum parasite and block the all-important transmission.

"The parasite that causes malaria has a very complex life cycle, which occurs in two hosts: humans and *Anopheles* <u>mosquitoes</u>," Mutombo explains. "In humans, the parasite goes through distinctive stages of development in the liver, then the bloodstream by infecting red blood cells. This is known as the asexual intraerythrocytic cycle of development. A small portion of asexual parasites commit and differentiate into sexual forms of the parasite known as gametocytes [males and females]."

These are the terminal parasitic stages of the parasite, which is transmitted to the

mosquito when the insect feeds on the blood of an infected person. The sexual cycle of the parasite then takes place in the mosquito.

"All antimalarial drugs, with the exception of primaquine, target the asexual stages of the parasites, meaning they kill the parasites during their asexual intra-erythrocytic cycle of development," Mutombo explains. "So an individual who has been treated for malaria with antimalarial drugs that are currently on the market can still transmit the parasite to mosquitos, because the sexual forms of the parasite were not killed. "Therefore, to contribute to the eradication of malaria, we need compounds that will kill the sexual forms of the parasites, thereby preventing the transmission of Plasmodium from human to mosquitos."

Southern Africa is known for its rich biodiversity and traditional knowledge, and is a significant source of natural compounds that can be developed for the treatment of malaria, yet no approved treatments from the region have come to fruition. This is unsurprising, however, as it is estimated that out of every 10 000 samples, only one is approved by the <u>US Food and Drug</u>. <u>Administration</u> as a drug or pharmaceutical. It could be that a systematic investigation of Southern African resources has not been undertaken, and that the research process is fragmented rather than collaborative.

"In order to increase the chances of success, modern-day drug discovery now relies on the use of a library of samples for a high throughput of biological assaying against diseases such as malaria, together with hyphenated analytical techniques to rapidly identify bioactive compounds," Mutombo says. UP's biodiscovery centre hosts a plant materials repository that contains more than 11 000 plant samples systematically collected throughout South Africa. The centre is under the directorship of the Department of Chemistry's Professor Vinesh Maharaj, Deputy Dean of Research and Postgraduate Education UP's Faculty of Natural and Agricultural Sciences (NAS), and a co-author of the study. A natural product library is being built from these samples, which are a collection of extracts, purified fractions and compounds obtained, stored in standardised formats in robotic freezers and readily deliverable to biological screening assays. The information associated with each sample is stored in a database.

Mutombo's work was done on 300 samples from the library in conjunction with modern technologies to assist in rapid identification of antimalarial drug candidates from plant material stored in the repository.

"We can use all of these resources to contribute to malaria eradication, bearing in mind that malaria is still one of the most severe public health problems worldwide, especially in Africa," Prof Maharaj said. "The huge burden of malaria cases and death is carried by the African region, and accounts for about 95% of malaria cases and 96% of malaria deaths. Sadly, children under five years old make up an estimated 80% of all malaria deaths. Clearly this is an African problem and as Africans, we would like to contribute to the solution."

<u>Click here</u> to view an infographic showing how malaria is spread and how this drug aims to stop its transmission.



UP confers honorary doctorate on agricultural development doyen Prof Richard Mkandawire

The University of Pretoria (UP) has awarded Professor Richard Mkandawire an honorary doctorate (honoris causa) in recognition of his outstanding contribution to transforming Africa's agricultural food systems and empowering youth on the continent.

Prof Mkandawire is the Africa Director of the Alliance for African Partnership (AAP), a consortium of ten African universities (including UP), Michigan State University (MSU) and other international collaborators that work to transform institutions and livelihoods in Africa.

He has held numerous senior positions on the continent and internationally. He has been instrumental in effecting positive change in various areas, including food policy, land tenure systems and agrarian development, gender and development, and youth empowerment.

"I accept this honorary doctorate on behalf of the institutions, universities and organisations that I've been associated with in pursuit of African development pathways," said Prof Mkandawire, who also holds an honorary doctorate from the University of KwaZulu-Natal. "This honour is dedicated to the people of Africa. I want to thank my colleagues, including members of UP, particularly those in the Department of Agricultural Economics, Extension and Rural Development, and my AAP colleagues at MSU. I have benefitted from these associations and from the high quality of research conducted by academics at UP and many other remarkable universities in the region and globally."

"Prof Mkandawire's intellectual contributions and practical work in transforming African institutions in the promotion of the socio-economic development of Africa embody UP's vision to be a leading African global university that makes a difference to the development of South Africa, Africa and the rest of the Global South," said Prof Frans Swanepoel, Director of Strategic International Partnerships at the CAS. UP has had a long-standing relationship with Prof Mkandawire, appointing him as an Extraordinary Professor in 2012. "When it comes to expertise on African agriculture, UP is one of the leading universities globally," said Prof Barend Erasmus, Dean of UP's Faculty of Natural and Agricultural Sciences. "Part of this leadership is not just about engaging with the fundamental science, but also the policy domain – Prof Mkandawire's high profile and obvious policy expertise made him an obvious partner with which to work to achieve the agricultural transformations needed."

Before joining the AAP, Prof Mkandawire was Vice-President of the African Fertiliser and Agribusiness Partnership (AFAP), where he led a team of experts in driving innovative interventions for the efficient delivery of fertilisers among smallholder farmers in Africa. Under his leadership, the AFAP reached 7.3 million farmers in three years through rural-based agro-dealers, thereby increasing production and yields and stimulating trade. He is currently Co-Chair for the policy team supporting the African Union 2023 Summit on Fertiliser and Soil Health.

Prof Mkandawire is recognised as the principal architect of the Comprehensive Africa Agriculture Development Programme (CAADP), which has become Africa's blueprint for agricultural transformation, wealth creation, food security, nutrition and economic growth. The CAADP model of country-owned, country-led agriculture and food security plans buffered Africa from the inflated food prices and other shocks emanating from the 2008/2009 financial crisis. He is also recognised for encouraging African heads of state and donor agencies to accept the CAADP model. He was rewarded for his efforts with the Southern Africa Development Trust's Drivers of Change award.

Throughout his career, Prof Mkandawire has worked to forge collaborations across geographic boundaries to support the transformation and strengthening of African institutions that drive sustainable development. His contributions to African agricultural development processes have built bridges between African institutions and development partners in the Global North, including universities.

In his almost decade-long role as Regional Director of the Commonwealth Youth Programme, he facilitated the establishment of national youth commissions and networks in six Commonwealth countries in Africa to support youth employment, youth reproductive health, and youth policy analysis and development. He was also



Prof Richard Mkandawire

the founding Director of the Centre for Youth Studies at the University of Venda for Science and Technology in the late 1990s. The centre was instrumental in contributing to the policy discourse on youth empowerment in Africa.

Prof Mkandawire has served on several international and Africa-based advisory boards and continues to be a leading voice on African development issues who is called upon to shape and design policy. He is currently Chairperson of the Malawi National Planning Commission, which allows him to fuse his scientific and academic experience with political leadership.

Prof Steven Hanson, Associate Provost and Dean for International Studies and Programmes at MSU praised Prof Mkandawire's commitment to improving lives and livelihoods in Africa and beyond.

"Prof Mkandawire has spent his career addressing Africa's most pressing challenges, and this honorary doctorate is a much-deserved recognition of his dedicated work," Prof Hanson said. "MSU and the AAP are fortunate to have his leadership as we pursue a shared vision for equitable global prosperity."

"The transformation to just, sustainable African agricultural food systems is a global challenge that needs committed networks and partners," UP Vice-Chancellor and Principal Prof Tawana Kupe said. "The University is proud to recognise Prof Mkandawire for his commitment and contribution to this challenge. Championing African-led development is a core value at UP. We are delighted to have bestowed this honour on Prof Mkandawire, and we look forward to the next steps in our journey."

UP bestowed honorary doctorate for global food systems expert to Prof Louise O. Fresco

The University of Pretoria (UP) bestowed Professor Louise O. Fresco with an honorary doctorate (honoris causa) in recognition of her outstanding intellectual and public contribution to the sphere of African and global food systems and equitable sustainable development, with an emphasis on Africa.

"For us, a borderless knowledge, opportunity and trade environment is a calling because the prosperity of one is the health and prosperity of all, as expressed through the philosophy of Ubuntu, a philosophy which is part of our UP DNA. It includes excellence, perseverance, respect, creativity, innovation, diversity, growth, kindness, making a difference and making everyday matters. Exemplifying this ethos is Prof Fresco," UP Vice-Chancellor and Principal Prof Tawana Kupe said.

Until 1 July 2022, Prof Fresco was the President of the Executive Board of Wageningen University & Research (WUR) in the Netherlands and professor at the same institution where she obtained her BSc and MSc in 1974 and 1976, respectively. She is also a columnist, writer and public speaker.

UP has had the good fortune of hosting her as a visiting professor, along with Stanford University's Institute of Earth Sciences in the US, Leiden University in the Netherlands, Uppsala in Sweden and Leuven in Belgium.

WUR is the leading university in agriculture globally. Prof Fresco has pioneered many innovations in areas such as protein transition, food chains, and gene editing, with a strong emphasis on these benefits for countries in the Global South. And during her tenure as its President, WUR has significantly strengthened its position and collaboration with universities on the African continent.

In 2014 Prof Fresco was recognised in South Africa by ASSAF – the Academy of Science of South Africa – when she was appointed honorary fellow. Four years later, in 2018, WUR and UP signed an institutional agreement for long-term, institution-wide collaboration – including research, postgraduate education, and staff and student exchange.

Following her Master's, Prof Fresco started working for the United Nations in the late 1970s – first in Papua New Guinea, then in Central Africa, where she spent many years in remote areas doing fieldwork. Based on her research on cassava farming systems in Africa, she obtained her doctorate in Tropical Plant Breeding and Production Systems summa cum laude from WUR in 1986. After that, she expanded her work for the UN to various parts of Africa, Asia, Central America, and Southern Europe, taking an inter- and transdisciplinary approach encompassing fields ranging from soil and plant science to hydrology and agricultural economics.

In 1989, she was appointed as Professorial Chair of the Agronomy Department at WUR – the second woman professor ever at the university. She made significant contributions to the advancement of the field of farming systems research and has worked with colleagues around the world in over 90 countries in a professional capacity.

In 1996, she was appointed Director of Research at the UN's Food and Agricultural Organisation (FAO) in Rome, followed one year later by her promotion to Assistant Director General of the FAO. She was one of the founding members of the Forum for Agricultural Research in Africa (FARA).

Another of her appointments was at the University of Amsterdam (UvA) as a distinguished professor in 2006 in a specially created research chair, focusing on the foundations of sustainable development. During her time at UvA, from 2006 to 2014, she served on the Socio-Economic Council of the Netherlands – the official government advisory body on science and innovation.

Her leadership role at the highest level of numerous organisations and task forces are many. She chaired the review of the 7th European Union Framework Programme on Research and Innovation. She was Vice-Chair of the Scientific group of the 2021 UN Food Systems Summit, where she has made academic and significant policy contributions reflecting her dedication to promoting food security as a global public good.

"She works in a wide range of disciplines, and I respectfully call her a 21st-century Renaissance superwoman, as she is also known for her artistic and literary achievements, which are deeply rooted



in her scientific expertise, and desire for societal sustainability transition. She uses several media, including newspaper columns, children's books and novels, to support her sustainability message and promote engagement and collaboration between the public and private sectors, which she regards as being of utmost importance for the future of food and agriculture. UP pursues the same as one of our cornerstones, "Prof Kupe emphasised.

In the Netherlands, she received the Groeneveld Award for rural development, while in Italy, she was rewarded with the Giuseppe Acerbi Prize for literature and culture.

Prof Fresco's playful side is revealed in her creative interaction between art, design, and science in projects such as the design of a fully sustainable outfit – utilising materials such as residual ink, bacterial dye, pineapple leather, and mushroom mycelium – which she wore for the WUR's centennial celebrations in 2018.

She has over 240 publications to her name, a television documentary on food, TED talks and numerous scientific and non-scientific books. Her best-known non-scientific book is titled 'Hamburgers in Paradise'; it's about the food we eat and has been translated into several languages.

The latest scientific book she co-edited and published by Springer in January this year is titled: '*Science and innovations for food systems transformation and summit actions'*. It's open access and compiles the Scientific Group of the United Nations Food Systems Summit 2021 findings and its research partners, including 28 food systems scientists worldwide.

Kiwi Plant Protection Programme launched at UP

The Forestry and Agricultural Biotechnology Institute (FABI) and the South African Kiwi Growers Association have recently established a collaborative programme to address threats posed by pests and pathogens to the growing kiwi industry in South Africa.

This new partnership was officially launched in February in Richmond, KwaZulu-Natal, during a ceremonial signing of a contract by the South African Kiwi Growers Association chairperson, Jonathan Trusler, and Prof Irene Barnes from FABI and an associate professor in the Department of Biochemistry, Genetics and Microbiology.

Kiwi fruit has been grown in South Africa for over 40 years, with many new varieties introduced to realise the potential of a growing and vibrant industry. However, as with all plant crops, disease and pest problems could threaten this industry. This has prompted local kiwi growers to invest with FABI to manage potential losses.



Prof Mike Wingfield, Cheyenne Theron and Prof Irene Barnes

During the next three years, PhD candidate, Cheyenne Theron from the Department of Plant and Soil Sciences, based at FABI, will research priority kiwi health problems. She will also assist farmers in providing a diagnostic service to identify and characterise the most important pathogens affecting kiwi plants in South African orchards. This project, supervised by Prof Barnes and Prof Mike Wingfield, will collaborate with existing research programmes in FABI, including the Macadamia Protection Programme, the Tree Protection Co-operative Programme (TPCP) and the DSI-NRF Centre of Excellence in Plant Health Biotechnology (CPHB), which all broadly focus on promoting tree health.

Prof Makhalanyane appointed as editor-in-chief of top international journal

Prof Thulani Makhalanyane has become the first African academic to be appointed Editor-in-Chief of Reviews and Perspectives for the prestigious ISME Journal.

The University of Pretoria (UP) is proud to announce that Professor Thulani Makhalanyane of the Department of Biochemistry, Genetics and Microbiology has been appointed Editor-in-Chief of Reviews and Perspectives for the International Society for Microbial Ecology (ISME) Journal, as of 1 May 2023. Prof Thulani – who holds the Department of Science and Innovation/National Research Foundation SARChI Chair in Marine Microbiomics – is the first African to assume this position.

The ISME Journal is a multidisciplinary journal that covers a broad range of topics, including environmental microbiology, microbial physiology and microbial genomics. Over the past 15 years, the journal has published ground-breaking research in microbial ecology, and its impact on the field has been immense. In 2022, the impact factor for the journal was 11.217.

Prof Makhalanyane holds a P-rating from the National Research Foundation and is a leading researcher in microbial ecology, particularly interested in microbial communities in extreme environments such as Antarctica and the Southern Ocean. His research focuses on understanding the processes that drive microbial diversity and how they influence ecosystem functioning.

In his new position, Prof Makhalanyane will play a crucial role in shaping the direction of the ISME Journal.



Read more on page 14 about the 31st University of Pretoria Expert Lecture he delivered.

Learning with and from each other in second Sense of Place workshop

The second project workshop of the Cognitive Geomatics project between the <u>Karlsruhe University</u> <u>of Applied Sciences (HKA)</u> in Germany and the University of Pretoria (UP) took place at the end of last year on the Hatfield Campus. This project also includes the <u>University of Nairobi (UoN)</u> in Kenya.

Germany, South Africa and Kenya are case studies in a project funded by the Baden-Württemberg-STIPENDIUM for University Students - BWS plus, a programme of the Baden-Württemberg Stiftung. This project, financed at a cost of €140 000, started in March 2022 and will continue until February 2025.

The second workshop, on the topic 'Sense of Place – Crowd Mapping' took place in September 2022, with Prof Dr-Ing Gertrud Schaab from HKA joining the workshop in Pretoria, while Prof Dr-Ing Faith Karanja from UoN participated remotely.

"According to Prof Serena Coetzee, Head of the <u>UP Department of</u> <u>Geography, Geoinformatics and Meteorology</u>, "We continued our approach of learning with and from each other together with students." A total of 120 final-year students in geography were involved. On the first day, Prof Coetzee introduced them to online crowd-mapping tools. Subsequently, students were divided into groups. Each group had to play with geospatial data collected through crowd mapping, considering the following questions: Could you infer something about 'sense of place'? and If you had to use the tool to map sense of place for the Hatfield Campus, how would you approach it?

On the second day, Prof Nerhene Davis (UP) and Prof Schaab facilitated a feedback session with final-year Geography students



The group of final-year Geography students with Prof Dr-Ing Gertrud Schaab

about their Sense of Place assignment. The students were given the assignment a few weeks before the scheduled session. They were required to complete a group-based research report to investigate the implications of the COVID-19 pandemic on the sense of place of residents within the City of Tshwane. The students presented their findings from the questionnaire-based interviews they conducted as an outcome of the exploratory research.

After each session, students reflected on their experiences with the crowd mapping tools and sense of place assignments respectively. Subsequently, the project partners further discussed and considered these reflections and how they should guide and inform the design of the digital teaching resources (for blended learning), to be developed and tested in 2023, again together with students. Despite physical distances, we plan to develop a portfolio of teaching and learning resources that can be used jointly at the three university sites to also, amongst others, create awareness of cultural differences in sense of place through the use geomatics methods. The results of this workshop are invaluable for the remaining project milestones.

While at UP, Prof Schaab used the opportunity to introduce prospective final-year students to the chance of spending the summer semester of 2023 at the HKA in Germany. In addition, students were informed about the summer school to be held in Karlsruhe in September 2023. The funding of these exchanges is provided by this project, too.

Prof Abba B Gumel elected as a Fellow of AAAS

Professor Abba B Gumel, an Extraordinary Professor from the Department of Mathematics and Applied Mathematics, has recently been elected as a Fellow of the American Association for the Advancement of Science (AAAS). This award honours his scientific and socially notable achievements during his career.

AAAS, the world's largest general scientific society and publisher of the Science family of journals, annually elects scientists, engineers and innovators from around the globe and across all disciplines to the class of AAAS Fellows, one of the most distinguished honours within the scientific community. AAAS is also the publisher of the prestigious Science family of journals. "I am very pleased that I have been elected as a Fellow of the American Association for the Advancement of Science. "It is great to be among the eminent scientists elected in this year's class of AAAS Fellows. I want to take this opportunity to thank you for the collaboration, collegiality, friendship and brotherhood. Greatly appreciated," Prof Gumel commented on being elected as an AAAS fellow.

He was also elected as a Fellow of the American Mathematical Society (AMS) in 2022 for his outstanding contributions to the creation, exposition, advancement, communication, and utilisation of mathematics.

Prof Gumel is a Professor of Mathematics at the Department of Mathematics, University of Maryland, College Park (where he holds The Michael and Eugenia Brin Endowed E-Nnovate Chair in Mathematics). As a mathematical biologist, he specialises in designing, rigorously analysing and parameterising novel



mathematical models for gaining insight and understanding of the transmission dynamics and control of emerging and reemerging infectious diseases of public health significance.

He is a Fellow of the Society for Industrial and Applied Mathematics (SIAM) and the 2021 Bellman Prize winner. In addition, Prof Gumel delivered the 2021 AMS Einstein Public Lecture in Mathematics and is a Fellow of the African Scientific Institute.

GLOBAL ENGAGEMENT

International Prize in Statistics for Prof CR Rao at the age of 102

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The legendary Statistician Prof Calayampudi Radhakrishna Rao (CR), aged 102, will receive the International Prize in Statistics, equivalent to a Nobel Prize in Statistics. Prof Rao received an honorary doctorate from the University of Pretoria in 2004.

"In awarding this prize, we celebrate the monumental work by CR Rao that not only revolutionised statistical thinking in its time but also continues to exert enormous influence on human understanding of science across a wide spectrum of disciplines." said Guy Nason, chair of the International Prize in Statistics Foundation.

The International Prize in Statistics is awarded every two years by a collaboration among five leading international statistics organisations. The prize recognises a significant achievement by an individual or team in the statistics field, particularly an achievement of powerful and original ideas that have led to practical applications and breakthroughs in other disciplines.

Currently, Prof Rao is a Research Professor at the University of Buffalo. Before he

joined Buffalo, Prof Rao was Eberly Professor Emeritus of Statistics and Director of the Centre for Multivariate Analysis at the Pennsylvania State University, USA. His research, scholarship and professional services have profoundly influenced the theory and applications of Statistics. For example, technical terms such as Cramer-Rao inequality, Rao-Blackwellization, Rao Score test, Fisher-Rao theorem, Rao distance and orthogonal arrays (used extensively in industries) appear in all standard books on Statistics. In addition, two of his papers appear in Breakthroughs in Statistics in the last century.

Prof Rao received 30 honorary doctoral degrees from universities in seventeen countries worldwide. During his visit to the University of Pretoria in 2004, he presented seminars, mainly focusing on Cross-examination of Data' at several universities in South Africa and Statistics South Africa. In 2001 the University of Cyprus honoured late President Nelson Mandela and Prof Rao with honorary doctorate degrees on the same platform.

He received numerous awards for his pioneering contributions to statistical theory and applications. He was elected to the National Academy of Sciences, USA, American Academy of Arts and Science, Fellow of the Royal Society (UK Academy of Sciences), Indian National Science

Prof CR Rao

Academy, Lithuanian Academy of Sciences and Third World Academy of Sciences. In addition, he was made an Honorary Member of the International Statistical Institute, International Biometric Society, Royal Statistical Society (UK), Finnish Statistical Society, Portuguese Statistical Society, Institute of Combinatorics and Applications and Applications and World Innovation Foundation, and Honorary Life Fellow of King's College, Cambridge.

Prof Rao received numerous medals: Wilks Medal of the American Statistical Association, Army Wilks Medal, Guy Medal in Silver of the Royal Statistical Society, Megnadh Saha Medal, S Ramanujan Medal of the Indian National Science Academy, J C Bose Gold Medal of Bose Institute and Mahalanobis Centenary Gold Medal of the Indian Science Congress. In addition, Prof Rao was honoured by the President of the United States of America with the prestigious National Medal of Science with the citation, "for his pioneering contributions to the foundations of statistical theory and multivariate statistical methodology and their applications, enriching the physical, biological, mathematical, economic and engineering sciences".

On behalf of the South African Statistical Association (SASA), we congratulate Prof CR Rao on his achievement in receiving this prestigious prize.



UP signs MoU with University of Illinois, strengthening existing relationship for future collaboration

The University of Pretoria (UP) signed a Memorandum of Understanding (MoU) with the University of Illinois Urbana Champaign, formally consolidating an existing relationship established in 2006. This broad institutional agreement encompasses all aspects of collaborative research, student and staff exchange, and collaborative academic programmes.

Speaking at the partnership agreement signing ceremony in Champaign, Illinois, UP Vice-Chancellor and Principal Professor Tawana Kupe said: "We are extremely grateful for the relationship with the University of Illinois, which has blossomed and deepened over the past 17 years, through formal agreements, staff and student mobility, research collaborations, and, more recently, visits between the delegations from the two institutions, where synergies were explored and areas for collaboration identified."

"The signing of our institutional agreement for mutual engagement and benefit is thus an exciting new milestone for our partnership, and we look forward to working together on initiatives and activities that will aid towards the realisation of our shared goals," he said.

The University of Illinois Urbana-Champaign Chancellor Robert J. Jones expressed his mutual appreciation, saying that the two institutions are united in their vision. "The complex problems of our time cannot be tackled in isolation," said Chancellor Jones. "Now more than ever, we need collaborative partnerships to co-create innovative solutions to global challenges and foster an environment of exceptional teaching and learning for all students."

The University of Illinois was founded through a land grant in 1867, and is home to more than 50 000 students from all 50 states in the United States, and more than 100 countries worldwide. Rated the 13th best public university in the US (*U.S* *News & World Report's America's Best Colleges rankings, 2022-23)*, faculty members and alumni have received 24 Nobel prizes and 28 Pulitzer prizes together.

As the University of Pretoria moves towards its vision to be a leading researchintensive university in Africa, recognised internationally for its quality, relevance and impact locally and globally, the institution has created a framework of strategy partners across the world with the firm belief that knowledge knows no boundaries. The university is already making great strides in producing socially impactful research through its five transdisciplinary innovation platforms - the Future Africa Institute, Engineering 4.0, the Javett-UP Art Centre, Innovation Africa@UP and the Centre for the Future of Work.

According to the research performance assessment tool SciVal, UP and the University of Illinois have co-authored 81 publications between 2017 and 2023. The most prolific subject areas for collaboration are physics and astronomy, and earth and planetary sciences, together with agricultural and biological sciences. In June 2019, a group of students and researchers from the University of Illinois visited the UP Institute for Food, Nutrition and Well-Being (IFNuW), to connect communities of like-minded researchers. A group of engineering students from the University of Illinois also worked with UP students completing their community engagement module in 2016, with various service-related activities around Pretoria.

Professor Kupe, together with Professor Barend Erasmus, Dean, Natural and Agricultural Sciences Faculty; Professor Wynand Steyn, Dean, Engineering, Built Environment and Information Technology Faculty; Professor Margaret Chitiga-Mabuga, Dean, Economic and Management Sciences Faculty; Professor Christopher Isike, Director of the African Centre for the Study of the United States (ACSUS) and Dr Farai Kapfudzaruwa, Research and Strategic Partnerships Manager, Future Africa, were part of the delegation that visited the USA, where the signing of the MOU took place, along with faculty tours, meetings and hospitality provided by the University of Illinois.

"The complex problems of our time cannot be tackled in isolation."

MoU signed between UP and Czech University of Life Sciences Prague

During a recent visit of Prof Tersia Needham and Prof Francisco Ceacero to the University of Pretoria, a Memorandum of Understanding (MoU) was signed between the Czech University of Life Sciences Prague (CZU) (represented by the Rector, Prof Petr Sklenička) and the Faculty of Natural and Agricultural Sciences at UP (represented by the Dean, Prof Barend Erasmus). This MoU is the result of the expanding collaborative efforts between the Mammal Research Institute at UP and the Faculty of Tropical AgriSciences of CZU, which were initiated through the framework of an Erasmus + International Credit Mobility project. Since 2020, Prof André Ganswindt (Director of the Mammal Research Institute) and Prof Needham initiated the exchange of staff and students between the two institutions to support the transfer of knowledge, exchange of pedagogical experience and skills, development of intercultural competencies and enhancement of research activities, primarily in the field of Animal and Wildlife Sciences.

The two institutions look forward to intensifying and broadening future collaborative efforts under the framework of the new Memorandum of Understanding.



Front: Barend Erasmus and Prof Tersia Needham. **Back:** Prof André Ganswindt and Prof Francisco Ceacero.

Third MoU signed between UP and SAWS



Prof Barend Erasmus, Dean of the Faculty of Natural and Agricultural Sciences and Mr Ishaam Abader, CEO of the South African Weather Service, signed the MoU.

In 2022 the South African Weather Service (SAWS) and the University of Pretoria (UP) celebrated 50 years of working together.

This long and close collaboration between the two institutions was underlined with the signing of a third Memorandum of Understanding (MoU) in March of this year.

The Meteorology programme is housed in UP's Department of Geography, Geoinformatics and Meteorology at the University of Pretoria. The MoU promotes academic collaboration (training and research) and exchanging information in Atmospheric Science.

UP uses the expertise at SAWS to teach in the Honours programme, and several staff at SAWS are extraordinary appointments at the University of Pretoria, where they supervise MSc and PhD candidates. Mr Ishaam Abader, CEO of the South African Weather Service, attended the event and stressed the importance of the relationship between the two institutions in a world with a changing climate where the impact of severe weather is ever-increasing. Prof Barend Erasmus, Dean of the Faculty of Natural and Agricultural Sciences, stressed that future partnerships should seek broader collaboration in areas important to both institutions.

50 YEARS OF COLLABORATION (UP AND SAWS)

NAS boasts seven finalists in NSTF's 'Science Oscars'

Seven researchers of the Faculty of Natural and Agricultural Sciences (NAS) made it to the National Science and Technology Foundation (NSTF) 2022/23 Awards finals. They are Prof Brenda Wingfield, Prof Nigel Bennett, Prof Paxie Chirwa, Prof Patricia Forbes, Prof John Annandale, Dr Daniel Hart and Dr Els Vermeulen.

The NSTF Awards event, known as the 'Science Oscars' of South Africa, are the most comprehensive and sought-after national awards of their kind in the country and recognise outstanding contributions to science, engineering and technology (SET) as well as innovation by SET-related professionals and organisations. It is the flagship project of the National Science and Technology Forum (NSTF), in partnership with global mining company South32.

The theme for this year is Ocean Science for sustainable development. This theme was chosen in response to the United Nations (UN) proclamation



Prof Nigel C Bennett, Chair: Austin Roberts of Mammalogy and Professor: Zoology, Department of Zoology and Entomology – Lifetime Award

of the decadal theme of Ocean Science for Sustainable Development for 2021-2030.

NAS has two finalists in the Lifetime Award category and two finalists in the NSTF-Water Research Commission (WRC) Award, as well as finalists in the Management Award, Green Economy category, with an additional nomination in the Special Annual Theme category, and TW Kambule-NSTF Award: Emerging Researcher Award respectively. It is also the 25th anniversary of the NSTF Awards. This year's Silver Jubilee of the NSTF Awards will be celebrated simultaneously at the Awards Gala Dinners in Cape Town and Johannesburg on Thursday, 13 July 2023, by live broadcast via the NSTF YouTube channel.



Dr Els Vermeulen, Research Manager: Department of Zoology and Entomology, Mammal Research Institute Whale Unit – Green Economy category, with an additional nomination in the Special Annual Theme category



Prof Brenda D Wingfield, Chair: DSI/NRF SARChI in Fungal Genomics; and Professor in the Department of Biochemistry, Genetics and Microbiology, and the Forestry and Agricultural Biotechnology Institute – Lifetime Award



Prof Paxie W Chirwa, Chair and Director: Forest Postgraduate Programme – Management Award



Prof John Annandale, Group Leader: Mine Water Irrigation Research Group, Department of Plant and Soil Sciences – NSTF-Water Research Commission (WRC) Award



Prof Patricia Forbes, Professor and Rand Water Chair in the Department of Chemistry – NSTF-Water Research Commission (WRC) Award



Dr Daniel W Hart, Senior Research Fellow: Department of Zoology and Entomology – TW Kambule-NSTF Award: Emerging Researcher Award

PSANA Chair encourage young scientists to take a leap of faith

"I would encourage all postgraduate students to take the leap of faith and apply for that conference you would like to attend even if you are hesitant. After all, you miss 100% of the opportunities you don't take."

These sentiments were shared by Henrico Langeveld, PhD Biochemistry candidate in the Malaria Parasite Molecular Laboratory (M2PL) in the Department of Biochemistry, Genetics and Microbiology, after presenting for the first time at an international conference. Henrico is also the Chair of the Postgraduate Student Association of the Natural and Agricultural Sciences (PSANA).

He attended the Protein Kinases of Parasitic Protozoa V conference at the College of Medicine, University of Central Florida in the USA earlier this year and said, "As PhD student who is still only in the beginning stages of my PhD journey, when I was made aware of this conference I could not let this opportunity pass me by. I was initially hesitant because I was only at the start of the second year of my PhD and I thought I did not have enough data yet. But I took the leap and submitted my abstract. Then, to my amazement, I got an email informing me that my abstract, Exploring and probing the druggable kinome of *Plasmodium falciparum* parasites, was accepted for a presentation! I was over the moon."

"I was going to a different country to share my work with other leading international scientists was, for me, a young scientist, a life-long dream and a massive milestone. This was my first in-person international conference, and I cannot stress how much I learned on this trip. I can honestly say this experience and opportunity has made me grow as a scientist and young researcher," he explained.

"Some of the work I presented at the conference and what my PhD project is all about is striving towards understanding



the role and function of the kinome and specifically a family of Aurora-related kinases within asexual replication and sexual differentiation of *Plasmodium falciparum* parasites and could we translate these findings into potential therapeutic interventions to combat malaria."

"All in all, this was one of the best experiences I have had in my short scientific journey and would not have been possible if it was not for the help from my supervisor, Prof Lyn-Marié Birkholtz, who is just an inspiration," Henrico concluded.

Courtney Gehle selected as prestigious Schwarzman Scholar

Courtney Gehle, a UP alumna who graduated with a BSc in Geography in 2016, was recently selected as a Schwarzman Scholar, one of the most prestigious postgraduate fellowships in the world. She is only the fifth South African, the second from UP, and the only one of the 2023/2024 cohort selected from over 3 000 applicants.

"Being selected as a Schwarzman Scholar and studying towards a master's degree at Tsinghua University in China will grant me the opportunity to marry two important fields of knowledge – environmental science and global affairs, to be a more impactful development professional," an elated Courtney said when sharing the news.

Quoting from the Schwarzman Scholars website, scholars are selected for demonstrated excellence in leadership, character, integrity, academics, intercultural competency and entrepreneurial spirit. "Looking back, these qualities were either instilled or developed through my time at UP. In addition, I received exceptional support from the Faculty of Natural and Agricultural Sciences (NAS) while studying here. NAS even supported my participation in the Paris Climate negotiations in 2015."

Courtney explained that she gained an essential set of skills that allowed her to understand and engage with global challenges through the lens of the physical and social sciences. Combining this knowledge with an understanding of politics, economics and international relations that I will receive through a master's in Global Affairs, as well as with the leadership skills that are a central tenant of the Schwarzman Scholarship programme, will allow me to be more effective in playing my part to solve global development challenges.

She is also Co-founder of The Better Tomorrow Movement – an award-winning organisation providing free interactive training programmes that help young people create, execute and scale social impact projects. Courtney also found The Greenline, a youthled environmental organisation, has worked with over 600 volunteers to raise awareness and act on environmental issues. "Though I am no longer involved, both organisations continue to serve young people."

"I am completing a Master's in International Development in Ireland as a recipient of the Government of Ireland International Education Scholarship, and serve as the Chairperson of the Board of Brightest Young Minds (BYM). It is a registered NPC in South Africa that



works to connect young leaders and facilitate developing skills and designing solutions that positively impact Africa. Before this, I served as a Manager at Global Changemakers and as a short-term consultant at the United Nations Industrial Development Organisation.

For her work, Courtney has been recognised by organisations such as the European Commission, UNESCO and the U.S. State Department. As a result, she concluded "that the research I aim to undertake would focus on developing a programme that will provide grants and investment for youth-led sustainable development initiatives across Africa."



Enhanced Access and Successful Student Learning

NAS proudly hosted two inaugural addresses

Prof Emma Archer and Prof Michael Somers delivered their inaugural addresses during the first few months of 2023. We are very proud of them, as this is a significant achievement in a researcher's career.

Prof Emma Archer is a Professor in the Department of Geography, Geoinformatics and Meteorology. Her inaugural address was an in-person event on 23 March in the Sanlam Auditorium. The title of her address was *Climate change, managed ecosystems and biodiversity*.

The inaugural address of Prof J Michael Somers, Professor in the Department of Zoology and Entomology, and Eugene Marais Chair of Wildlife Management in the Mammal Research Institute, was a hybrid event in the Plant Sciences Auditorium on 3 April. The title of his address was: *Large carnivore management in Southern Africa: Challenges and Opportunities*.

Click here for the virtual recording of the event.



Prof Paulette Bloomer (Deputy Dean: Teaching and Learning), Prof Emma Archer, Prof Loretta Feris (Vice-Principal: Academic) and Prof Serena Coetzee (Head: Department of Geography, Geoinformatics and Meteorology).



Prof Chris Weldon (Acting Head: Department of Zoology and Entomology), Prof Sunil Maharaj (Vice-Principal: Research and Postgraduate Studies), Prof Michael Somers and Prof Barend Erasmus (Dean: Faculty of Natural and Agricultural Sciences).



Autumn Graduation 2023

1323 TOTAL AUTUMN GRADUATES

789 UNDERGRADUATE DEGREES

534 POSTGRADUATE DEGREES

298 HONOURS DEGREES

169 MASTER'S DEGREES

> 67 PhDs

Biochemistry MSc graduate scores academic hat-trick with third *cum laude* degree in a row

Vusi Chiloane pulled off a rare academic hat-trick when he completed his third University of Pretoria (UP) degree in a row cum laude (with honour). What makes his feat even more impressive is that while studying he was also managing a hereditary condition which was causing his eyesight to deteriorate.

Chiloane, an organic chemistry scientist at the National Metrology Institute of South Africa (NMISA), received his *cum laude* master's degree in biochemistry during the recent UP autumn graduation season. He had previously received his BSc and honours degree in the same discipline from UP. And to top it all off, at his graduation on 9 May Chiloane also received the Labotec Prize awarded to the student who obtains the highest mark for their MSc dissertation in biochemistry.

"Science is an incredibly powerful tool with far-reaching applications in all facets of life," he said after his recent graduation. "Yet I only occupy a small fraction of the vast scientific discipline. My occupation in organic chemistry has shown me how science is indispensable for proper functioning and maintaining a thriving global food economy, as it informs food safety, nutrition, and regulations."

Chiloane is no stranger to awards: he received SRC academic colours in 2019, the Lasec Biochemistry Prize as the best final-year student in biochemistry in 2018, and a Golden Key award – for which the top 15% of university students and graduates around the world are eligible – in 2016.

He has tried to never let anything deter him from reaching his goals. He was born with a hereditary condition which predisposed him to a gradually thinning and irregular cornea, which affects how light enters his eyes and ultimately damaged his vision. "Since this is a progressive condition, it became a significant issue with age. I was advised that my eyesight was deteriorating and would likely require a corneal transplant unless attended to almost immediately. Fortunately, my vision was still relatively acceptable throughout my degree, with assistance from prescription glasses. With the help of my honours and later MSc supervisor, Dr Precious Motshwene of the Department of Biochemistry, Genetics and Microbiology, I had an ophthalmologic procedure to curb the disease progression."

Chiloane thanked the lecturers who helped him at every step of his academic and health journeys. "Dr Motshwene's scholarly counsel was invaluable in seeing the completion of my degree. His strict adherence to the scientific method and ensuring the research follows a clearly defined, logical path at such a junior level moulded my approach towards research, and continues to guide my career in science. His supervision is not only limited to academia but goes the extra step to ensure his students are not facing external, strenuous circumstances that may negatively impact their academic performance." He also thanked cosupervisor Désirée Prevoo-Franzsen for her support.

Dr Motshwene praised his student, emphasising Chiloane's commitment and passion for excelling in science and life. "Vusi is humble and works hard. There is no task that is too big for him. He could grasp complex scientific topics in a relatively short space of time, which was a demonstration of his intellectual capacity. He listened when corrected, and accepted feedback positively," Dr Motshwene said.

Chiloane's MSc project focused on developing analytical methods to determine physicochemical chemical properties (moisture and particle size distribution), proteins, and amino acids in cassava, maize, sorghum, teff grain, and corn-soya. "These staple foods are important sources of energy and nutrition in the developing world, because they are easily accessible. Furthermore, they are relatively less restrictive to produce compared to animal sources of food, thus serving as an essential source of income. This highlights the importance of investigating the nutritional offering of staple foods and properties that would improve their marketability and profitability."

He said there were many reasons why he chose UP as his academic home, but one stood out: "I believe the University of Pretoria to be an objectively superior academic institution, which would encourage me to perform at my level best to match the high standards set by the University. Looking at my academic



transcript thus far, I would say UP has met my expectations."

Chiloane, who was born and raised in rural Mpumalanga, said his upbringing was often punctuated with challenges one would expect growing up in a rural environment. "However, my mother always ensured we were provided with the little available. She strongly advocates for education, and would make difficult sacrifices to see us through school. Her efforts and continued support enabled my sibling and I to earn a tertiary education."

He concluded by recommending the University of Pretoria to prospective students as a top academic and research institution. "The University offers a holistic learning experience combining theoretical and practical components to produce well-rounded and capable students. It affords students the necessary resources to succeed in their chosen degrees. I began my studies without a laptop but managed to study for my exams and complete my assignments on time because computer labs, internet access, and library material were easily accessible."

He also cited UP's Ready for Work programme, which introduces students to a formal work environment, thus equipping them with the necessary skills to thrive in a real work environment after completing their qualification. "The University is also equipped with highly skilled personnel who offer valuable academic support and guidance that has resulted in the success of many. UP's rewarding environment recognises talent, athleticism, and academic excellence through awards and prizes, which greatly motivate student performance."

Actuarial students shine in BetterSure BetterIdeas Battle

Last year, BetterSure Financial Consultants launched the BetterIdeas Battle, a competition challenging University of Pretoria (UP)'s actuarial science students to use their science and technology skills – and tenacity – to develop BIG ideas capable of helping insurance businesses operate better. Their ideas could address challenges in risk management, underwriting, pricing, client service, product development, and more.

After some fierce competition, the judging panel, which included Professor Conrad Beyers (Head of UP's Department of Actuarial Science) and lecturer Regard Budler, awarded first place and the R20 000 prize to Luca du Plessis, with the runner-up spot (and the R10 000 prize) being shared by Hannaa Hoosen and Nelis Daniels.

Luca du Plessis wowed the judges with his POP Insure concept, a short-term, on-demand insurance option designed to offer anyone unable to afford comprehensive insurance the option of buying insurance for anything from 30 minutes to 24 hours. The judges saw huge value in this idea, which would allow clients to purchase cover via an app for those moments when they feel most at risk – for example, carrying a laptop or other valuables to their car after a late lecture or work day. The idea also extended to medical aid, with the idea being that clients could buy cover for a specified period – for example, if they had a child going away on a school camp where they might be at greater risk of injury.

Joint runner-up Hannaa Hoosen proposed that BetterSure allow clients to finance solar panels through increased premiums over five or ten years. The judging panel loved how the idea tackled the ongoing issue of load shedding and how it addressed some of the associated insurance issues, including security, spoilt fridge and freezer items, etc.

And finally, Nelis Daniels took on the issue of drivers under 25 who typically pay more for their car insurance due to the 'accident hump'. His big idea included fitting a tracker to the vehicles of drivers within this group to monitor their driving habits over time and ultimately identify safe drivers who would enjoy lower premiums. Again, the judges were impressed by the creative thinking that went into the idea and the customer loyalty it would encourage among younger clients.



Mr Andrew Kruger (Head of Data Analytics: BetterSure), Luca du Plessis, Nelis Daniels (on screen), Ms Chantal Schoonderwoerd (Head of Product Development: BetterSure) and Hannaa Hoosen.

Congratulations to all three winners for showing such incredible innovation – the insurance industry's future looks bright indeed!

Dr Christine Mundy honoured for contribution to chemistry education

University of Pretoria (UP) chemistry lecturer and earlycareer researcher Dr Christine Mundy was recently awarded the South African Chemical Institute's 2022 medal for Chemical Education for her contribution as a researcher in the field.

"Receiving this award means more visibility for me as an academic," says Dr Mundy, a lecturer for the Bachelor of Science Extended Curriculum Programmes at UP's Mamelodi Campus.

"It also serves as recognition of the quality of research we produce as the Department of Chemistry at UP. This medal motivated me to consider going for a National Research Foundation rating within the next year. It has also made me confident as a supervisor – I am more assured that I am producing quality research, which also reassures my students."

She completed her doctoral studies in tertiary chemical education research at the

University. Her research seeks to make chemistry meaningful for students who are at beginner level. As such, she has introduced innovative teaching methods to inspire meaningful cognitive and affective learning in the chemistry module.

"In my teaching, I am enthusiastic and compassionate," she says. "My main goal is to meet the students where they are before taking them on a journey of becoming informed citizens and ethical scientists. These extended programmes require excellence. To get the most out of students and unlock learning that was previously out of their reach, you have to go the extra mile as a lecturer."

Dr Mundy has also refined a low-cost spectroscope, a device that students can use to visualise the emission of light. In her research thesis – titled 'Addressing barriers to understanding emissions spectroscopy on novice chemistry students' – she used cognitive load theory and cutting-edge, design-based research to understand how processing occurs in the minds of learners.



She is acutely aware of her position as a woman making an impact in science and encourages women and girls to explore the field and all the opportunities it offers. "You do not have to be predefined," she says. "You can let yourself grow at university level."

In light of the International Day for Women and Girls in Science, observed annually on 11 February, Dr Mundy has the following to say: "More women must enter into science and engineering spaces. This is because women have a different perspective than men – having women's voices in science and engineering will take the industries further and make them more advanced. While it will be a difficult transition, it is definitely needed."

Meet our NAS Faculty Student Advisors

Meet the undergraduate and postgraduate faculty advisors as well as the peer advisors in the Faculty.

They can assist you with important matters ranging from academic support, study methods, stress management and goal setting and motivation. They are also trained to help students with test and exam preparation, career exploration, vocational guidance, time management and many other (sometimes challenging) facets of student life.

UNDERGRADUATE STUDENT ADVISORS



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#TuksFootball: Ncamisile Shongwe is committed to making a difference on and off the field

Plants and football are the two things Ncamisile Shongwe is genuinely passionate about.

Whether the PhD Horticulture Science student at Tuks is dirtying her hands in the soil or playing with her heart out against opponents does not matter. Her goal remains the same. She wants to make a difference, and she is succeeding.

Shongwe does not think twice about putting her body on the line while trying to defend or disrupt her opponents. It boils down to her being continuously amid the action and going down hard quite often.

Taking knocks for Tuks does not faze her. All that matters is that her team should win. Shongwe has been playing football since age five and has no plans to stop in the foreseeable future.

"Football is, to me, a counterbalance to studying. Most days, I am utterly focused on

my studies. So after a hectic day getting an opportunity to play football is escapism. When I am on the field, I revive my 'batteries'.

"Football has also helped me to gain confidence as a person. I don't want to use the word introvert, but I am not getting away from the fact that playing football made me more confident about interacting with others. One of the most rewarding things about football is the people you meet. I am fascinated by different languages and cultures."

2023 is a big year for the TuksFootball women's team. Last year, they qualified to play in the Hollywoodbets Super League. However, despite a tough start to the new season, Shongwe is not despairing.

"At times, we did play good football. We only need to be more patient because we are a young team. After five or six games, we will start to hold our own against the best. I can promise we will not be relegated at the end of the season. Our goal is to be one of the top eight teams."



Shongwe can't help but get excited when she explains why she decided to do her doctorate in horticulture.

"Horticulture plays a significant role in generating the agricultural gross domestic product. I want to be responsible for increasing yield and improving plant products' vigour, size and taste. My studies are primarily focused on fruit trees. I chose to do so because of the trees' longevity. If managed properly, you can harvest crops for years to come."

#TuksSwimming: Erin Gallagher's passion is environmental preservation and winning medals



Being fast is essential to Erin Gallagher; it is what motivates her to swim for hours most days, but there is more to the Tuks student-athlete than trying to become a champion at all times.

The 24-year-old is studying BSc Geography and Environmental Science student in the Faculty of Natural and Agricultural Sciences. "The world's population is expected to increase by nearly two billion persons in the next 30 years. A direct consequence is ecological degradation and a higher risk of natural disasters," explains the 2022 Commonwealth Games medallist. "I hope through my studies to make a difference. Currently, I plan to work as an urban planner. My role would be to ensure there are no dire consequences to the environment during an urban development project. But I tend to change my mind quickly. I might even go into disaster management when I finish studying."

Gallagher still has some dreams to fulfil before she becomes a full-time working woman. Her immediate goal is to qualify to represent South Africa at the 20th FINA World Championships in Japan in July.

During the recent Grand Prix Meeting in Durban, she swam B-qualifying times in the 50m-butterfly (26.87s), the 100m-butterfly (59.59s) and the 100m-freestyle (55.97s).

"Obviously, I would have liked to swim A-qualifying times, but considering that I have not tapered at all, I am happy with my times. There are still a few hard blocks of training I got to get through before the national championships. I plan to peak at the national championships in April. I certainly need to work on becoming stronger in the water. From a technical perspective, my kick could be better. There is a whole list of small things we are currently working on."

The Tuks swimmer will aim to defend her SA 50m- and 100m-butterfly titles. She might even medal in the 100 or 200-metre freestyle events on a good day. Gallagher is unsure

how many medals she has won at the SA Senior Champs but guesses it could be as many as 15.

So which does she prefer, butterfly or freestyle?"

"It is difficult to answer. It always used to be freestyle, but somehow, the butterfly came into the mix. Of course, my focus is mainly on improving my times in the butterfly events. But I have found that training for the butterfly also strengthens you in the freestyle."

"75 metres," Gallagher answers when asked what she considers her best distance. "If only there could have been 75-metre events in swimming. I could have 'cleaned up'," the 2022 Tuks Sportswoman of the Year jokes.

On a more serious note, she added that 100 metres suited her best. "Two lengths are more than enough for me, although; I will swim the 200m freestyle at the national championships. It is a fun event for me. There are quite a few good swimmers. So it is never a done deal as to who will win."

Gallagher considers the 100m-freestyle as one of the most brutal events. "Often twenty minutes after I swam the 100m-freestyle, my body still produces lactic acid.

RETHINK@NAS committed to transformation

At the University of Pretoria (UP), we stand for diversity, equality and inclusion. Accordingly, the Faculty of Natural and Agricultural Sciences (NAS) unequivocally supports the different activities of the UP Transformation Office, which is, among others, to protect students and staff against discrimination, Gender-Based Violence (GBV) and other related issues.

By now, most of you are aware of the Faculty's transformation initiative, aptly called **RETHINK@NAS**. This initiative is a holistic approach to transformation in NAS. It reminds all staff and students to stop and assess their actions and words, the potential effect on others, perceptions, and norms that impede change in NAS.

We want to remind you about the UP resources available to staff and students.

RETHINK@NAS Contact persons:

Ms Jessika Samuels (Research Manager – NAS Faculty Chairperson to the UP Institutional Transformation Committee) Email: jessika.samuels@up.ac.za Telephone: 012 420 5678

Prof Barend Erasmus (Dean – Chairperson RETHINK@NAS and member of the UP Institutional Transformation Committee) Email: <u>barend.erasmus@up.ac.za</u> Telephone: 012 420 4235

#SpeakOutUP Programme

#SpeakOutUP is the advocacy programme of the University of Pretoria's Transformation Office. Through #SpeakOutUP, the Transformation Office coordinates initiatives and activities to address discrimination on prohibited grounds, Sexual and Gender-Based Violence and all forms of sexual harassment. This work is guided by the University's Anti-Discrimination Policy (ADP), which the Transformation Office is responsible for its implementation and associated protocols. It draws attention to other policies that speak to the abovementioned focus areas.

#SpeakOutUP has a cohort of student volunteers who play a critical role in the socialisation of the ADP amongst the student population across all UP campuses and residences and in ensuring that campaigns and programmes extend to UP-accredited residences which house the university's day students. Beyond the work related to the ADP, #SpeakOutUP student volunteers run initiatives that help spotlight student issues and concerns relating to transformation within the university.

Visit <u>https://www.up.ac.za/speakoutup</u> for more information and help concerning sexual harassment and Gender-Based Violence (GBV).

To report or seek help, contact the Transformation Office

Email: transformationoffice@up.ac.za WhatsApp: 012 420 8404 UP Careline: 0800 747 747 UP Crisis line: 0800 006 428 SMS 'UP' to 31393

Watch the video to find out where the UP Transformation Office is located.

Students and staff can access psychological support through the UP Careline

UP Careline: 0800 747 747

Watch the #SpeakOutUP video

#SpeakOutUP





Prof Sheryl Hendriks off to University of Greenwich in UK

The Department of Agricultural Economics, Extension and Rural Development says goodbye to its former (2018– 2022) Head of Department, Prof Sheryl Hendriks. She has taken up the role of Director of the Natural Resources Institute at the University of Greenwich in the United Kingdom.

Prof Hendriks' research focused on food security and nutrition policy analysis and monitoring and evaluation of food security at the household, national and global information system levels. She also teaches food security policy analysis and monitoring and evaluation.

She was actively engaged in high-level global food security policy think tanks and panels and was influential in food security and nutrition policy circles in Africa. Some of these engagements include serving two terms on the UN Committee on World Food Security's High-Level Panel of Experts on Food Security and Nutrition and as a current member of the Montpellier Malabo Panel. In addition, she led the food security component of the African Union/NEPAD Comprehensive Africa Agriculture Development Programme from 2007 to 2010.

Sheryl is a transdisciplinary specialist, leading, facilitating and coordinating large research teams focused on solving complex food security and nutritionrelated problems. During her tenure at the University of Pretoria (UP), she led the UP Institute for Food, Nutrition and Well-being, bringing research together from over 35 academic disciplines at the University. Prof Hendriks had significantly contributed to capacity building for African food security, having trained, mentored and supervised graduates and professionals from various African countries. She is very passionate about helping young researchers to follow her footprint. Prof Hendriks established an extensive network for her graduates by creating different platforms to share experiences among themselves and other experts in the field. As a result, many of her graduates occupy leading positions in international development agencies, continental bodies, national governments and NGOs.

Many students have expressed their gratitude for her guidance and mentorship over the years. Mwansa Mwansa, one of Prof Hendriks' students, says, "Professor Hendriks was passionate about producing well-equipped and highly knowledgeable students about food systems. She always spoke openly about how she wanted to empower us to become impactful food systems researchers on the African continent. Her teaching and supervising style demonstrated this, where she created opportunities for us to network with industry experts and among ourselves. One thing I loved about her was how she connected all the students she supervised like a family. We all interacted on a WhatsApp group and met every Friday to discuss topical issues around global food systems and our research. One occasion that stood out was when she invited us to host a side event for the 2022 World Day Celebration hosted by the FAO Science and Innovation Forum. As a collective, we organised a virtual panel discussion where we invited experts leading UN SDG hubs at their various institutions and Maximo Terrero (chief economist at FAO) to contribute to the event. Overall, the opportunities she created for us to get involved in food systems served as a springboard for me to develop a strong passion for a career in this sector. We are eternally grateful for the doors Professor Hendriks opened for us and hope she will continue to impact African food systems through us."



Prof Hendriks will be remembered for leading the Department during the COVID-19 pandemic of 2020-2022. The Department wishes her all the best in her new role at the University of Greenwich, United Kingdom. "Go well, Shery!".

Dr Selma Karuaihe has been the Acting Head of the Department of Agricultural Economics, Extension and Rural Development (DAEERD) since Prof Hendriks left, and the term will end on 30 June. Dr Karuaihe, who has been a part of the Department since 2016, is a Senior Lecturer in the Department, and her area of focus is environmental and resource economics, where she works under the Centre for Environmental Economics and Policy in Africa (CEEPA)

Dr Karuaihe was the President of AFAERE from 2021 to 2022 and is now a member of the Council as Past President until 2024. She is a member of the World Council of Environmental and Resource Economists Associations (WCEREA). She is responsible for coordinating the World Congress for Environmental and Resource Economists (WCERE) in 2024. She is a former Associate Coordinator of the South African SDG Hub.

UP Stable Isotope Laboratory to receive upgrade soon

We are pleased to announce some exciting news regarding the UP Stable Isotope Laboratory (UPSTIL). We are getting a fantastic renovation/ upgrade, and we will also be expanding our repertoire of stable isotope analyses. More details will be available once all our equipment has been re-commissioned and tested. The planning stage is almost complete, and the actual work in the laboratory should begin soon.

Unfortunately, the renovations mean that the laboratory cannot provide stable isotope analyses or any training. We are still determining how long the actual work will take at this stage, but we will likely be back in action later this year. The UPSTIL Manager, Dr Grant Hall, will provide an update on when this will take place and give everyone interested details as to what the new and improved UP Stable Isotope Laboratory will offer. Our apologies for not being able to assist with any analyses for the next few months.

Dr Hall (grant.hall@up.ac.za) will be able to assist with any queries/ questions relating to new projects and services.



of QQR (5-year) report

NAS embraces findings

The Faculty of Natural and Agricultural Sciences (NAS) completed an extensive and time-consuming Quinquennial Quality Review (QQR) in 2022. This was the first time in the Faculty's history.

The Review panel recently shared their findings with the Faculty, and several issues have been raised by the Panel that can and will be dealt with internally by the Faculty. Those have been detailed in the improvement plan. Additionally, several recommendations have been made for the Faculty to implement in collaboration with UP support departments.

The Faculty found the review panel process very helpful and are grateful for the time and interest they took in the Faculty. In addition, it is gratifying to see the alignment between the QQR recommendations and issues already prioritised in the NAS 2023 plan. This response plan was developed by soliciting input from individual departments, where they matched their plans with the QQR. The final set of actions was then consolidation of departmental and faculty-level inputs.

The Faculty is serious about the quality of its research, teaching and professional services and will work with relevant professional services and fellow faculties to achieve the impact envisaged.



Social Responsiveness and Societal Impact



PSANA provides a platform for postgraduate students

The Postgraduate Student Association of the Natural and Agricultural Sciences (PSANA) is a student-driven committee that promotes young researchers by providing a platform where postgraduate students can interact in the different disciplines in the Faculty of Natural and Agricultural Sciences (NAS). PSANA also assist postgraduate students with obstacles they might face, and in doing so, hope to help with collaborative efforts aiding in future research.

Moving forward, we at PSANA are excited to launch a newsletter aimed at our postgraduate students highlighting all the achievements and publications of our students, popular science articles written by our postgrads, bursary opportunities and all information you need to make your postgraduate studies successful. In addition, we encourage our students to send us awesome photos (to be featured on our social media) and all other exciting aspects of their work. We can't wait to hear from you! Furthermore, our Outreach Teams have identified beautiful areas in which PSANA can give back to the community, and we are excited to share these opportunities with those in our Faculty. Faculty members are welcome to join us in giving back to those in need.

We encourage our postgraduate students to contact their representatives should they face any issues, need information, or want to participate in any of the PSANA activities.

PSANA gets social

On 26 April, PSANA hosted a social event for postgraduate students in the Faculty of Natural and Agricultural Sciences (NAS). Students were invited to enjoy a cup of tea or coffee with us. Students from seven departments in the Faculty joined us, and we had a fantastic time getting to know all of you! We plan to host more social events moving forward and encourage students to join the fun.



MEET THE PSANA MEMBERS:



Henrico Langeveld (Chair of PSANA) PhD (Biochemistry - Malaria Parasite Molecular Laboratory (M2PL) research group)



Ayla Malan (*Deputy Chair*) PhD (Microbiology - Lyssavirus Research Laboratory)



Liezel Oberholzer MSc (Actuarial Science)



Tilana Marais MScAgric (Food Science)



Dené Visser MSc (Zoology)



Sirisha Bhawanideen (MSc Microbiology - Lyssavirus Research Laboratory)



Prisca Atieno PhD (Agricultural Economics)



Christopher Ruiters MSc (Geography, Geoinformatics, and Meteorology)



Merishka Archary MSc (Genetics)



Hannah Chloe Gross MScAgric (Animal Nutrition)



Martha Muruya MSc (Biochemistry - Malaria Parasite Molecular Laboratory (M2PL) research group)



Misha Malherbe PhD (Environmental Management)



Shae Swanepoel PhD (Genetics)



Sensory Science shapes the food we eat and the products we use on our hair

When was the last time you paid attention to the textural changes of your hair before, during or after applying products? Recently, a lunch with the theme 'Sensory Science meets hair' was hosted to celebrate the research done by the trained food and hair product evaluators of the Department of Consumer and Food Sciences.

The lunch was prepared by third-year Consumer Science (Hospitality Management) students. The food and decor were exquisite, highlighting visual, flavour and textural contrasts. The menu was designed to reflect the stages of hair preparation. The starter, a dark black risotto starter, was plated in a 'messy' fashion to represent hair when you wake up in the morning. This was followed by an organised, orange and red visual-feast main course of oxtail with carrot mash, an apricot crumb, green beans and beetroot crisps designed to represent getting ready for the new day. The highlight was the 'styled to perfection' hair-inspired dessert of lemon meringue ice cream with orange syrup cake, walnut meringue crumb and spun sugar, a true feast for the eyes and the palate.

But why sensory evaluation of hair products? The evaluators' comments clearly explain why research on the sensory properties of hair products is critical.

'My hair represents my natural beauty, my mood, a new day and being African'.

'When I care for my hair, I feel confident and love myself more.'

'I see my hair as part of my body (skin, organs), health etc.

'My hair represents my cultural background.'

'It represents my ethnicity and where I'm from. It tells a story about a girl who learned to love herself and her hair in its natural state.'

'My hair represents confidence, beauty, femininity, progress and journey.'

'My hair is my baby. I love taking care of it.'

'My hair represents growth and pride.'

'It's an extension of my identity, love and patience.'

'My hair is my biggest problem in life. But also my identity.

'Nothing makes me feel more like a Tswana girl like my big afro. Somehow my confidence is also tied to how my hair looks, so my hair is my confidence.' Hair is indeed a 'loaded subject'. It has different meanings to different individuals. For some, hair is an extension of identity, igniting a sense of beauty felt within, and to others, it is freedom of expression - painting a picture of the story and the storyteller. Sensory evaluation research at the University of Pretoria is integral to this process. The interaction of our senses (sight, smell, taste, touch, and hearing) with food and other products forms part of who we are. Our senses help us navigate daily life, connecting our internal and external worlds, whether it's noticing the taste or smell of food or the feel of the shirt we wear. UP has a dedicated team of students trained to describe and measure food products' aroma, feel and taste in a made-for-thepurpose sensory laboratory. We also have trained hair product evaluators who apply hair care products following specific gestures and evaluate the products' numerous attributes and effects on hair. This is a parttime employment opportunity for two and four hours per week.

If you want to know more or are interested in becoming a sensory evaluator, please get in touch with Josephine Baloyi at tukssensory@gmail.com











NAS Postgraduate students bring joy to children over Easter

The Postgraduate Student Association for the Natural and Agricultural Sciences (PSANA), in collaboration with the postgraduate student committee of the Department of Biochemistry, Genetics and Microbiology, recently partnered with TUKS Friends of *MSF to support their Easter Toys and Book Drive for the Paediatrics Ward and Hospital School at Steve Biko Academic Hospital.

They handed the donations to children and their mothers who spent Easter weekend in the hospital.

There was a slight change in the distribution of the toys. Due to

concerns around infection control, no pre-loved toys could be handed over to children on the ward. Instead, 40 new toys were distributed to different ages, ranging from babies to children of eight years and older, in the Paediatric Ward. Another ten new toys were handed over to children in the Oncology Ward.

All the books were sanitised and donated to the Paediatric Ward library. Each child, except diabetic children, was given a set of two Easter eggs. The parents and nurses also received Easter eggs with a short message of encouragement and gratitude. Some pre-loved toys were handed over to the doctor's clinics for their outpatients, and the remainder was donated to an orphanage in Soshanguve.

Volunteers spent the day engaging and entertaining the children with some of the donated finger puppets, board games, puzzles and storybooks. Creating this little pocket of joy for children and mothers going through a difficult Easter season was a privilege.



We want to extend our sincerest gratitude for all the generous donations. This would not have been possible without you!

*MSF is a global network of principled medical and other professionals who respond to disasters and emergencies.

"Speed date a Champion" at Sci-Enza

Ready, Set, Date! These were the instructions given to learners in grades seven to nine for a "Speed date a Champion" session hosted by Sci-Enza in their Science of Champions Holiday programme during the Easter school holidays.

Since the holiday programme was themed the *Science of Champions*, it was only fitting that we had actual Champions join the programme to interact with the learners.

We had the honour of hosting Pieter Reyneke, a Gauteng Chess Champion with springbok colours, Khaya Zondo professional cricketer who plays for the Dolphins Cricket team from KZN and the South African national cricket team, the Proteas and lastly, Armand van der Colf an Esports champion with National colours in ESports.

During the session, learners had an opportunity to converse with our three Champions to learn about them, their respective sports, the science, their experience and all the work behind the scenes to make them Champions.

This was only one of many sessions we ran while hosting the *Science of Champions holiday programme*. Learners from grade R to grade 9 participated in the programme across two weeks to gain insight into different sports and the science behind them through multiple engaging workshops.

Learners also had the opportunity to meet and interact with sports scientists such as Dietitian Lizanne Meyer from Sport, Exercise Medicine and Lifestyle Institute (SEMLI) and Neurophysiologists Prof Peet du Toit from the Physiology department. The programme also included coaches from Fitness Willow Way for a fitness session and Cora Mak from TuksChess for a Chess session.

These interactions with real-life scientists and champions aid in exposing learners to different potential career paths in science and sports.

We look forward to hosting our next holiday programme in the winter school holidays, with lots of fun, learning and relevance to the learners.









Final goodbye to Prof Sue Nicolson

The South African scientific community lost an influential biologist of rare quality with the death of Professor Sue Nicolson, former Head of the Department of Zoology and Entomology at the University of Pretoria (UP), on 27 April 2023.

Sue was born in 1950 in Dargaville, New Zealand and completed a BSc (Hons) degree in Zoology at the University of Auckland with distinction. She proceeded to the University of Cambridge where, as one of the first women to be admitted to King's College, she completed a PhD in Insect Physiology. Her doctoral research focused on comparative aspects of osmoregulation in insects, a field of study in which she developed an international reputation culminating in a review article in 1993 on the ionic basis of fluid secretion in insect Malpighian tubules. After moving to Cape Town with her South African husband, John Sharp, her expertise and experimental skill led to her undertaking, a series of studies on Namib Desert beetles that provided novel insights into the physiological mechanisms that permit some insects to persist in even the most inhospitable environments on the planet.

Sue's interest in osmoregulation resulted in her exploring how nectar-feeding carpenter bees deal with excess water in their food and conserve ions. This led to her focusing most of her subsequent research on nectar-producing plants and the insects, birds and small mammals that forage on this nectar. She adopted an integrative approach, complementing studies of nectar composition and production among plants with investigations of the digestive physiology and nutritional ecology of sunbirds and other avian pollinators. Indeed, her work has yielded fundamental insights into the interactions between flowering plants and their diverse pollinators.

In the latter part of her, she focused almost exclusively on the study of nectar and the bees and sunbirds that use nectar as a primary source of food and how foraging bees remove most of the water from nectar droplets at the flower and in flight, thereby reducing flight energy costs for individual bees as well as for the colony.

Apart from regular funding from the National Research Foundation of South Africa, she received funding from the Insect Pollinator Initiative of the BBSRC



of the UK from 2011-2014 and was a collaborator of the BBSRC, UK study of the macronutrient regulation of adult worker honeybees from 2017-2019. She was on the National Steering Committee for the Global Pollinator Project South Africa from 2009-2014. She annually received the Exceptional Achiever award from UP for the years 2003-2016.

She was the author of some 185 scientific publications that established her as an internationally recognised research scientist (NRF B1 rating, H-index 48). She and her co-author Steven Chown wrote Insect Physiological Ecology: Mechanism and Patterns (Oxford University Press), rated as one of the top 10 academic titles for 2005. The work reflected the depth of their insights into Physiological Ecology and their comprehensive grasp of the field. The strong interest and the expansion of knowledge in pollination biology prompted the book Nectaries and Nectar, which she co-edited with Massimo Nepi and Ettore Pacini.

Both at UCT and UP, she made significant contributions to the teaching of undergraduate students and the mentoring of postgraduate students and postdoctoral fellows. In the case of her doctoral candidates and postdoctoral fellows, she published extensively in collaboration with them, and they serve as a legacy of her enlightening influence. In addition, she maintained her research initiatives and teaching responsibilities while contributing to the administration of the Department of Zoology and Entomology as departmental head from 2003-2011. The period of her tenure was one during which the department was the most researchintensive department in the University and served as a role model for research and teaching excellence.

She was a fellow of the Royal Society of South Africa, the Royal Entomological Society, and the Cambridge Philosophical Society. She received the Gold Medal of the Zoological Society of Southern Africa and the Chancellor's Award for Research from the University of Pretoria in 2013.

She was a warm, engaging and challenging colleague who will be sorely missed in the Department of Zoology and Entomology and at the Centre for the Advancement of Scholarship, where she was a senior research fellow. In her spare time, Sue was a gifted artist who produced many paintings drawing on her experience of New Zealand and South African landscapes.

Sue is survived by her husband, her children and grandchild.

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