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UESM Newsletter

Spring Edition 2022

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ENVIRA

Interactive Buttons

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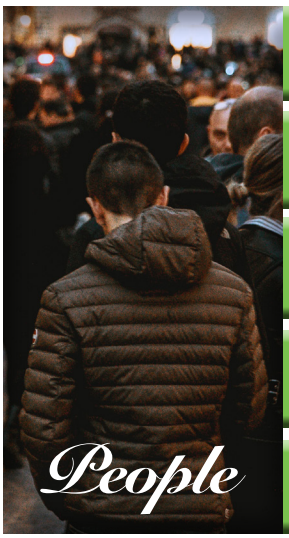
Ethics

Accolades

Calliper



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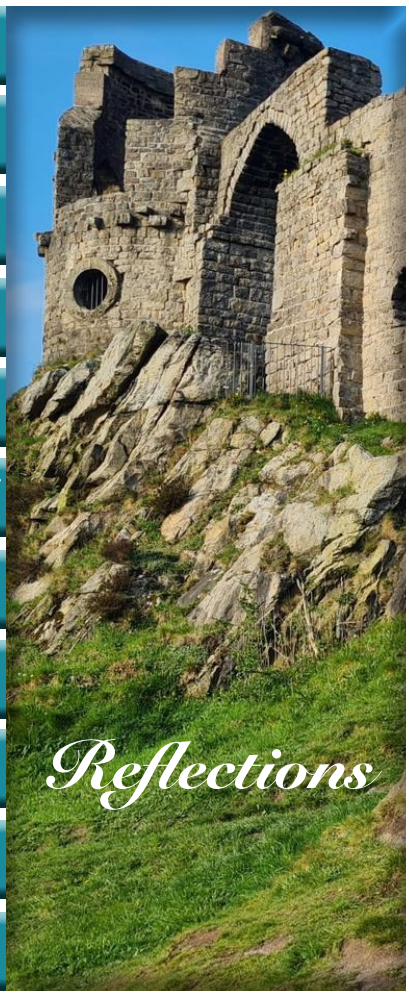
NWU Researcher Visits the University of Missouri

A Naturalist's Dream Come True



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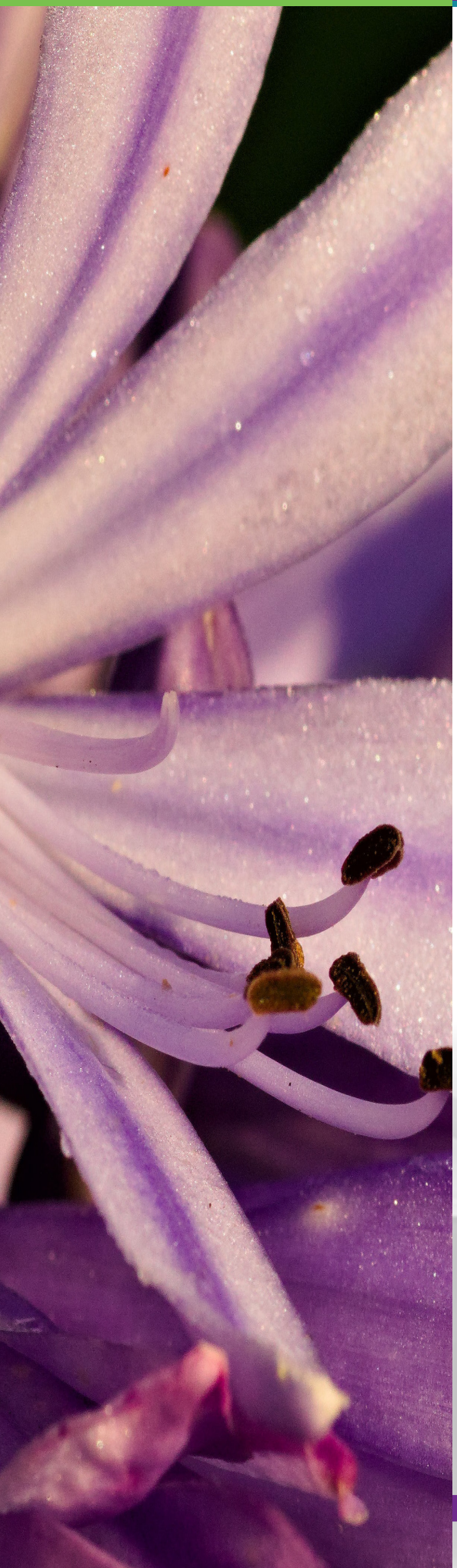
Hobby Showcase



Editorial

How privileged we are to celebrate our 10th ENVIRA edition in the 10th month – October – a beautiful month and an epitome of hope and inspiration.

Spring not only inspires the inner soul, but clearly inspired writing, as this edition is by far the most packed edition of all! Thank you, colleagues and students, for remarkable stories, reflections and many interesting pieces on people and their passion for the environment.

A sprinkle of spring is notable throughout this edition – from the ***interview with Tsebo***, our new UESM administrative assistant, ***Prof Rialet inspiring*** RSG listeners on 'Omgewingspraatjies', inspirational young ***visitors*** to the UESM, and all the many reflections on activities from the past few months.

Come along, and join the UESM 'tour' of our astonishing planet with its remarkable ***seas***, ***insects and cycads***, ***rocks*** and ***soils***, and be mindful of ***pesticides*** and ***weather conditions***.

Remember to get ready for our annual

Photography Competition

Grab your camera and get your entries ready!

Spring: What a lovely reminder of how beautiful change can be.

Until Summer 2022!

Frances Siebert (Editor) and Clarissa Minnaar (Sub-editor)

ANNOUNCEMENTS

UESM: EFUNDI FORMS

Get all the admin forms here - the UESM One-Stop Source

Did you know that all the procedures and documents for UESM staff and students are uploaded onto a single eFundi page?

Click **here** to visit the UESM eFundi portal

This site contains the latest version of the most important forms used by the unit.

COMMUNICATE YOUR NEWS

Corporate Communication is requesting your news

Share your newsworthy events, achievements (staff and students), projects, community engagement research, teaching-learning breakthroughs, or any relevant news that may position the NWU. These news items are used on various internal and external university platforms and are also made available to the media.

Complete this **template** and submit it to **louis.jacobs@nwu.ac.za**.

Academics are also encouraged to submit opinion pieces to Corporate Communications whereby these pieces will be directed to the appropriate media houses.

SAVE THE DATE

The ENVIRA-UESM Academic Recognition function will take place on the:

1ST OF DESEMBER 2022.

Please save this date and remember to submit your accolades to Prof Carlos Bezuidenthout and the editors.

CAMPUS TREE ROUTE

Stretch your legs, go outside and explore campus on the 2km Tree Route.

Important information:

- Full length **article** to the tree route (as seen in the **ENVIRA Autumn Edition 2022**)
- **Species List**
- **Map**

NEW APPOINTMENT

The **School of Biological Sciences** would like to officially welcome:

Mr Jonathan Kok

who has joined the team as Laboratory Helper (SBS) after being in the position temporarily for three months.

ANNOUNCEMENTS

PHOTOGRAPHY COMPETITON

Now, for the moment we've all been waiting for:

Grab your camera and get your entries ready! Our annual Photography Competition is finally underway!

Let's get snapping!

All UESM staff members, postdoctoral fellows and postgraduate students are invited to participate.

This year, we will also have categories for VIDEO FOOTAGE!

SOCIAL MEDIA

Have you followed the UESM on social media yet?

Here are the links:

ARE YOUR DETAILS CORRECT?

Updates have been made to the UESM website.

Please check your details on the staff page

If you are a senior member or the head of a sub-programme or research group, please also go visit these pages and make sure the content is correct and up to date.

Contact Clarissa Minnaar at 25161873@nwu.ac.za for any necessary ammendments

ETHICS

Visit the FNAS eFundi link for a detailed summary of the ethics process.

If you do not have access to the page view the guide here.

For any queries or assistance, please contact:

Ms Madelien Burgers: 37630067@nwu.ac.za

Prof Roelof Burger: Roelof.Burger@nwu.ac.za

More information on Ethics here.

CHANGE YOUR AFFILIATION ON RESEARCH GATE

Change your affiliation to the Unit for Environmental Sciences and Management on Research Gate

This is easy to do! You can complete it in less than a minute the next time you log on to your Research Gate **'profile'** page. This is the page with your name, photo and other info. On the right there is a box with the heading **'Current Affiliation'**. If under **'Department'** it states **'Unit for Environmental Sciences and Management'** you have nothing further to do. If anything else, then click on **'edit'** to the right of **'Current Affiliation'** and then **'edit current affiliation'**. Under **'Department'** scroll and choose **'Unit for Environmental Sciences and Management'**. Do not copy and paste, just start typing and it will appear. Right at the bottom click **'save'**.

Welcome to one of the most active, dynamic and productive research communities of the NWU!

Upcoming FNASREC meeting dates 2022

27 October
24 November

Research ethics risk categories: The role of FNASREC

Roelof Burger & Madelien Burgers

The Faculty of Natural and Agricultural Sciences Research Ethics Committee (FNASREC) deals with zero / no-risk and low-risk studies that are not health-related.

The scientific review committee (i.e. the internal committee of a sub-programme under which the research falls, comprised by researchers with the relevant expertise) plays a central role in ensuring that the quality and potential ethical risk are promoted in the faculty. The committee needs to make sure that the proposed research meets the discipline's requirements and suggests the relevant REC and the risk level.

The research proposal must include the details necessary for the REC to confirm the essential aspects of the research methods that might have ethical implications. The first aspect to consider is whether the research topic falls under the auspices of HREC (Health). If the subject matter is human health related, and the research aims to speak to, and inform health bodies, or publish in health journals, the study has to be submitted to HREC. This is true even if the risk level is zero. Should animals or animal products are directly involved in the study, the proposal must be submitted to Animcare or Animprod. Should the study is submitted to FNASREC and possible conflicts arise (i.e. the study suggests human participants), the research proposal has to clearly indicate why the research topic fits best with FNASREC.

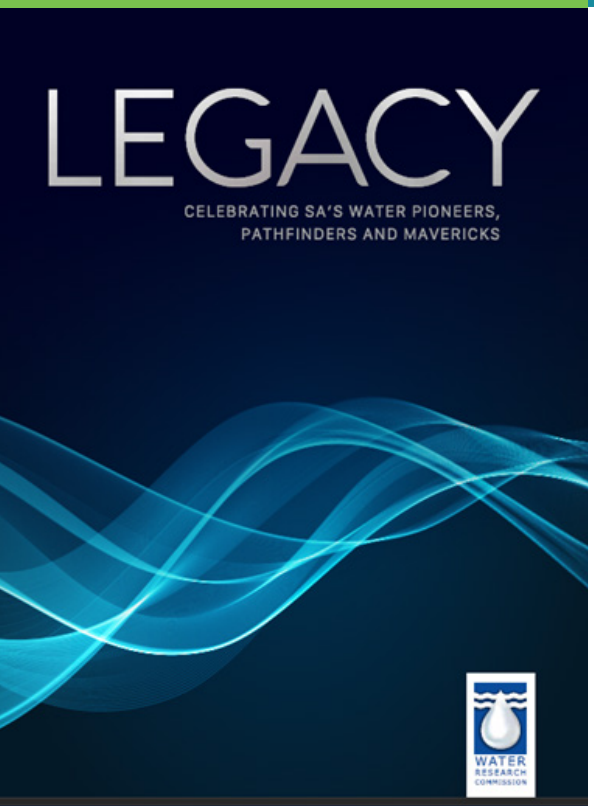
The second consideration of the research proposal is the risk level. All aspects of risk need to be clearly articulated in the research proposal. The proposal also has to state how that risk will be managed. The following includes components of research that will impact the study's risk level: human participants in the study, any direct involvement of animals, any potential impact on the environment, any sensitive topic or data set. Details should be provided in the research proposal that will convince FNASREC that the risk level does not exceed their mandate (No/Low-Risk review). The strategies to manage the risk should also be mentioned specifically.

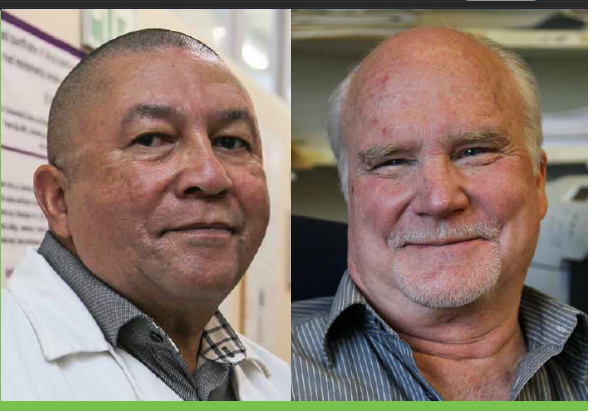
More information on the Ethics Process here.

If you are interested to contribute towards ethics in FNAS, contact:

Ms Madelien Burgers:
37630067@nwu.ac.za

Prof Roelof Burger:
Roelof.Burger@nwu.ac.za





The UESM's very own "Water Legends", Prof Carlos Bezuidenhout and Prof Henk Bouwman.

Congratulations

The following awards and accolades from the international scientific community demonstrate the high quality and significant impact of research within the UESM.

Professors Bezuidenhout and Bouwman acknowledged as WRC legendary water mavericks

Thirty-three South African water and sanitation specialists have been accorded Water Legends by the Water Research Commission (WRC) in a book "***Legacy: Celebrating SA's water pioneers, pathfinders and mavericks***". Two of these mavericks, Professors Bezuidenhout and Bouwman are included. According to Dr Jennifer Molwantwa (CEO of the WRC), their "...remarkable careers have left a lasting legacy on the South African water sector. Their tales are truly remarkable, and speak of passion, dedication and hard work." She stated further "...while all their life stories might be unique, their goal has been the same – to make South Africa a better place for all who live in it through practical application of water security research, development, innovation and technology."

Zoology ranked under the top 250 globally in the latest University Ranking by Academic Performance

The international University Ranking by Academic Performance (URAP) system has released its 2021/22 results. URAP is a ranking system based on academic performance indicators of 3000 universities worldwide that reflect the quality and the quantity of scholarly publications based on 78 subject areas. Zoology was the top-ranked research subject at the NWU, ranked globally at 210. Although Zoology is recognised as a subject, it seems that Botany, Microbiology, and Biochemistry are included under Biology or Environmental Sciences.

Click on this link for a more comprehensive summary.

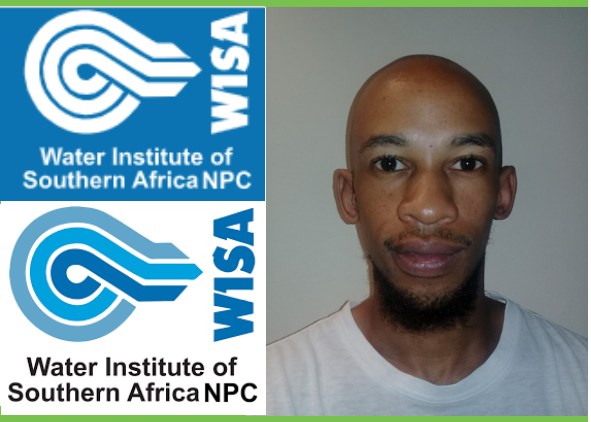
Lifetime Achievement Award: Prof Klaus Kellner

Prof Klaus Kellner was awarded the "Lifetime Achievement Award" by the Land Rehabilitation Society of Southern Africa (LaRSSA) on 14 September 2022 at the gala dinner of the annual conference by LaRSSA. This award is in grateful appreciation for his continued commitment and dedication to Environmental Rehabilitation in southern Africa. Prof Kellner represented South Africa on national and international committees regarding land degradation, desertification and rehabilitation ecology. He was recognised for his mentorship and for sharing his expertise with others.

LaRSSA

LAND REHABILITATION SOCIETY
OF SOUTHERN AFRICA

Dr Fortunate Mafeta Phaka.



Mr Hlakae Leseba.

Enviropeadia's Eco-Logic Silver Award: Dr Fortunate Mafeta Phaka

Enviropeadia's Eco-Logic Awards recognise individuals, organisations and communities whose actions promote sustainability. Dr Fortunate Mafeta Phaka, a postdoctoral research fellow in the African Amphibian Conservation Research Group under supervision of Prof Louis du Preez, was awarded silver in the Eco-Angel Award category at the 2022 Eco-Logic Awards for the outreach that formed part of his PhD research on people and herpetofauna. Eco-Angel Awards are for individuals whose caring actions contribute to protection of biodiversity. This is Dr Phaka's second award for 2022 - earlier in the year he was also honoured at the Golden Shield Heritage Awards.

https://www.eco-logicawards.com/winners/

WISA 2022 conference poster award: Hlakae Leseba

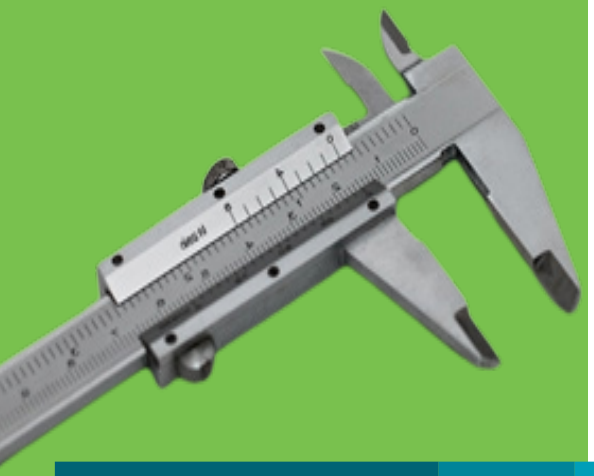
Hlakae Leseba (BSc Hons) won the prize for the best student poster presentation at the recent biennual conference of the Water Institute of Southern Africa (WISA) that was held from 28 to 30 September 2022. With his poster titled "*Potential impact of drinking water treatment residue on river water quality at MidVaal Water Company*", he contributed to this year's theme of the conference, namely "Navigating the course". In this study, supervised by Prof Sandra Barnard, he found that the residue produced at the MidVaal drinking water treatment plant will not be a cause of concern should it be deposited back into the river system.

UESM Media Personality Spring 2022

Prof Rialet Pieters

The Afrikaans radio station, RSG (Radio Sonder Grense) has a brand-new presenter of the Saturday morning programme, 'Omgewingspraatjies' (which translates to 'Environmental talk') in the regular morning show, 'Brêkfis met Derrich'. Prof Rialet Pieters took over this prestigious position with contagious enthusiasm. She is the third researcher from the UESM who has been approached to present 'Omgewingspraatjies' – Prof Kobus van der Walt, the first presenter, passed on the baton to prof Juaneé Cilliers, who then handed it over in the capable hands (or 'voice') of another FNAS, NWU member, Dr Ruhann Steyn, prof Rialet's predecessor.

Click here to learn more about Prof Rialet's contributions to 'Omgewingspraatjies'



Impact of UESM research

Alper-Doger Scientific Index

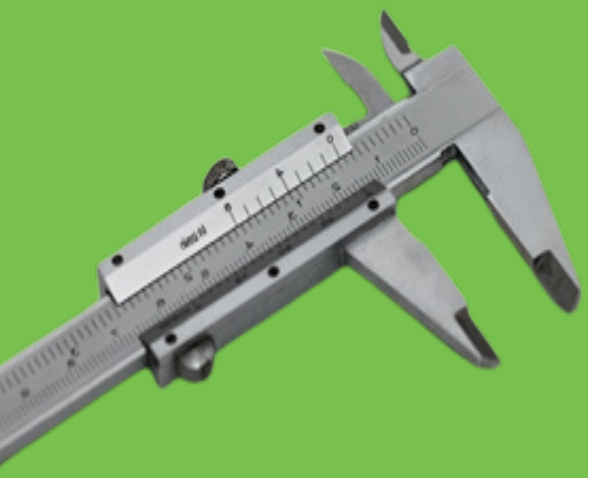
The AD Scientific Index (ADSI) has been developed by Prof. Dr. Murat Alper (MD) and Associate Prof. Dr. Cihan Doger (MD) by using the total and last 5 years' values of the i10 index, h-index, and citation scores in Google Scholar. In addition, the ratio of the last 5 years' value to the total value of the abovementioned indices is used and thereby placing more emphasis on the quality of recent outputs. Using a total of nine parameters, the ADSI shows the ranking of an individual scientist across all scientific fields based on research impact in 14 120 institutions of employment, 215 countries, 10 regions, and in the world. Thus, all scientists in the UESM are ranked by this system and can monitor their own ranking over time.

Why is the ADSI useful?

ADSI considers the total and the last five-year productivity coefficients of scientists based on h-index and i10 index scores and citations in Google Scholar. In other words, the ADSI provides both the ranking and analysis results. Such analyses reveal the medium and long-term results of several policies implemented by institutions, including those of academic staff employment, retention and mentoring policies.

Table 1: UESM staff ranked under the top 50 of the NWU across all research fields based on their Google Scholar H-indices. Eleven of the 77 researchers in the UESM fall under the top 50 of 269 NWU staff members ranked by ADSI. This means close to a quarter of the top researchers of the NWU reside in the UESM.

Member	NRF rating	Sub-programme	UESM	NWU	RSA	Africa	World
Prof Henk Bouwman	C1	BCE	1	14	474	788	119 367
Prof Stuart Piketh	B2	CCAQI	2	17	570	992	137 029
Prof Louis du Preez	B2	BCE	3	18	594	1045	141 947
Prof Johnnie van den Berg	B1	IPM	4	19	601	1056	142 752
Prof Victor Wepener	C2	AEH	5	20	616	1097	146 163
Prof Nico Smit	B3	AEH	6	22	655	1178	154 468
Prof Sarel Cilliers	C1	EIER	7	28	751	1388	171 069
Prof Oriel Thekisoe	C2	IPM	8	40	927	1840	201 391
Prof Francois Retief	B2	EM	9	43	981	1974	210 120
Prof Stefan Siebert	C1	EIER	10	44	1026	2108	217 759
Prof Carlos Bezuidenhout	C3	AEH	11	50	1104	2294	228 682



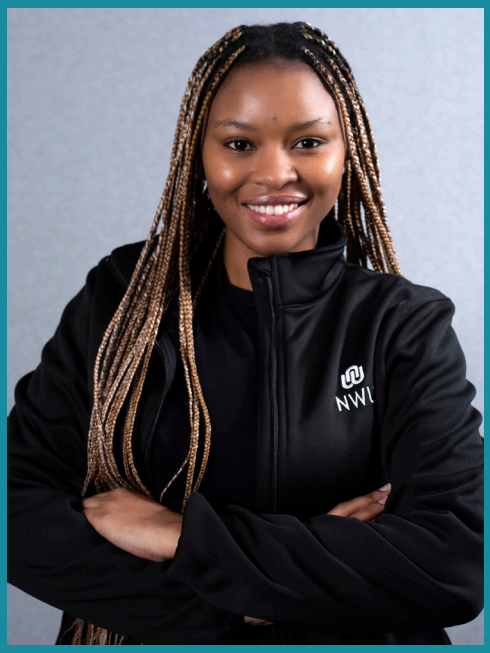
Most influential research conducted over the past 5 years in the UESM

Table 2: UESM researchers ranked under the top 50 of the NWU based on recent (5-year) impact of their research as calculated by the ADSI. In cases where the index value was the same, the researchers with the higher overall H-index is listed first.

UESM	Member	Sub-programme	NRF	ADSI
Gold	Prof Henk Bouwman	BCE	C1	28
Silver	Prof Stuart Piketh	CCAQI	B2	27
Bronze	Prof Victor Wepener	AEH	C2	26
4	Prof Johnnie van den Berg	IPM	B1	26
5	Prof Nico Smit	AEH	B3	25
6	Prof Sarel Cilliers	EIER	C1	25
7	Prof Francois Retief	EM	B2	25
8	Prof Louis du Preez	BCE	B2	23
9	Prof Oriel Thekisoe	IPM	C2	22
10	Prof Carlos Bezuidenhout	AEH	C3	22
11	Prof Stefan Siebert	EIER	C1	21
12	Prof Dewald van Niekerk	DRM	B3	20

"Success is no accident. It is hard work, perseverance, learning, studying, sacrifice and most of all, love of what you are doing or learning to do."

Pelé



Tsebo Mothibedi

Administrative Assistant to Prof Carlos Bezuidenhout

Interview by Clarissa Minnaar

General

Where did you grow up as a child?
Potchefstroom, for the most part, and the Free State with my paternal grandparents for every, single school holiday.

What's your favourite childhood memory?
The monthly daddy-and-daughter McDonald's dates. On the 15th of every month (it did not matter which day of the week) my dad would pick me up and we would go to McDonald's since that was my favourite restaurant at that time.

What does an ideal weekend look like for you?
My 29-year-old self loves a clean house, a home cooked meal and some good movies. I am not for the streets.

What's the best vacation or trip you've ever been on?
I was on vacation at Zimbali in Durban four years ago. Zimbali is the best of the best!

What's your biggest pet peeve, and how do you respond when it happens?
Rude people, I normally just walk away, but I will probably avoid talking to that person again.

Can you tell us a random fun fact about yourself?
I love telling jokes. I was probably a comedian in my past life.

What is your favourite restaurant to go to, and do you have a go to order?
I LOVE burgers, so of course, RocoMamas would be my favourite restaurant. Any burger would do, as long as it's not too spicy.

What are the top three bucket list things you'd like to do?
1) Take my mom on holiday, since she has never been on a holiday outing before;
2) Take all my siblings (I have five) on a *Sho't-Left* trip;
3) Go bungee jumping.

Do you have a life motto that you strongly believe in?
Do unto others as you would have them do unto you.

Women's month has passed since the previous edition of ENVIRA. Considering Women's month and the significant role you played in organising the UESM Women's month event, have you received a good piece of wisdom from your mother or grandmother that you would like to share?
My grandmother used to say: "A woman should always have her own." If I had to really explain it, I would tell you to read the poem by Maya Angelou called "Every Woman Should".

Favouities

Music genre	**RnB**
Sport	**Hockey**
Holiday destination	**The Maldives**
Hobby	**Working out and playing sports**
Local spot in Potchefstroom	**My house**
Dessert	**The Black Forest cake from *Woolies***
Accent	**French, maybe**
Superhero	**My late grandmother**
Smell	**The smell of soil after it has rained**
TV show	**Discovery channel's investigation shows e.g., Homicide Hunter.**

My grandmother used to say:

"A woman should always have her own."

If I had to really explain it, I would tell you to read the poem by Maya Angelou called "Every Woman Should".

This or that?

Beach or bushveld	Beach
Coffee or tea	Coffee, please
Book or movie	Movie
Early bird or night owl	Night owl
Pizza or sushi	Pizza
Juice or fizzy drinks	Fizzy drinks
Taylor Swift or Beyonce	Queen B
Fiction or non-fiction	Non-fiction
Plans or surprises	Plans, please
Animals or people	People

Career / NWU related

Where did you get your schooling?
Potch Central Primary School and Potchefstroom High School for Girls. I completed my undergraduate studies in Development and Management and my postgraduate studies with Disaster Studies at the NWU.

In short, what led you to this career?
Fate.

Where were you working and what was your position before coming to the UESM?
I was an Administrative Officer at the School of Languages on the Vaal Campus.

What made you decide to come to Potch?
My daughter and having my parents' support in Potchefstroom which will allow me to a pickup where I left off with my academics.

What do you feel adds the most value to your day at the UESM?
My Director. I have been here for only two months, and I have grown so much both in my career and my personal life. His famous words to me are ''take an executive decision'' and I do that now even in my personal life. I make decisions every day to help improve "Tsebo" as a brand. Prof Carlos is always willing to listen to our problems, and he guides us to find solutions.

Which of your talents and skills do you use most in your position?
I am generally a hard worker. Everything I have I got through proper hard work.

In your position, a fast-paced work environment is generally common. What do you feel is most helpful coping with this?
Like Tannie Anita always reminds me: ''How do you eat an elephant? One bite at a time". Be on top of it before it overwhelms you, as it can get overwhelming at the UESM with the number of emails coming in, calls, and walk in's that come with being a secretary to a director. I constantly have to prioritize tasks based on urgency or time consumption. So, my coping mechanism would be proper planning before tackling the day.

What is the most exciting thing you've worked on since you've joined the UESM?
The UESM external programme evaluation. It was a first-time experience to me and I was quite nervous, but satisfied with what we have accomplished.

As a valued middle-[wo]man, what do you think is your most important role at the UESM?
To use my experience, knowledge, and enthusiasm to improve systems that might need some improvement. This is why I value my director because he is open for suggestions related to new or more efficient ways to take on some of the tasks we do.

What do you love most about your job?
My colleagues. You spend eight hours a day at work, so I believe it's really important to have a healthy workplace.

ENVIRA
Visiting Scientists

The students (from left to right: Elvira Trolltoft, Sofie Hällsten and Tanja Sellick) during a field visit to the Vredefort Dome.

African Centre for Disaster Studies hosts three master's students from Lund University, Sweden.

Tanja Sellick, Elvira Trolltoft & Sofie Hällsten

Three students from Lund University, Sweden, are working with the African Centre for Disaster Studies (ACDS). Tanja Sellick is undertaking a three-month internship at the ACDS as part of her master's degree in Disaster Risk Management and Climate Change Adaptation. Elvira Trolltoft and Sofie Hällsten (middle) are fire safety engineers spending two months at the ACDS for their thesis research as part of their master's degree in Risk Management and Safety Engineering.

Tanja is trained in earth science, where her research is focussed on natural hazards. Her acknowledgement of the social part of disasters being equally important, has led her to a master's degree in social science. Being a South African as well as a Swedish resident, exposed her to two very different places regarding disaster risk. With this dual background, both in research and in herself, her research interests have been rooted mostly in the Southern African context with examples in flood risk, the climate impacts of organic waste management, and preparedness in informal settlements. She is mostly interested in the connections between disaster risk and climate change. '*Being here at the ACDS, where the focus is on the African and South African context, has therefore been beneficial for me in developing my knowledge and understanding of the disaster risk landscape and processes in these areas. I will go back to Sweden with a broader perspective and many good memories*'.

Elvira and Sofie have a background in fire safety engineering. Their interest in disaster risk management is linked to veldfires with a focus on communication in disaster prevention. With veldfires being a large threat to human health, society, the environment and the economy, working with prevention is essential to limit the negative impacts they induce. Their research will be based on a field study performed in the World Heritage Site in the Vredefort Dome. The area is between two provinces, where different stakeholders with various interests affect the management of the site and the communication to and between them. Effective communication is essential for the common understanding and cooperative effort in preventing veldfires, which is why they chose this topic for their research. They hope that their research will prove useful in a Swedish as well as a South African context since the frequency and consequences of wildfires are increasing in Sweden and there is a need for more preventative work.

LUND UNIVERSITY | LTH FACULTY OF ENGINEERING

The Vredefort Dome area.

Back to buttons

Best student performance in the Environmental Management master's programmes for the 2021 academic year

Claudine Roos

The Unit for Environmental Sciences and Management (UESM) wishes to congratulate the following three students for being awarded the Best Performing Students in the master's programmes in Environmental Management and specialisation fields for the 2021 academic year:

Master's in Environmental Management:

Mavisha Nariansamy

"This degree signifies a milestone in my academic and professional career. I have gained critical thinking skills throughout the research process, and gained valuable insights to the inner workings of an often elusive administrative system.."

View abstract & read more

Master's in Environmental Management with Specialisation in Ecological Water Requirements:

"Personally, I found it most remarkable how my critical thinking, analysis and communication skills improved over the past two years.

Thank you to each and everyone at the NWU Water Research Group that made this project a truly memorable experience..."

View abstract & read more

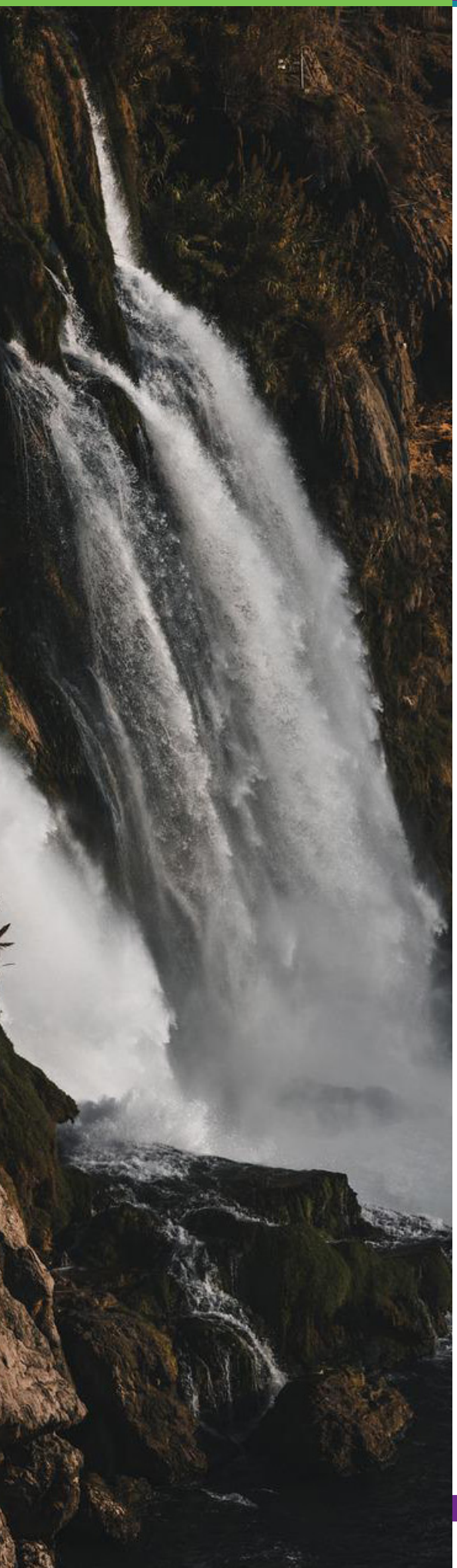
Abraham Smit

Master's in Environmental Management with Specialisation in Waste Management:

Masilo Sehaswana

"The research findings positively impact my workplace, and I have already started influencing and applying the recommendations to improve the ease of reporting to the SAWIS. I am forever grateful towards the NWU for the knowledge and skills I acquired..."

View abstract & read more



The Establishment of a Knowledge Hub for Contaminants of Emerging Concern in South African Water Resources

Rasheed Adeleke

The North-West University, in conjunction with the Agricultural Research Council, Tshwane University of Technology, and University of South Africa is conducting a study for the Water Research Commission (Project 2021/2022-00256) to establish a portal consisting of emerging aquatic pollutants viz. the Contaminants of Emerging Concern (CEC) Knowledge Hub.

What are Contaminants of Emerging Concern?

Contaminants of Emerging Concern are pollutants that have previously been at levels below detection limits, which are now being detected by water professionals in our water bodies. These can include nanomaterials, flame-retardants, microplastics, agricultural waste, microbial contaminants, heavy metals, pharmaceuticals and personal care products, which may cause ecological and human health impacts.

Project Objectives:

1. Compilation of identified emerging contaminants of concern in water, their occurrence including hotspots and their distribution in catchment areas in SA.
2. Collation of available data on CECs in SA water resources, validation of selected analytical methods for identification of CECs and compilation of possible correlations and seasonal variations for selected CECs in SA water resources.
3. Establishment of an interactive knowledge hub with databases for all-inclusive information on CECs in SA water sources.

Research Team:

The team has Dr Ashira Roopnarain (ARC) as the project leader, and Dr Tarryn Botha (UNISA) as the principal investigator.

Prof Rasheed Adeleke is leading the North-West University team and has a MSc student Ms Fanelesibonge Vilakazi working on the project. It further includes Prof Ntebogeng Mokgalaka (TUT), Dr Maryam Bello-Akinosho (ARC), Dr Busiswa Ndaba (ARC), Dr Emomotimi Bamuza-Pemu (OptimalEnviro Consulting), Dr Michael van der Laan (ARC), and Ms Phedisho Mphahlele (TUT/ARC).

In order to aid the research on CECs, you are welcome to submit new contaminants under the following categories: Nanomaterials, Flame Retardants, Microplastics, Agricultural Waste, Microbial Contaminants, Heavy Metals, Pharmaceuticals and Personal Care Products.

For more information click the link below:
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ENVIRA
Research Group Showcase

Micropalaeontology and pollen analysis: new field of science at the North-West University

Dorra Gharbi, Moteng Moseri, Nikiwe Ndlovu, Eugene Bergh & Frank Neumann

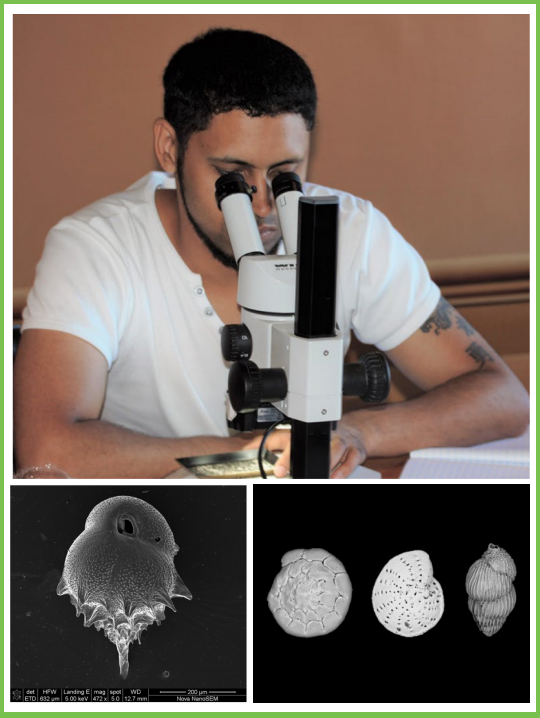


Figure 1. Microfossils being viewed under a microscope. Scanning electron microscope (SEM) image of a *Bulimina aculeata* species, a foraminiferan species that indicates low-oxygenated environments (bottom left). SEM images of *Ammonia batava*, *Elphidium advenum* and *Uvigerina peregrina*, foraminifera species that are abundant in productive upwelled waters along the western margin of southern Africa (bottom right). SEM images taken with University of Cape Town Nova NanoSEM1.

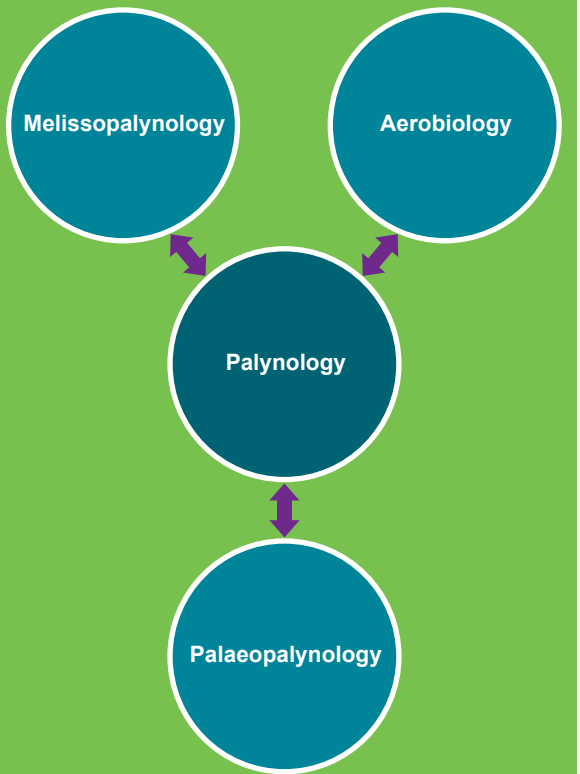


Figure 2. Applications of Palynology

1. What is Micropalaeontology?

Micropalaeontology is the study of the remains of organisms (microfossils) that are too small to be observed with the naked eye and require a microscope to observe them. These tiny fossils are preserved in rocks and sediments from where geologists extract them to aid in geological and environmental analyses. Palynology is a subdiscipline of micropalaeontology dealing with organic-walled microfossils.

1.1 Micropalaeontology at NWU

New research at the NWU utilising micropalaeontology and palynology will be undertaken by staff in Geology Soil Science to decipher environmental change over various timescales. Microfossils are extremely important in providing ages to rocks and sediments, correlation between different geological units and deciphering past and modern environmental change. The addition of micropalaeontology to the NWU will also enable our students to explore more opportunities in the oil, mining, marine geology, climate and environmental consulting industries.

One of the groups of microfossils that will be focussed on is foraminifera (Figure 1). These are microscopic organisms that are very sensitive to the environment. Any changes in the environment cause a shift in species assemblage compositions and the chemistry that is preserved in their remains. At the NWU, faunal characteristics of these microfossils and their chemistry will be studied to determine the ages of geological units and to determine the interconnection between climate and environmental change over time.

2. What is Palynology?

Palynology deals with the study of modern- and fossil spores and pollens which have distinctive morphological features and are used in palaeoecology, taxonomy, honey analysis (melissopalynology), forensic sciences, and aerobiology (Figure 2).

2.1 Applications

In Geology and Soil Sciences, we focus on Aerobiology, Melissopalynology, and Palaeopalynology.

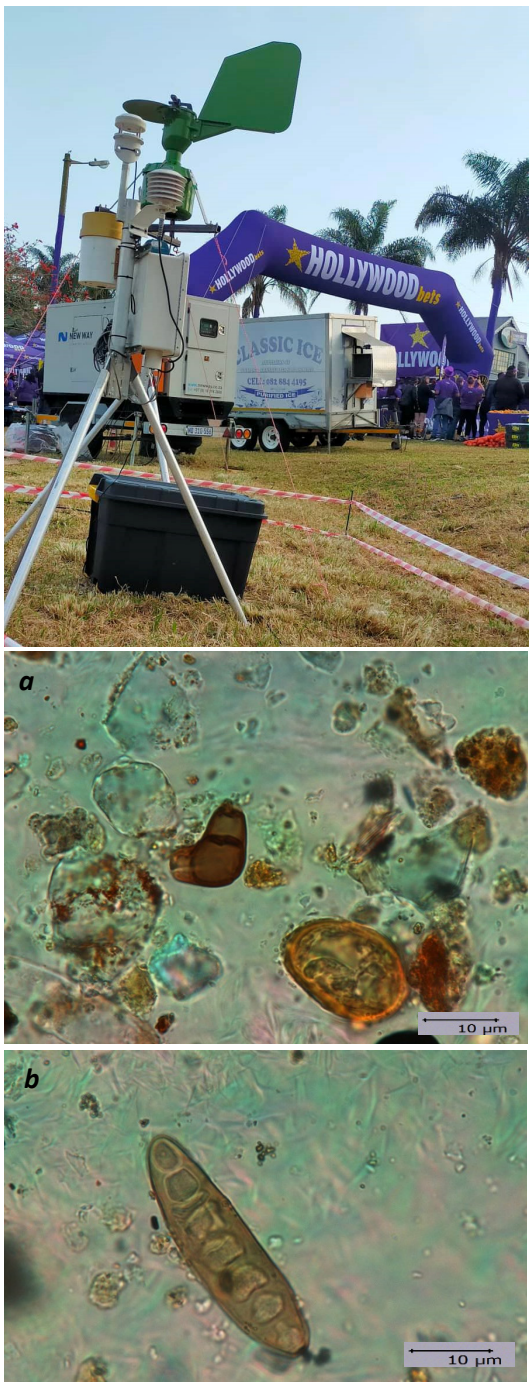


Figure 3. Aerobiological sampling of airborne pollen and fungal spores during the Comrades Marathon on the 28th of August 2022 (view article).
a. *Curvularia* sp; b. *Drechslera* sp. The runner's exposure to allergenic aerospora can be associated with risk of respiratory symptoms.

A. Aerobiology

Aerobiology is the study of processes involved in the production, emission, dispersal, and impact of particles of biological origin (bioaerosols) in the atmosphere. SAPNET (South African Pollen monitoring Network) was started in 2019 to measure the atmospheric pollen and spore load in South Africa. Aerobiology involves botanists, mycologists, ecologists, meteorologists, modellers, and allergologists. Understanding pollen and spore emission is fundamental for the characterisation of potential allergens that may be of health relevance. At the NWU, air quality is among the most significant and well-studied concepts of environmental quality. Lots of evidence has been accumulated concerning the influence of pollen on human health and possible synergies between pollen and air pollution. These investigations triggered the interest of the scientific community in the research group CCAQI (Climate Change and Air Quality) to search for interrelationships and cross-influences between aerospora (pollen and fungal spores) and air pollution levels. A project has been started to investigate bioaerosol diversity and dynamics in North-West Province. A 7-day volumetric spore trap will be installed on the NWU, Potchefstroom campus, another will run on the Mahikeng campus. The goal is to explain the airborne pollen and ecology of plants, the effect of climate change on phenology and its correlation with meteorology. Ultimately, the research aims to understand the association between aerospora and distinct allergy patterns and to inform the public via the SAPNET website https://pollencount.co.za/ (Figure 3).

B. Melissopalynology

Melissopalynology studies the pollen composition in honey samples, as this reveals the geographical and botanical origin of the samples. This information is used to determine the regional climatic conditions that contribute to pollen transportation, dispersion, and deposition in the ecosystem and as a result shedding light on pollination pathways. This allows for quantitative analysis of the adulteration of South African honey. Thus far, a basic debut quantitative honey pollen analysis outline has been performed using melissopalynology for the Savanna biome of the Greater Kruger National Park.

Environmental factors like seasonality, landscape, and vegetation distribution contribute to differences in honey samples and these differences need to be considered in different southern African biomes. This sprouts a new tool for establishing a fundamental understanding of the contribution of southern African vegetation to locally produced honey and creating a reliable tool for food quality investigations, e.g., the analysis of honey adulteration specifically suitable for different biomes in South Africa.

C. Palaeopalynology

Palaeopalynology is the study of organic microfossils known as palynomorphs, that are resistant to decay and include acritarchs,

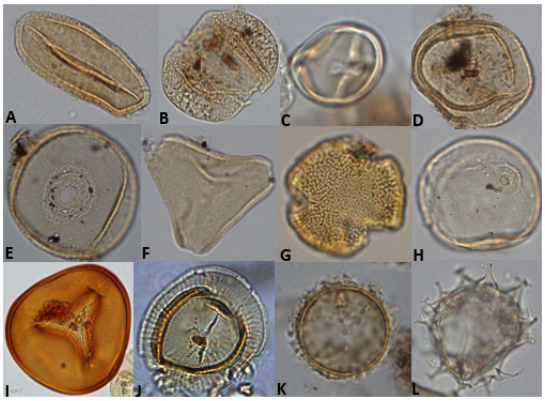


Figure 4. Fossil pollen, spores, algae and dinoflagellates from Oligo-Miocene deposits at Langebaanweg, Western Cape (from MSc thesis by Moteng Moseri). A. *Arecipites otagoensis* (palm); B. *Podocarpidites sp.* (podocarp); C. *Zonocostites ramonae* (mangrove tree); D. cf. *Araucariacites australis* (monkey puzzle tree); E. *Milfordia homeopunctatus* (restio); F. *Proteacidites sp.* (Protea); G. *Rhoipites arnotiensis* (Rubiaceae); H. *Graminidites* cf. *neogenicus* (grass); I. *Leiotriletes maxoides* (fern); J. *Debarya sp.* (algal cyst); K. *Sigmopollis sp.*; L. *Spiniferites spp.* (dinoflagellate cyst). Scale: 10 µm. Photos taken at Evolutionary Studies Institute, University of the Witwatersrand.

Figure 5. Coert Coetzee (left) extracting core material from a peat wetland during one of the METSI field campaigns in March 2022. His research will focus on the analysis of palynomorphs macerated from the sediment cores to reconstruct the palaeoenvironmental conditions and the influence of human activity on the peat wetland at METSI, in Potchefstroom.

chitinozoans, dinoflagellates, pollen and spores (Figure 4). These palynomorphs are found in sediments and sedimentary rocks and are extracted from them through a variety of maceration methods. The analyses of these palynomorphs enables us to conduct research in palaeoecology and stratigraphy in order to reconstruct past climatic conditions and palaeoecological environments at the time of deposition.

Our research interests at the NWU are focused mainly on Cenozoic deposits in South Africa. One such project is that based at METSI (north of Potchefstroom), the research facility of the UESM. This research project, conducted by our honours student Coert Coetzee, aims to investigate the influence of climate fluctuations and anthropogenic interactions on the last 2000 years of sedimentation in a peat wetland at METSI (Figure 5). Changes in the palynomorph record over time will be used as a reflectance of the impact of human activity and climate change on the peat wetland in the Holocene. The ongoing project is part of a collaboration between the NWU and the University of the Witwatersrand. It involves several honours and master's students in collaboration with Prof Jonathan Taylor, diatom expert at the NWU. We hope to strengthen our research prospects through such collaborations and the establishment of our own micropalaeontology research labs.

NWU student volunteers acting as tutors at Ourief Primary School.

Paint Party: Reusing old tyres for a planned food garden at Ourief.

Lifting Dreams through Community Engagement in Urban and Regional Planning

Karen Puren

Apart from teaching and research, the "third mission" of Higher Education Institutions (HEI) namely to contribute to the social, economic and cultural development of communities through Community Engagement (CE) is considered a core function of the academia (Jones *et al.*, 2021). It was within this context of HEI's and CE as well as her involvement as a business leader in a Non-Profit Organisation (NPO) called *Partners for Possibility*, that Dr Karen Puren (Chair: Urban and Regional Planning) have become involved in a national NPO called *Lifting Dreams*. *Lifting Dreams* literature aims to lift the dreams of school learners by providing supplementary educational support in English and Mathematics through an enrichment programme at under-resourced schools.

Lifting Dreams Potchefstroom was launched in March 2022 at the farm school Ourief Primary (located approximately 20 km from Potchefstroom on the R53 road) where 95 school learners from Grade R – Grade 7 are reached and enriched by NWU volunteers (students from wide variety of disciplines) on a weekly basis. Volunteers sign up via Google® to join the *Lifting Dreams* team in action to spend two hours of their time to make a difference in the school community, but also in the youth of our country. Due to the success of the programme, *Lifting Dreams* was recently launched at a secondary school, Seiphemelo in Ikageng.

While the educational support remains the focus of *Lifting Dreams*, the programme is flexible and context-sensitive and consequently geared to respond to a variety of physical interventions e.g. building libraries, bathrooms and green initiatives (e.g. food gardens) and introducing upliftment programmes. Although *Lifting Dreams* is outreach-based (from a CE perspective), it is also utilised as an umbrella organisation to incorporate service-learning and research-based teaching in Urban and Regional Planning. As part of the *Lifting Dreams* umbrella, Urban and Regional Planning students were involved in a service learning project during the first semester of 2022 where they were tasked with the challenge to develop a visionary plan for Ourief Primary to, in the future, become a sustainable, resilient and regenerative school. The idea behind this project assignment was to develop a local perspective in response to the United Nation's Sustainable Development Goals (SDGs), in particular SG 11: Sustainable Cities and Communities. In this particular CE service-learning project, students had the opportunity to be better equipped to address the integrated and challenging complexities of planning for a sustainable, resilient and regenerative future while they managed to learn the skills how to listen to, understand and voice the needs and aspirations of the school community.

To become part of *Lifting Dreams* in Potchefstroom or obtain more information contact Dr Karen Puren at karen.puren@nwu.ac.za.

(General Info) *(Potch Volunteers)*

Back to buttons

Academic Officer prestige event.

Formal Dine.

Awards and Dining with the FNAS Chapter

Krupa Daya
FNAS Chapter Chairperson

The final quarter of the year caught up with us in a blink of an eye.

After many students have had to do most of the degrees online, being back on campus this year was a thrilling restart. As the Student Academic Council (SAC) for our faculty, we have had a lovely term meeting and supporting new students and seeing them at our functions.

During the past few months, the biggest events that we held were the Prestige Academic Awards Evening and the Faculty Dine. Congratulations to all the students who attended this evening and received awards! The late nights, early mornings and using close to your entire monthly budget on coffee, has finally paid off. During the awards evening, we got to acknowledge students for their sheer determination and hard work.

With careful planning and creative logistics we had the privilege to celebrate the faculty's students on the 12th of September with a formal dine. Students had the chance to show off their glamourous attire, unwind and take a moment to appreciate the hard work that has been put into 2022.

On behalf of the FNAS Chapter, we would like to thank and commend the students for "hanging in there", for adjusting when the pandemic threw us curve balls and for being able to adapt and modify as needed. You have demonstrated to everyone that you are ultimately strong and resilient. We have one last push before this year comes to an end, so keep your head held high and make it count!

To my colleagues, thank you for all your hard work and continuous support throughout our term. Thank you for seamlessly organising and carrying out both online- and in-person events. I sincerely appreciate your time and effort.

I wish the newly elected committee all the best in your next term. May the SAC reach greater heights under your leadership.

Reflecting on the First Three Quarters

PhD course: Global Perspectives on Adaptive Wildlife Management

Marlize Muller
Forb Ecology Research Group (FERG)

From 9 to 24 June 2022, fifteen PhD students and a group of lecturers from Africa, Europe, and South America gathered at the Skukuza Science Leadership Initiative campus in the Kruger National Park (KNP), South Africa for an international course on adaptive wildlife management. The course was a collaborative initiative between the Swedish University of Agricultural Sciences, the Nsasani Trust, Nelson Mandela University, Wageningen University & Research, and Umeå University.

The purpose of the course was to provide students with a broader, multidisciplinary understanding of adaptive and sustainable wildlife management in northern and southern hemisphere systems. This was done by challenging our critical, analytical, and out-of-the-box thinking. We discussed how certain paradigms (e.g., Euro-American) dominate natural science and natural resource management and how approaches towards the inclusion of more diverse perspectives may lead to alternative solutions for sustainable development.

We were able to interact with a diversity of local and international scientists, researchers, and managers that deal with adaptive wildlife management on a day-to-day basis. Traditional knowledge is also woven into the course with guest lectures from the Tsonga community.

The mixture of people from different nationalities and backgrounds created a particularly stimulating, innovative, and effective educational experience.

Most days started early, often before breakfast, with a drive to experience the wildlife of the KNP. After breakfast, lectures were presented either in the field or in the outdoor classroom through workshop-type interactions. Brainstorming in groups stimulated critical evaluations and comparisons of management strategies and how these would vary among different continents, e.g. comparing the management of African rhinos versus European carnivores. Other exercises included presentations of our PhD work to the general public as "Wild Science" talks (live-streamed over Instagram) and multiple opportunities to create social media content about everything we learned.

For me, the take-home message of the course was: '*To solve complex environmental problems, people from all walks of life need to work together for a better future for all*'.

My appreciation to my supervisor, Prof Frances Siebert, for providing me with this opportunity, and to the above-mentioned institutions for subsidising my participation in the course.

Lecture in our outdoor classroom

Working on our group project

Lecture on elephant impact on trees

Participants of the PhD course

Photos by Susanna Bergström

Reflecting on the First Three Quarters

British Council-Funded University Staff Doctoral Programme (USDP)

Phathu Mukwevho

The North-West University (NWU) is part of the doctoral programme which aims to train young academic staff members towards obtaining their PhDs in collaboration with University of Limpopo (UL) and Keele University in the UK. This dual award programme will provide international exposure to staff members which will enhance their teaching and research skills as well as strengthen collaboration between these institutions.

Awarded UESM members:

Kristel Fourie: NWU PhD student and lecturer at UESM. Her research investigates participation in Disaster Risk Reduction in the African context. NWU Supervisors: Prof Livhuwani Nemakonde and Dr Sizwile Khoza.

Phathu Mukwevho: NWU PhD student and lecturer at UESM. His research aims to evaluate the effectiveness of air quality management plans (AQMPs) as a governance instrument in South Africa. NWU Supervisor: Prof Roelof Burger.

Izelque Botha: NWU PhD student and lecturer at the University of Limpopo, department of Geography and Environmental Studies. Her research investigates the impact of climate change message framing used by environmental campaigning organisations on the perceptions of South African university students. NWU Supervisor: Prof Roelof Burger.

Masego Montwedi: NWU PhD student and lecturer for the department of Water and Sanitation at the University of Limpopo. Her PhD project is on the “Effectiveness of Peri-Urban Wetlands in Providing Ecosystem Services: Mankweng, Limpopo as a Case Study”. NWU Supervisor: Dr Wynand Malherbe.

Modjadji Lebepe: PhD student, lecturer and senior laboratory assistant (Academic Support) at the University of Limpopo’s Department of Biodiversity, Zoology Unit. Her research focuses on utilizing an urban stream assessment tool to evaluate the health of urban streams and its potential effects on the health of the community, using Mankweng, Limpopo Province as a case study. NWU Supervisors: Prof Nico Smit and Prof Victor Wepener.

Collaborative research visit to Keele University May 2022:

The NWU and UL delegates travelled to Keele University in May 2022. The purpose of this visit was among others to have UK-SA supervisory meetings including developing and scheduling further research visits. This visit also included visits to Keele University’s Sustainability Hub, where the delegation got to see solar and wind farms and had a briefing on the Hydeploy project. Another highlight of the visit was that students had the opportunity to present their research as posters during the Keele Faculty of Annual Natural Science Postgraduate Research Symposium. Some of the staff members also got opportunities to teach and share their experiences during classes at the time and to assess student presentations. Students will have the opportunity to visit Keele University for study trips during their research projects. Keele, NWU and UL are all very excited about this collaboration and look forward to delivering successful research projects as contributions to knowledge and society in general.

Reflecting on the First Three Quarters

Botany 2022 International Conference, in Anchorage, Alaska, USA.

Tomi Adetunji
Forb Ecology Research Group (FERG)

BOTANY 2022, tagged "Plants at the extreme", is an annual conference of six premier scientific societies, including Botanical Society of America, American Bryological and Lichenological Society, American Fern Society, International Association for Plant Taxonomy, American Society of Plant Taxonomists, and Society of Herbarium Curators.

I arrived in Alaska on 24 July after an exhausting three-day flight from Johannesburg, South Africa. The conference kicked off with a field trip (#BotanyInAction) to one of the gardens in Alaska, where volunteers, myself included, did our part to remove *Prunus padus* - an invasive species. After that, I had the opportunity to attend a workshop on "cultivating inclusive research labs through intentional mentoring at Primarily Undergraduate Institutions". The workshop aimed to support current- and future principal investigators (PIs) on how to maintain an equitable and inclusive research lab group.

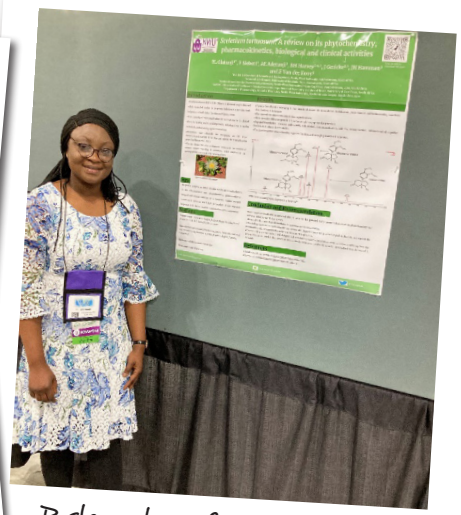
The first day of the conference ended with a plenary lecture by Dr Cassandra Quave, an ethnobotanist from Emory University, who talked about "Nature's healing bounty: The incredible untapped potential of medicinal plants". Her lecture reviewed the historical importance of plants in the evolution of current therapeutics, and urged scientists, particularly ethnobotanists, to explore the emerging technologies for deeper assessments of the incredible pharmacological properties of plants. This plenary lecture was fascinating to me as an ethnobotanist, as I had looked forward to having more research support for scientific infrastructure that will enable me to further explore the rich, untapped potentials of African medicinal plants.

Over the next few days, I had the opportunity to present my poster titled "*Sceletium tortuosum*; a review on its phytochemistry, pharmacokinetics, biological and clinical activities", and attend lectures by accomplished researchers in various fields of botany. My presentation drew the attention of many participants given that there is considerable commercial interest in the proudly South African forb, *Sceletium tortuosum* as a psychoactive agent globally. Additionally, I was able to showcase the value of indigenous forb species in nutrition and medicine and promote the research focus of the Forb Ecology Research Group (FERG) of the North-West University internationally. It was great to receive feedback from some of the audience members who engaged with my poster.

Alaska is very beautiful with different floras. The 4-day conference garnered about 1200 attendees from 38 countries who came to present their research. I had the time to network with researchers across the globe and reflect on my role as an ethnobotanist. Every day of the conference was fully packed with interesting lectures and presentations that I had looked forward to. Overall, I must acknowledge the fact that this rewarding experience will stay with me for a long time. I look forward to more opportunities to attend in-person conferences, present my research findings, and network with other researchers working in the field of medicinal plant research.

My appreciation goes to the UESM for the travel award and my advisor, Prof Frances Siebert, for her support.

Doing my part #BotanyInAction to remove invasive Prunus!



Poster set up for presentation.

Reflecting on the First Three Quarters

ICOPAnhagen hosted by the World Federations of Parasitologists (WFP)

Anja Erasmus & Anja Vermaak
Water Research Group (WRG)

Ten parasitologists from the Water Research Group (WRG), Unit for Environmental Sciences and Management at the North-West University (NWU) presented their research at the 15th International Congresses of Parasitology (ICOPA XV), Copenhagen, Denmark, during August 2022. This conference was integrated with the 10th International Symposium for Fish Parasitology (ISFP X). The theme for the meeting was *"Living with parasites"*. The conference was a hybrid event with a total of 2 000 delegates in the field of parasitology worldwide, with ~1 400 delegates attending in-person.

Contributions from the WRG include 10 posters, three presentations and one invited talk - covering topics of parasite biodiversity in teleost fishes and elasmobranchs, the story of the famous tongue replacement isopod, as well as tick-borne pathogens in reptiles. In addition, there were also contributions from three extraordinary-appointed members of the WRG on environmental parasitology and parasites of cartilaginous fishes. Other aspects of the conference included human and aquaculture diseases caused by some parasites, as well as some of the beneficial effects of hosting parasites. In addition, an intriguing plenary talk by Dr Chelsea Wood on a new subdiscipline of historical ecology of parasitism captured the audience.

Over the course of the week, students and staff were able to interact professionally and socially with world experts in the field of parasitology, establishing new collaborations at international level. As part of the International Symposium for Fish Parasitology, delegates were also treated to a visit at the Blue Planet exhibition aquarium, experiencing Northern Europe's largest aquarium.

We look forward to ISFP XI in Mexico (2025) and ICOPA XVI in Montreal (2026).

Reflecting on the First Three Quarters

Disaster in our backyard

Kristel Fourie & PW Bredenkamp
African Centre for Disaster Studies (ACDS)

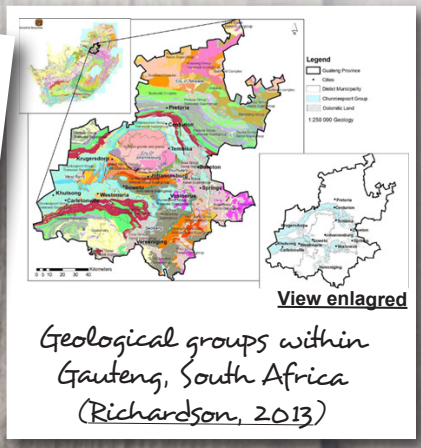
On 31 August 2022, the students of the Postgraduate Diploma in Disaster Risk Science visited the Khutsong area outside the town of Carletonville. This area has for years struggled with political instability, neglected infrastructure and exceptionally poor service delivery. All of these factors, together with a complex history have contributed to the damage caused by sinkholes in the area. Students were shown around by Mr Eric Stoch, the chairperson of the North-West Umbrella Fire Protection Agency, Mr Klaas Rabele a local activist, and Mr Jerry Ramokgoatedi an elder in Khutsong. The students were taken to various areas where sinkholes have caused houses to be evacuated, roads severely damaged and where the local authorities together with the mine has tried some remedial action. These activities and the funding of these activities are however seemingly ladened with misappropriation and the minimum is currently done to address the severe sinkhole issue in the area.

The concern of soil instability and sinkholes in the area is well documented. Within the Gauteng Province, the Transvaal Supergroup is subdivided into the Pretoria Group as well as the Chuniespoort Group. The different Groups within the Supergroup comprises different geological formations, each with its own set of characteristics. The Chuniespoort Group has a relatively high occurrence of dolomite rock, which is commonly referred to as dolomite land (Richardson, 2013).

The Chuniespoort Group (see illustration below) stretches South of Khutsong, up north towards Centurion, and west towards Vosloosrus. The entire area, including Carletonville and Khutsong, is therefore built on dolomitic land, which comprises of a series of alternating bands of insoluble chert and dolomite, creating large compartments wherein water bodies are separated.

The equilibrium of these compartments have been disrupted by the surrounding mining industry. Through mining activity, water is drained from the table for structural and process safety within the mines. Draining this water subsequently lowers the water table level within various compartments, respectively.

Although the structure of dolomite lends itself to be relatively impervious in pure water, contaminated water can have an impact on the geochemistry of the dolomite rock, causing the rock to slowly dissolve (Brink & Partridge, 1965; Brink 1979). Acid mine drainage and wastewater from neglected sewages systems pose a high risk in dolomite land, especially in areas where the water table has been drained. The convergence of various geological (natural), social, political and historical factors resulted in the formation of sinkholes in Khutsong. Sadly, according to the community, the people in Khutsong will, at least in the foreseeable future, have to continue living with the uncertainty of when and where parts of their homes and people might disappear into the earth. As Mr Rabele rightly said "… these sinkholes are MANmade, and not natural…"



View enlagred

Geological groups within Gauteng, South Africa (Richardson, 2013)

Reflecting on the First Three Quarters

Disaster Risk Assessment and development of Comprehensive Disaster Risk Management Plan for Ezulwini Municipality

Livhuwani Nemakonde & Christo Coetzee
Disaster Risk Science Research Group (DRS)

In July, a team of researchers from the Disaster Risk Science Research Group in the UESM, including Prof Livhuwani Nemakonde, Prof Christo Coetzee and Dr Sizwile Khoza (now working for Stockholm Environment Institute, Thailand), travelled to Eswatini to finalize a multi-year disaster risk assessment project carried out in cooperation with the Institute of Development and Management (IDM) and the Ezulwini Local Municipality (both from Eswatini). The purpose of the disaster risk assessment project was to give the municipality a clearer understanding of disaster risks within their jurisdiction and assist with the development of a Comprehensive Disaster Risk Management Plan. The plan makes provision for pro-active disaster risk reduction and disaster response strategies, and this is in line with Target E of the Sendai Framework for Disaster Risk Reduction. The project was commissioned in December 2018, but due to the Covid-19 pandemic, several challenges were experienced that delayed the completion of the project. However, these delays presented unique opportunities to foster cooperation between various institutions and across various subject disciplines. As part of the project closure activities, the project team was invited to present key findings at a project validation workshop, which involved the Major of Ezulwini Local Municipality, members of parliament representatives from the Eswatini National Disaster Management Agency and community members. During the workshop the research team presented the three Volumes of the reports i.e., Volume 1: Governance and institutional arrangements for Disaster Risk Reduction; Volume 2: Disaster Risk Assessment and Risk profiling for the municipality; and Volume 3: Disaster Response and Recovery Plans. The participants involved in the workshop gave valuable inputs towards the finalization of the project and commended both the team and municipality on a job well done. The comprehensive disaster management plan is envisaged to allow the municipality to adapt and respond to current and future disaster risk much more efficiently, leading to the protection of the lives and livelihoods of at-risk communities.

From left to right: Front row - Mayor of Ezulwini Municipality Cllr. Bongile Mbingo, Ms Xolile Maphanga, Manager in the Department of Public Health and Environment and Prof Nemakonde (NWU)

Back row - Dr Sizwile Khoza (NWU) and Prof Christo Coetzee (NWU)

Group photo of workshop participants

Prof Coetzee (NWU) presenting

Reflecting on the First Three Quarters

NWU ecotoxicology researchers representing Africa on a global scale

Hannes Erasmus
Water Research Group (WRG)

A group of 15 colleagues and students from the Unit for Environmental Sciences and Management (UESM) presented their research at the 32nd Annual Meeting of the Society of Environmental Toxicology and Chemistry (SETAC) Europe conference between 15 and 19 May 2022 in Copenhagen, Denmark. SETAC is the forum to facilitate interdisciplinary communication among biologists, chemists, engineers, environmental scientists, managers, toxicologists, or others interested in environmental issues. The theme of the 32nd Annual meeting was "*Towards a reduced pollution society*".

Researchers from various UESM research groups, including En*vitro*X (6 members), Soil Ecotoxicology (2 members) and Water Research Group (7 members) presented three oral and 14 poster presentations. A variety of topics were addressed and ranged from laboratory-based studies to field studies in terrestrial, fresh water and marine ecosystems. These included the effects of platinum on aquatic ecosystems; the use of passive samplers; mercury concentrations in elasmobranchs; other elemental concentrations in marine species, as well as marine fish parasites as effect indicators; organochlorine pesticides in African leopards; using Bayesian neural network models to assess stressors in a transboundary river; ecological consequences of altered water quality; bioaccumulation testing strategy for nanomaterials; cytotoxic effects of biopesticides; effects of pesticides in soil ecosystems; endocrine disruptive effects in freshwater ecosystems; soils used for agriculture, face mask leachates, as well as sediments in South African harbours; and monitoring COVID-19 in wastewater. Based on these topics it is evident that the NWU plays an important role in ecotoxicological research on an African and global scale and that the outputs are world class.

Participation of postgraduate students in international conferences is supported and encouraged by the UESM where travel bursaries are awarded to students who have published in internationally accredited journals. This is an ideal opportunity for postgraduate students and researchers to network and establish collaborations at an international level.

Figure 1: Researchers from the UESM who attended the conference in Copenhagen. From left to right: Dr Oladayo Idris, Dr Wynand Malherbe, Artimisia Monjane-Mabule (Ph.D. candidate), Prof Nico Smit, Ilzé Horak (Ph.D. candidate), Dr Suranie Horn, Annika Kruger (M.Sc. student), Monique Labuschagne (M.Sc. student), Dr Anja Erasmus, Prof Rialet Pieters, Marelize Labuschagne (Ph.D. candidate), Dr Hannes Erasmus, Prof Mark Maboeta, Ryan Uren (Ph.D. candidate), and Prof Victor Wepener.

Reflecting on the First Three Quarters

18th International Symposium on Microbial Ecology (ISME) Conference

Adekunle Raimi & Nolwandle Khumalo

The 18th ISME conference was hosted in Lausanne, Switzerland from 14 to 19 August 2022. The ISME conference, which is organised biennially, is the front runner in the field of microbial ecology. This year, about 2000 scientists from over 50 countries attended the conference, showcasing their research outputs and innovative ideas from the diverse field of microbial ecology research.

The scientific programme covered interesting topics, including molecular plant-microbial interaction, ecological drivers of microbes in foods, metabolic interactions in microbiomes, soil and marine microbial ecology, as well as host-microbe and microbe-microbe interactions. Aside from the opportunity to present our research outputs in the poster session, the conference provided our team with the opportunity to relate with other intellectuals in the field of microbial ecology and gain more understanding in the area of plant-microbe interactions and their potential application in agroecosystems, which represent the main focus in our research team. In addition, the conference has broadened our knowledge and experience, while connecting with other scientists.

Some of the post-conference fun activities that we could make time for while visiting Switzerland included a visit to the famous Olympic museum, lake Geneva and, of course, tasting and bringing home some of the delicious Swiss chocolate.

We are looking forward to the 19th ISME conference, which will be hosted in Cape Town, South Africa in 2024!

Finally, we appreciate the financial support received from the Unit for Environmental Sciences and Management (UESM), North-West University and the National Research Foundation (NRF). We also acknowledge our supervisor, Prof Rasheed Adeleke, and the UESM Research Director, Prof Carlos Bezuidenhout, for their full support and guidance.

Left to right: Prof Rasheed Adeleke, Mmanoko Napo, Sinawo Tsipinana, Adekunle Raimi, Nolwandle Khumalo

Reflecting on the First Three Quarters

That time we went to Marion Island

Michelle Hamman
Persistent Organic Pollutants (POPs)

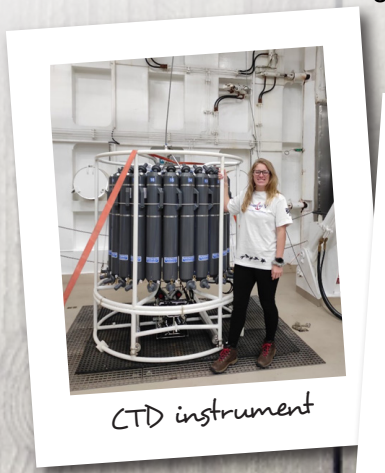
SEAmester - South Africa's Class Afloat – aids in achieving a highly competitive marine science standard through gathering various cohorts of students from cross-disciplinary fields. The network of collaboration between students and teachers contribute to filling the capacity needs of South African marine science as a whole. In line with the Phakisa Operation, which President Zuma officially launched in 2014, SEAmester aims to close the gap between theoretical and workplace learning.

As part of the 15 participating universities, MSc student Michelle Hamman from the Persistent Organic Pollutants (POPs) research group was selected as a North-West University representative for the 2022 SEAmester cruise. The SA Agulhas II departed on the 5th SEAmester cruise on the 27th of June 2022. The students boarded the vessel with lots of excitement, not sure what exactly to expect. During the first few days the students were divided into two groups for guided tours around the vessel. The "*Tools of the Trade"* group learned techniques in data collection, marine instrumentation and the technology behind the ship-based physical and biological instrumentation. The "*Oceans in a Changing Climate"* group learned more about life in the Sea and interaction between the ocean and the global carbon cycle, and the dynamics between the ocean and atmosphere. The "*Tools of the Trade"* group started each day with their theory classes, where the "*Oceans in a Changing Climate"* group started with deck work. After lunch the groups switched, and only got together for *Ocean Dynamics*, the theory class for both groups. The science team, lecturers and students came together after dinner, and the lecturers shared more on their research and interesting findings.

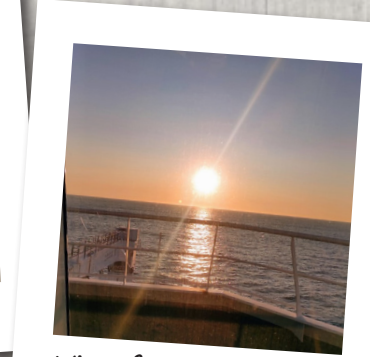
Between weather balloon launching, arts and crafts breaks (including mosaic and photography classes), seal dissections, invertebrate collection, CTD (Conductivity, Temperature, Depth) sample analyses, and watching the sunsets with new friends, the highlight of the trip was the visit to Marion Island. After the distress "medivac" call from the Island, the SA Agalhas II entered the Southern Ocean waters and spend the whole of the 4th of July rescuing two scientists from the island. Facing various obstacles, the crew eventually got everyone on board and the vessel turned back to Cape Town. During the last day on the vessel, all the students had the opportunity to present the projects they worked on with their on-board-supervisors, and presented an art show to showcase their mosaics and photographs. The journey ended with a volleyball game and a braai on the helipad marking the end of, yet another, successful SEAmester experience.

SEAmester is funded through the National Research Foundation (NRF) (South Africa) and Department of Science and Technology (DST), and logistically supported by the Department of Environmental Affairs (DEA). The Agulhas Systems Climate Array (ASCA) is funded through the DST/SAEON/DEA/NIOZ/RSMAS/NSF partnership.

See the SEAmester website here.

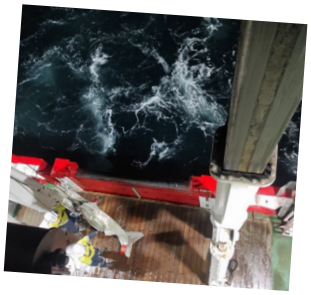


CTD instrument



View from whale and birding room, facing the front of the ship

Marion Island



Night sampling

Reflecting on the First Three Quarters

Home- and health clinic gardens researcher at NWU visits the University of Missouri in the United States

Nanamhla Gwedla
Urban Ecology Research Group

In June 2022 Dr Nanamhla Gwedla from the Urban Ecology research group, under the mentorship of Prof Sarel Cilliers, visited the School of Natural Resources at the University of Missouri (MU) in the United States. This was part of the University of Missouri South African Education Program (UMSAEP) and funded through the UMSAEP Partnership Award, which is aimed at building scholarly collaborations with colleagues from MU and selected South African universities. The visit was in relation to the ongoing research on home and health clinic gardens in the North-West province. The aim was to gain insights into different models of community gardening and the extent to which indigenous vegetation is incorporated in gardens around Columbia and St Louis, Missouri.

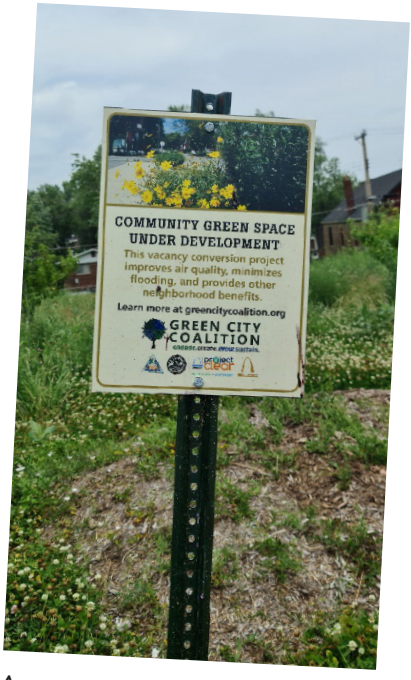
Dr Gwedla visited various types of community gardens and learned about the different governance and management models that make these types of gardens work. She interviewed some of the people with plots in community church gardens. Congregants volunteer in these gardens, and the produce is donated to the food bank in Columbia. She learned about community gardens on vacant lots in St Louis, and how they are dedicated to preserving native vegetation.

She also engaged with scientists from the Center for Agroforestry at MU. Her interest in cultural heritage preservation through incorporating indigenous plants for food and human well-being saw her visit the Land of the Osages Research Farm. The farm is dedicated to "research and training opportunities focusing on traditional ecological knowledge and its potential applications in modern agroforestry and Ozark farms" (MU, 2022). These engagements came at an opportune time for her guest attendance at the annual Elderberry Conference. Dr Gwedla and colleagues from NWU and MU are hopeful for a collaboration focused on home gardens in the North-West province, South Africa, and Columbia, Missouri.

Dr Gwedla in the St Joseph's Street Community Garden developed and maintained by residents and the Community Garden Coalition in Columbia, Missouri.

Volunteers at the Inter-Faith Community Garden, Columbia, Missouri.

Dr Gwedla standing on the western edge of Lake of the Ozarks at the Land of the Osages Research Farm.



A community garden for native plants in a vacant lot in St Louis, Missouri.

Reflecting on the First Three Quarters

A Naturalist's Dream Come True: Seeing southern Africa through plants, lichens, wildlife, and the people who call this spectacular land their home

Nishanta Rajakaruna
GeoEcology Lab

I first visited South Africa in 1999 to attend my first International Serpentine Ecology Conference. Within hours of landing, I experienced something I have yet to anywhere else in the world: The Zulu taxi driver who dropped me off at the motel said, when I realized I did not have enough rand to pay, that he would return after the weekend to get paid. How he trusted a total stranger amazes me to this day. This is the South Africa I first got to know, have come to love, and want to get to know more. My first South African friend was Stefan Siebert. As conference roommates, we quickly realized that we shared a passion for sport as well as serpentine ecology. Stefan introduced me to my favorite South African pastimes: delicious braai over red wine and Amarula and Rooibos tea to top it off! 22 Years later, thanks to a Fulbright US Scholar Award, I now have the pleasure of spending 10 months with Stefan and his colleagues, teaching and mentoring students and advancing our collaborative research on geoecology.

I arrived in South Africa in early August just in time to embark on a month-long field expedition with the Gypworld team consisting of Spanish, Turkish, and South African scientists and students. We travelled 8500 km through northern Cape to the Namib Desert and then back down to the western Cape to present papers in the session on 'Plant Life on Atypical Soils' at the MEDECOS conference. The plants, lichens, landscapes, and wildlife I encountered not only gave me a solid introduction to the fascinating natural history of southern Africa but also to the many people who call this land their home. During our visit to the Gobabeb Namib Research Institute, I saw my first *Welwitschia mirabilis* – an ancient lineage of plants endemic to coastal deserts from central Namibia to southern Angola. Having first heard of this plant as an undergraduate, I couldn't believe I had the good fortune of being in its presence. From witnessing Blue Cranes on a superbloom, ostriches on the sand dunes, Greater flamingos taking flight, and an ancient Quiver Tree forest, I now have a sense of how wondrous this country is and how blessed I am to be its visitor. And, this is just month 1 of my 10-month stay.

Capers on coral reef islands: Part 5 Rodrigues: It had its own Dodo species

Henk Bouwman

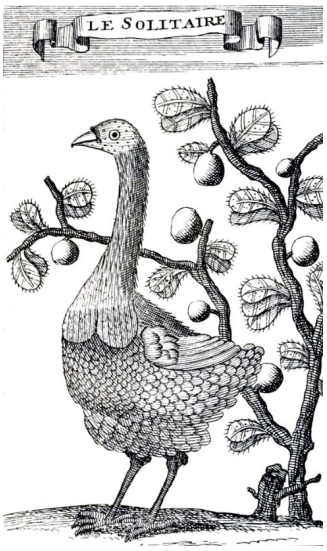
There is a beautiful volcanic island 580 km to the east of Mauritius called Rodrigues. It is much smaller than Mauritius at 108 km^2 and is an autonomous region of the Republic of Mauritius. About 45 000 people live there but Rodrigues was only inhabited starting on and off from 1691 by French and Dutch, and later British settlers, and slaves from Africa and Asia. Because of its remoteness, many species are endemic, including plants, birds, two giant tortoises, as well as its only mammal, the Rodrigues Flying Fox (a fruit bat).

The Rodrigues Flying Fox.

Remarkably, and in parallel with Mauritius, a dodo-like flightless bird, the Rodrigues Solitaire (*Pezophaps solitaria*) evolved from pigeons to the size of swans. It became extinct in the same way as the Mauritian Dodo, sometime in the late 18th century. Rodrigues has a fascinating history, of which you can read more here.

Skeleton of the Solitaire, the Rodrigues dodo. Many skeletons have been found.

It is of course the biology that got me there more or less by accident. As part of the Blue Skies project about pollutants in the Western Indian Ocean, I was exploring Google Maps, when I 'discovered' this island. This island was not part of the original plan but was instantly incorporated. My first excuse to go there was to collect tern eggs for Persistent Organic Pollutants (POP) analyses. Fortunately, my friend Robert Choong Kwet Yive, a lecturer (now Professor) is from Mauritius, and together we contrived an expedition.



The Solitaire, drawn by Francois Leguat (1708), the leader of the first settlement (Wikipedia).

Now, we were not doing a highly dangerous survival-type expedition. We flew there with Air Mauritius in a small turbo-prop aircraft, rented a bakkie, and stayed at a 'French' hotel with a chef. We visited the forest research station, plenty of beaches, small settlements, and explored the (small) capital of Port Mathurin, the most laid-back capital I have ever been to. All in the name of cultural orientation and preparation for our expedition, of course.

Île aux Sables from the air.

The terns breed on a small sandy island, Île aux Sables, a small bird reserve in the lagoon, 1.5 km long and 150 m wide, which we reached by tourist boat. This was also my first encounter with the fabulous Fairy Tern, about which I wrote previously. The Fairy Terns were rare so we limited ourselves to Sooty Terns and Common (Brown) Noddies. The birds are incredibly

Common Noddies.

tame, and you can approach them within arm's length. What was meticulously planned to take two days was accomplished in two delightful hours. The only injury was a scratch on my hand from an angry mother when I pushed her of her egg. These birds double-clutch, and since their global populations are in the millions, there was no impact. The remaining time was allocated to culinary and cultural enrichment, discussing philosophy and future research opportunities (yeah right).

Very effectively, doing two days of work in two hours.

First class ride for the eggs, without a boarding pass.

The eggs were flown back with us in a cooler bag and given its own seat. It turns out that the tern eggs from Rodrigues had the lowest levels of pollutants of any similar marine bird, worldwide. It may seem a waste of time, but global changes in POPs can only really be followed from attenuated changes in low background levels, since high-pollutant sites experience high variations that therefore take long to indicate global trends. Two papers followed and the data enriched further papers.

Vista of the island. The next bit of land is Australia.

Since then, I have been to Rodrigues a few times. What remains to be mentioned is that the coral reef lagoon that surrounds the entire island is about the same surface area as the island itself, and incredibly beautiful – opportunities we explored later. If I could, I would retire there.

Addo Elephant National Park: insects associated with Cycads

Paul Janse van Rensburg & Johnnie van den Berg

Cycads are among the most threatened group of organisms worldwide. Their numbers are declining rapidly all over the world, and South Africa is no exception. Poaching for the horticultural trade has already wiped out several South African species, and many more are facing the same fate. A further matter of concern is the disappearance of pollinators. The codependency between cycads and their pollinators may render both especially sensitive to cycad population decline. South Africa has several such 'functionally extinct' cycad populations, whose remaining individuals produce viable seeds only after artificial pollination. Even so, there are some success stories of cycads prevailing despite the enormous obstacles they face.

Stretching across 170 000 hectares, the Addo Elephant National Park (AENP) contains an impressive representative sample of the Eastern Cape's unique mix of biodiversity. Five species of *Encephalartos* occur in AENP, two of which are Endangered and the rest Near Threatened. These cycads are well guarded against theft and a healthy balance of immature and mature stages are present.

***Encephalartos longifolius* in the Darlington section of Addo Elephant National Park.**

Cycads are home to a great diversity of cycadivorous insects, none more so than the genus *Encephalartos*. Curculionoidea and Cucujoidea beetles of several families represent the majority of associations and many are important pollinators. In order to gain insights into these associations, we study the abundance and species richness of insects associated with *Encephalartos* species in AENP.

Amid growing concerns about the future survival of cycads, our findings are encouraging. Species of several insect taxa were observed in a variety of interactions with cycads, ranging from simple herbivory to mutualistic pollination. We observed the herbivory of young leaflets by the larvae of *Zerenopsis lepida* (Lepidoptera: Geometridae) and recorded the presence of two stem borer species, *Phacecorynes sommeri* (Coleoptera: Curculionidae) and *P. variegatus*. We also recorded additional records of the cycad-specific *Apinotropis* weevil (Coleoptera: Anthribidae) feeding in the dead leaf stalks of *Encephalartos* species. Specialist consumers of female cones included species of *Amorphocerus* (Coleoptera: Curculionidae) and the seed predator *Antliarhis zamiae* (Coleoptera: Brentidae).

Erotylidae beetle (a) and larva (b).

***Porthetes* weevil (c) and larva (d).**

However, the most significant findings are the presence of two types of beetles that are pollinating cycads in AENP, namely *Porthetes* weevils and still undescribed species of Erotylidae beetles. Pollen appears to adhere particularly well to the cuticle of adult beetles visiting cones. They have a unique mutualistic relationship with cycads. In exchange for transporting pollen, the cycads offer their male cones as an insect nursery where eggs are laid and larvae feed on the carbohydrate-rich cone tissue. The feeding behaviour of larvae may also provide an additional service by aiding the rapid degradation of metabolically expensive cones after pollen shedding has ceased.

These discoveries may also have value for other South African cycads where the beetles have disappeared. Many questions remain regarding the host specificity of cycad pollinators. The majority of *Porthetes* weevils have only been recorded from a single host and seem to exhibit a degree of host specificity. The Erotylidae beetles associated with *Encephalartos* species remain undescribed and there is little information about their host specificity. Perhaps a pollinator insect that indiscriminately pollinates cycads may be discovered and can be transferred to other cycad populations.

Serpentine Geoecology: Thinking beyond the Mediterranean Biome

Nishanta Rajakaruna & Stefan Siebert

GeoEcology Lab

Ultramafic rocks (e.g., peridotite, serpentinite) are found along continental margins, faults, and shear zones on almost all continents and island arcs on the planet (Rajakaruna and Boyd, 2014). Serpentine soils weathered from such rocks are generally deficient in essential plant nutrients (e.g., Ca, N, P) and have elevated levels of Ni and Cr. Although the physical features of serpentine soils can vary considerably, they are generally found in open, steep landscapes, are often shallow and rocky, and may have reduced water retention capacity. Due to intense selective pressures generated by such stressful conditions, serpentine soils promote speciation and the evolution of serpentine endemism, contributing to unique biotas worldwide, including floras with high rates of endemism and species with disjunct distributions. Research on serpentine soil biota has contributed greatly to the development of ecological and evolutionary theory and to the study of the genetics of adaptation and speciation (Harrison and Rajakaruna, 2011). Plants growing on serpentine soils also provide genetic material for phytoremediation and phytomining: green technologies used to reclaim metal-contaminated sites and extract valuable metals from metal-enriched soils, respectively (van der Ent *et al.* 2015). However, most of our understanding of ultramafic plant ecology comes from Mediterranean and temperate biomes, raising questions about the generality of plant responses to ultramafic soils. This is especially the case in tropical ultramafic ecosystems which exhibit a wide range of endemism and differentiation between ultramafic and adjacent non-ultramafic soils. A team of 17 researchers from 11 countries, including the Geoecology Labs of the North-West University and the California Polytechnic State University, synthesized what is known about the ecology of tropical and sub-tropical ultramafic ecosystems in The Americas (Puerto Rico, Dominican Republic, Cuba, Guatemala, Costa Rica, Colombia, Venezuela, Brazil, Mexico, Nicaragua, Jamaica, Guiana Shield), Southern Africa (Zimbabwe, South Africa, Eswatini, Botswana, Cameroon, Angola, and Zambia), South and Southeast Asia (Sri Lanka, India, Malaysia, Indonesia, The Philippines), and New Caledonia, and highlight areas for future research in a comprehensive treatment in *The Botanical Review*, a leading international journal noted for its in-depth articles on a broad spectrum of

Figure 1a. Ussangoda Serpentinite Outcrop on the Southern Coast of Sri Lanka.

Figure 1b. Nickel hyperaccumulating *Evolvulus alsinoides* from Ussangoda Serpentinite Outcrop, Sri Lanka.

botanical fields. The review illustrates how tropical and sub-tropical ultramafic floras are diverse and variable in plant form and function due to the interactive effects of biogeography, climate, and soil properties. It further stresses that the variability in patterns of endemism, specialization, and stress tolerance traits across tropical ultramafic ecosystems have implications for their management and conservation. Additionally, many tropical/subtropical ultramafic ecosystems that remain understudied are noted, including in Madagascar, Angola, Cameroon, and Zambia. While floristic diversity of outcrops in New Caledonia, Malaysia,

Figure 2a. Sassenheim Serpentinite Outcrop near Barberton, South Africa.

Figure 2b. Nickel hyperaccumulating *Berkheya nivea* from Nelshoogte Serpentinite Outcrop, South Africa.

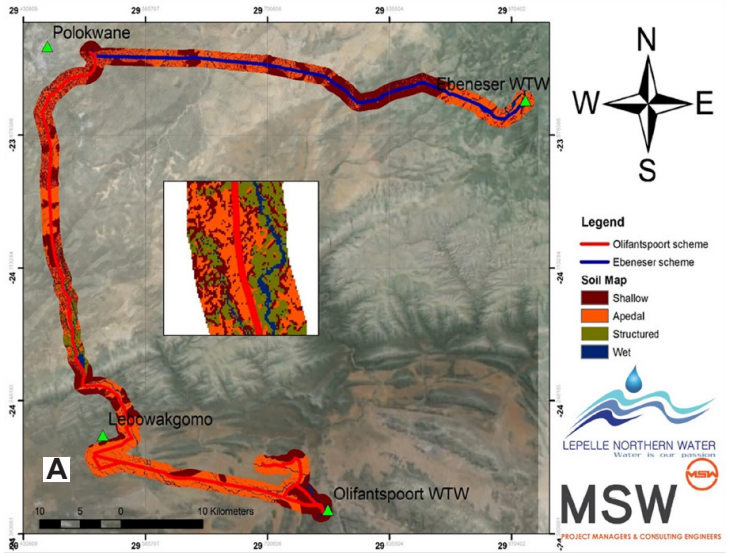
Sri Lanka (Figure 1a, b), and South Africa (Figure 2a, b) are fairly well documented, there is limited research in experimental ecology or in evolutionary studies, compared to the Mediterranean. The authors hope to inspire collaboration among plant community ecologists, physiologists, geologists, and soil biologists to address novel tests of macroecological and macroevolutionary theories in topical ultramafic systems as has been done extensively in the Mediterranean and temperate climes.

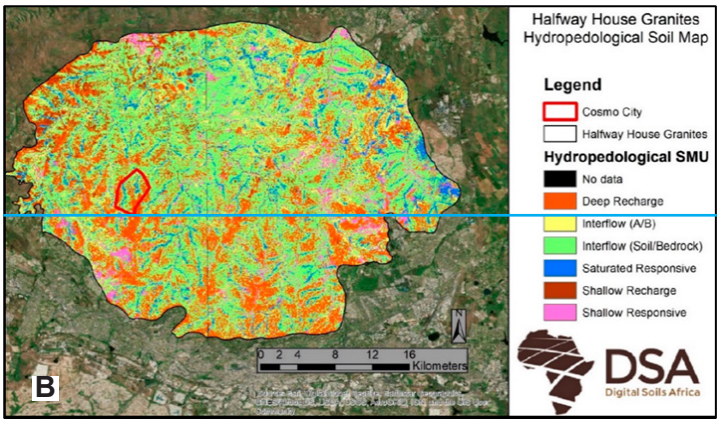
Digital soil mapping, making soil maps quicker, accurate and useful

George van Zijl
Pedometrics Research Group

Digital soil mapping (DSM) is a research and application field whereby soils can be mapped quicker, easier and therefore cheaper than with conventional methods. It is based on the concept that soils are not distributed randomly in the landscape, but is the result of the interactions between the five soil forming factors i.e. climate, organisms, relief, parent material and time (Jenny, 1941). Therefore, there is a relationship between soil distribution and the environment. Generally, maps for different environmental factors are readily available, such as digital elevation models (DEM's) from which numerous terrain variables can be derived, satellite images (and their derivatives, such as Normalized Difference Vegetation Index, NDVI) and geological maps. These environmental maps are called environmental covariates, as they vary together with the soil variation. If the relationship between the soil and the environmental covariates can be deciphered, the covariates can be used to determine the soil distribution.

In southern Africa, three different DSM approaches have been formalized through research, and shown to work in the real world, with application through consultation projects. Land Type disaggregation is a desktop method and has been used for Environmental Impact Assessments (EIA's). With the expert knowledge approach, the soil surveyor's mental soil distribution model is quantified as the soil-environment relationship,





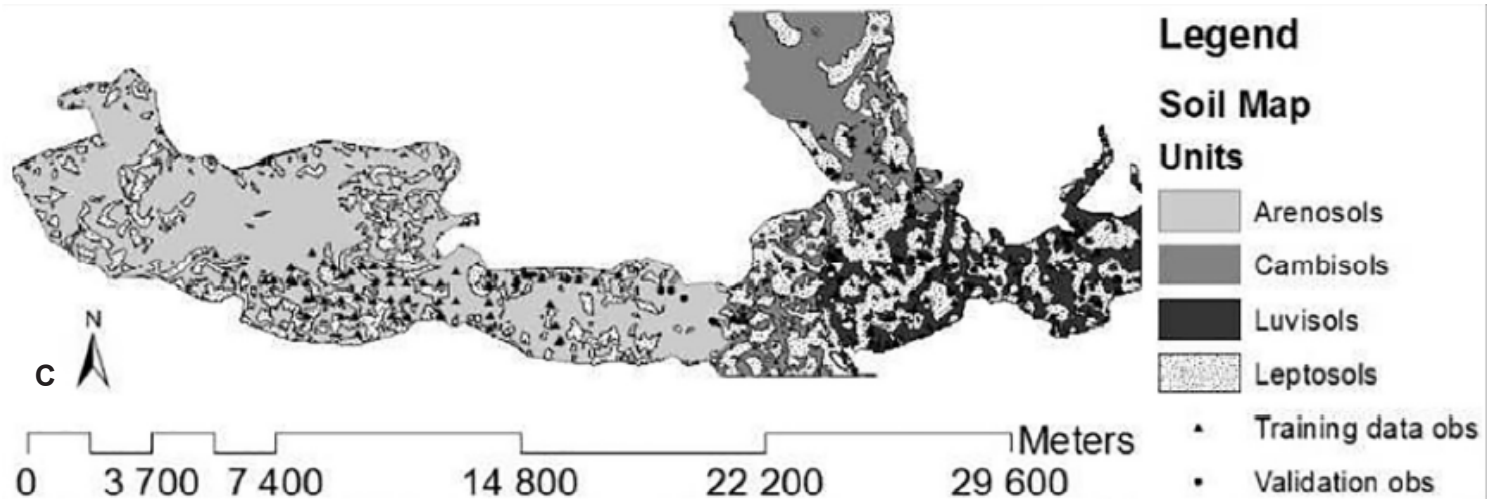


Figure 1: Examples of maps created with different DSM approaches, A – land type disaggregation (From van Zijl, 2019), B – expert knowledge (From van Zijl *et al.*, 2012), C – machine learning (From van Zijl *et al.*, 2020). Note the increase in complexity and size from A – C.

and has been used for hydrology, conservation and forestry. Through the application of machine learning algorithms, data heavy (and often large) areas can be mapped automatically. It has been used for mapping soil erosion susceptibility, hydrological modelling, urban land use planning and production potential mapping. The application of DSM maps tends to be on large areas, with the projects listed occurring in areas between 4000 and 144 000 ha. Examples of soil maps created by the different approaches are given in Figure 1.

The current thrust in DSM research at the NWU is using DSM to create soil maps for hydrological modelling of large catchments. Six large and diverse catchments, each with an ecological and/or economic importance, will be mapped and the hydrology thereof modelled during the HYDROSOIL WRC funded project. Catchments include the Sabie-Sand (Mpumalanga), Upper Olifants (Mpumalanga and Gauteng), Jukskei (Gauteng), Umgeni (KwaZulu Natal), Tsitsa (Eastern Cape) and Goukou (Western Cape) rivers (Table 1 and Figure 2).

Additionally, the use of DSM methods will be explored to enhance the current precision agriculture methodology in South Africa. This includes the inclusion of Gamma Radiometrics as an additional covariate, carbon accounting auditing in fields farmed regeneratively and reducing the number of samples required for accurate soil mapping for precision agriculture use.

Table 1: The sites selected for the HYDROSOIL research project, with their significance and sizes.

Site	Quaternary Catchments	Unique Significance	Size (km²)
Sabie	X31 and X32	Environmental significance / EFTEON site	5 043
Olifants	B11	Coal mining	4 698
Jukskei	A21, B, C and E	Urban development	1 583
Umgeni	U20G	Sugar Cane farming	499
Tsitsa	T35E	Soil Erosion	494

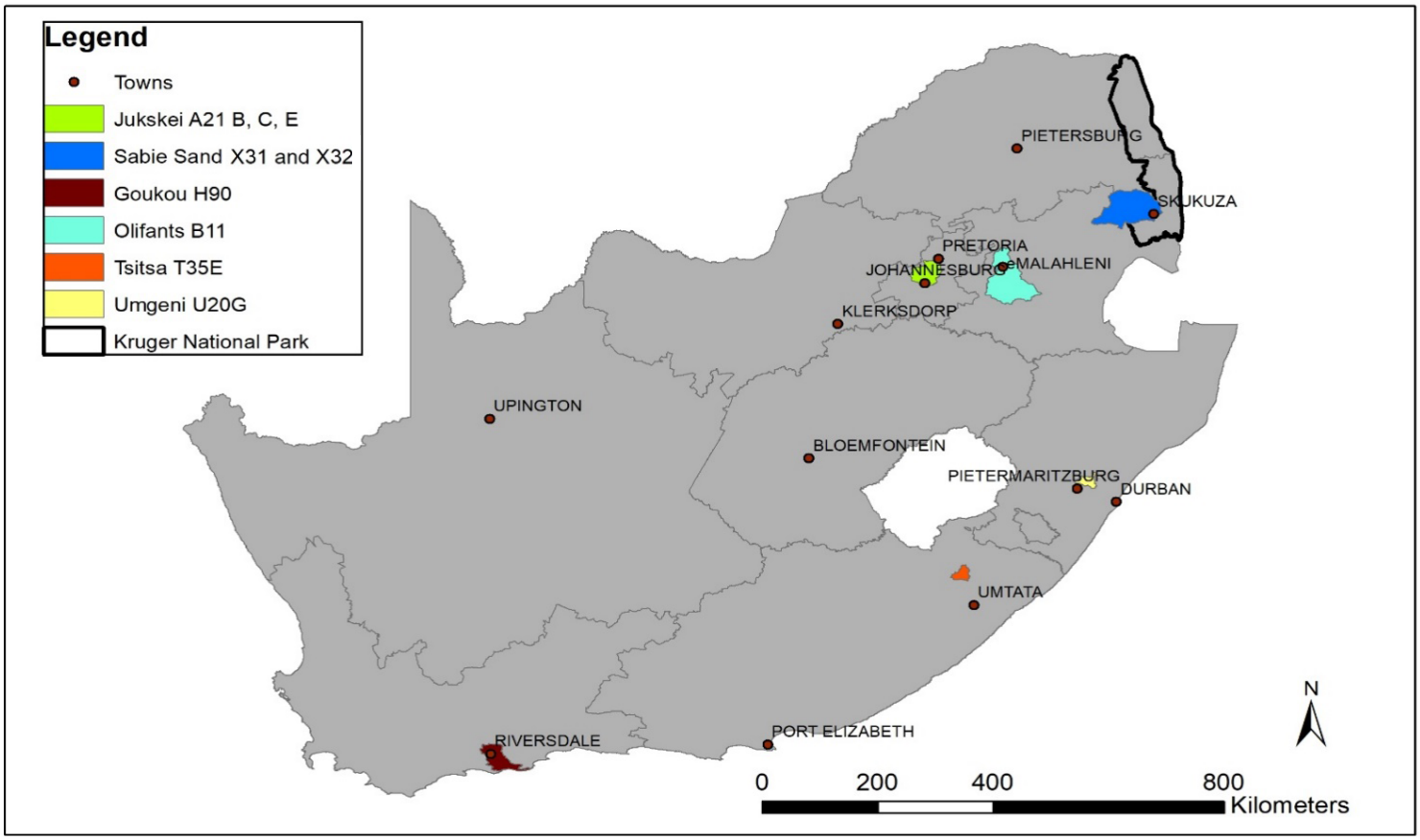


Figure 2: Sites selected for the HYDROSOIL WRC Project.

Pesticides induce oxidative stress: the need for *in vitro* studies in South Africa

Ilzé Engelbrecht, Suranie Horn & Rialet Pieters
Envitrox

Although beneficial in reducing pest-associated crop losses, applied pesticides end up in non-target environments as complex mixtures. When bioavailable, these chemicals pose a threat to organisms and can cause a series of different adverse health effects, for example, oxidative stress—an imbalance between reactive oxygen species production and a biological system's ability to neutralise these radicals. Prolonged oxidative stress can cause reactive oxygen species such as hydrogen peroxide, superoxide and hydroxyl radicals to directly interact with proteins, lipids, and nucleic acids leading to effects such as protein carbonylation, lipid peroxidation, and DNA damage. This is worrisome as oxidative stress has been linked to the pathogenesis of several diseases, including diabetes, Parkinson's disease, and even cancer.

In South Africa, pesticides have been detected in various biotic and abiotic matrices, including marine organisms; freshwater fish; frogs; aquatic bird eggs; marine-, surface-, ground- and drinking water; soil; sediment; and air. This highlights the degree to which the South African environment is polluted with pesticides. Globally, the pesticides most often investigated for their oxidative effects include chlorpyrifos, glyphosate-based herbicides, imidacloprid, atrazine, cypermethrin, and deltamethrin. Since all these pesticides are registered for use in South Africa, there is a need to screen environmental samples (i.e., soil, water, sediment, and biota) for their potential to induce oxidative stress.

Under laboratory conditions, oxidative stress endpoints (e.g., reactive oxygen species production, antioxidant enzyme activities, and lipid peroxidation) can be measured *in vivo* or *in vitro*. Although *in vivo* tests are very useful for whole-organism assessment, there is a need to reduce animal-testing and rather use non-animal-based approaches—the so called "new

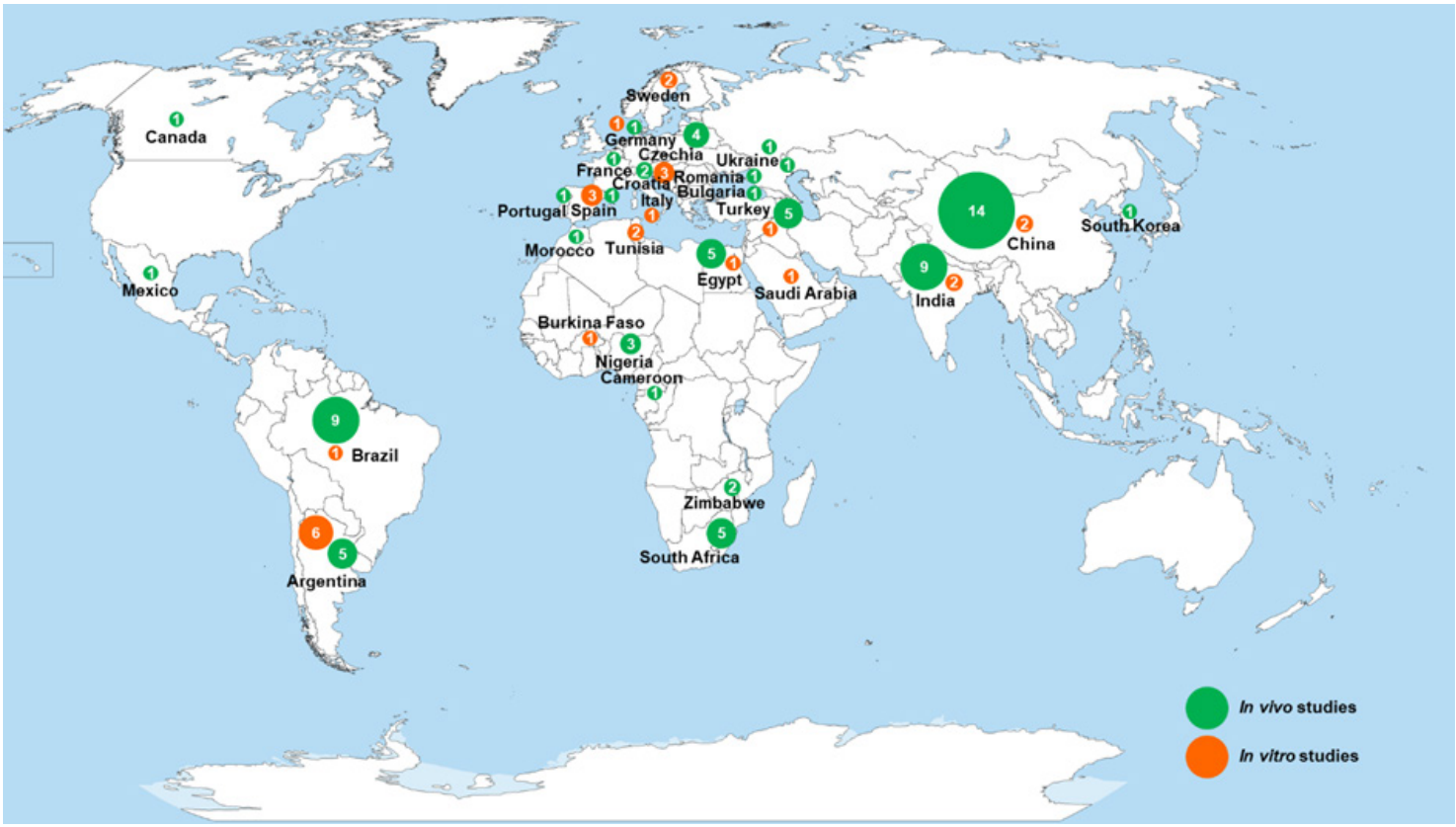


Figure 1. The number of studies worldwide investigating pesticide induced oxidative stress in the last decade (2012 to 2022). The size of the circles indicates the number of studies investigating *in vitro* (red) and *in vivo* (green) studies.

approach methodologies" which are in line with the 3Rs principle (Replace, Reduce and Refine). Cell-based *in vitro* bioassays are a useful alternative that tick several boxes required for ecotoxicological investigations: (i) highly sensitive and able to detect responses in the range of ng/mL, which are more comparable to environmental pesticide concentrations; (ii) able to provide information on basic mechanistic processes; (iii) good predictors of certain *in vivo* effects; (iv) allow for the high-throughput screening of environmental samples to identify pollution "hotspots"; (v) able to assess the effects of a wide range of environmental matrices (e.g., surface water, effluent, soil, sediment); and (vi) available tissue cultures for various mammalian models, including humans.

Although *in vitro* approaches to assess oxidative stress are used internationally, no studies have been published for South Africa. South African studies have only assessed oxidative stress *in vivo* (Figure 1). Since oxidative stress responses are activated and measurable at lower cellular concentrations, *in vitro* oxidative stress bioassays should be used as an early warning sign for the potential toxicity of chemical mixtures in the environment. It will therefore be worthwhile for South Africa to include *in vitro* oxidative stress bioassays as part of a battery of tests to screen environmental matrices for other biological endpoints such as endocrine disruption, xenobiotic metabolism, hepatotoxicity, and neurotoxicity. This will facilitate the development of more effective biomonitoring programmes, thereby safeguarding the environment and its biota.

Further reading:

Cortés-Iza, S.C., Rodríguez, A.I., 2018. Oxidative stress and pesticide disease: a challenge for toxicology. *Revista de la Facultad de Medicina*, 66(2), 261–267. https://doi.org/10.15446/revfacmed.v66n2.60783

Ilboudo, S., Fouche, E., Rizzati, V., Toé, A.M., Gamet-Payrastre, L., Guissou, P.I., 2014. *In vitro* impact of five pesticides alone or in combination on human intestinal cell line Caco-2. *Toxicology Reports*, 1: 474–489. https://doi.org/10.1016/j.toxrep.2014.07.008

Limón-Pacheco, J., Gonsebatt, M.E., 2009. The role of antioxidants and antioxidant-related enzymes in protective responses to environmentally induced oxidative stress. *Mutation Research/Genetic Toxicology and Environmental Mutagenesis*, 674(1–2): 137–147. https://doi.org/10.1016/j.mrgentox.2008.09.015

Measuring the local weather conditions along the Comrades Marathon route

Henno Havenga
Climatology Research Group (CRG)

Background

Every year since 1921, athletes across South Africa join in fellowship to run through one of South Africa's most scenic landscapes, along the rolling hills of rural KwaZulu-Natal and the iconic Valley of a Thousand Hills. The route, with these rolling hills and valleys, is home to the Comrades Marathon, South Africa's most iconic running event. The 90 km route alternates between these two towns every year. During the up run, participants run from Durban at the coast to Pietermaritzburg, and vice versa during the down run.

The Comrades marathon's status as the premier ultra-marathon event means it has attracted over 15 000 participants over the past 30 years. These athletes, and athletes competing in similar outdoor events, are exposed to complex microclimates along the 90 km route, which can contribute to the incidence of medical conditions. The most common condition often faced by endurance athletes is heat stress. Heat stress is more than just the temperature of the ambient environment which causes you to feel warm. Other variables, such as shortwave radiation from the sun and longwave radiation from the surface, wind direction and speed, relative humidity, the clothes you wear and metabolic activity, lead to differential heat stress conditions.

The Field Project

To better understand heat stress conditions, the NWU's Climatology Research Group (CRG) has teamed up with the University of Pretoria's Sports Medicine and Lifestyle Institute (SEMLI) and the Comrades Marathon Association to deploy a suite of instruments along the 90 km route. During this project, a team of 10 dedicated CRG members deployed wind speed and direction sensors, rain gauges, temperature and relative humidity sensors and ambient particular matter sensors at critical points along the route. Along with these instruments, a Sporetrap Pollen and Fungal instrument was also deployed with the help of Prof Frank Neumann and Dr Dorra Ghabi. The Sporetrap can capture biological material to help quantify agents that lead to allergenic responses (more information here).

This deployment aimed to help elucidate which environmental factors lead to medical incidents along the route. Previous research has only examined these factors using a proximity station along the whole course. This station would often be far from the actual route and not be representative of the conditions that athletes experienced. With our deployment, we will be able to provide an accurate estimation of the exact weather conditions experienced by participants, between the valleys and peaks and the urban and rural environments they run through.

The NWU team getting ready for deployment by checking all the instruments the day before the event.

Tjaart Van Der Walt from the NWU team at one station along the route. The station consists of several instruments that measure weather conditions and air pollution.

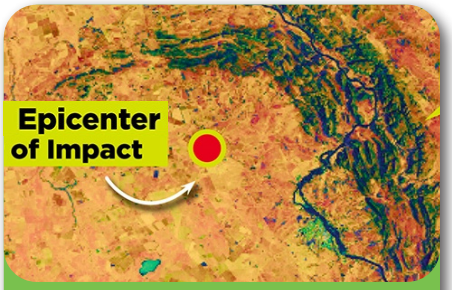
Healthy Environments for AthleTes (HEAT)

The success of the first deployment led to NWU CRG and SEMLI establishing a working group, **H**ealthy **E**nvironments for **A**thle**T**es (HEAT). HEAT aims to deploy and set the standard of environmental monitoring during endurance events in the future, particularly events which cover vast distances and across complex terrains. HEAT also seeks to examine the future of sporting events under changing climate conditions during which warmer conditions are predicted for South Africa. Under these conditions, event organizers and participants must be aware of the risks to ensure safe participation by implementing mitigation measures based on sound scientific advice.

The deployment would not have been possible without the dedicated team members who endured early mornings and long working days during the event day. The team consisted of PW Brendenkamp (PhD Student), Gerhardt Botha (MSc student), Gabbriela Khumalo (MSc student), Lisa Pienaar (MSc student), Nike Jacobs (Postdoc), Dorra Gharbi (Postdoc), Phumelo Nkosi (Intern), Tanya Sellick (Intern), Tjaart Van Der Walt (Technician), and Aneska Richter (MSc student)

The NWU team at halfway standing with the event Mascots, who showed a keen interest in the science.

SCIENCE FACT BOX

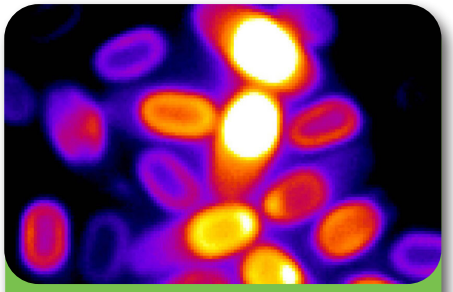


Vredefort - Asteroid larger than expected

Unicorns of the sea - Narwhal behaviour

Machine Learning - Predictable chaos

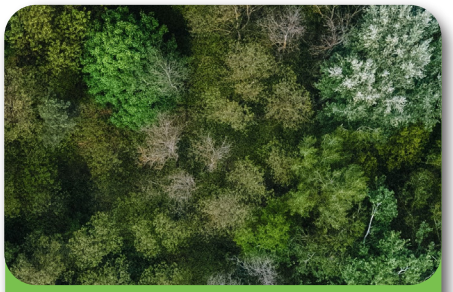
Climate change ages lizards prematurely



How dormant bacteria comes back to life

How many ants live on Earth?

Lava waves predict volcanic lows

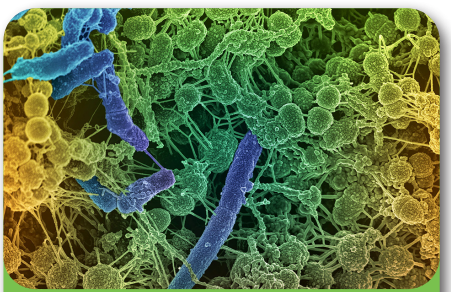


Status of arboreta in South Africa

Making beer taste even better

Back to the forest - Spix's macaw

Extinct cockroach reappears



Grasp complex gut microbes - Physics

Entrepreneurship in Biological Sciences

Clarissa Minnaar

After spending time with UESM alumni, Bianca Peterson, young professional and owner of her own company, I realized two things. Firstly, any experience gained during your studies is never futile. Secondly, your connections and networking skills may be one of your greatest assets towards building a successful future. This, however, does not go without diligent and dedicated effort aimed towards your final goal.

Whilst pursuing her doctoral degree in Environmental Sciences, under the supervision of Prof Carlos Bezuidenhout, challenges came about with Bianca's data. At that time, she didn't posess the necessary data science skills to analyse her own data, which meant that the data analyses had to be outsourced. With the support of Prof Carlos, she attended a Data Carpentry workshop. She gained a great deal of knowledge on data analysis and visualisation and soon became the go-to-person when somebody needed help with their data analyses.

The Data Carpentry workshop led her to becoming a certified Software and Data Carpentry instructor. She has since co-taught multiple Data Carpentry workshops on coding and data science skills nationally and internationally. In 2016, Bianca's application was successful, and she attended the first CODATA-RDA School of Research Data Science hosted by the International Centre for Theoretical Physics (ICTP) in Trieste, Italy.

Prof Sandra Barnard who was familiar with Bianca's data analysis skills, suggested that she should start her own data analysis company after completing her PhD in 2017. It became clear that there was a great need for foundational data analysis training programmes, tailored to the specific research project at hand. Bianca obtained information and advice from her connections and got her business registered.

In 2018 Bianca founded her company, Conquest Analytics and Training, which offers consultancy, data analysis and hands-on training workshops. These workshops aim to teach data analysis as well as help workshop attendees visualise their data and write reports. Typical programmes that she provides training in include OpenRefine for data cleaning, and Unix Shell and R for data analysis and visualisation. Bianca is particularly skilled in Molecular Biology, Environmental Microbiology, Polymerase Chain Reaction (PCR), and Next-Generation Sequencing (NGS) analyses.

Through Bianca's story, we get to see how experience, personal network and determination can be valuable resources on the path to becoming a thriving entrepreneur.

Bianca's website: https://binxiepeterson.github.io/

Quick Info & Tips by Bianca

Most challenging experience as an entrepreneur:

To be taken seriously and to convince people that you have the skills, even though you are young!

Most enjoyable part of being an entrepreneur:

Flexibility in your schedule.

Tips on getting a business registered:

Decide *what* skills you have and do research to determine what the market *needs*. Consider at least 3 attractive business names, submit your business registration application on the CIPC website. Thereafter, open a bank account for your business, and that's it!

Tips for aspiring entrepreneurs, currently in pursuit of Biological Sciences degrees:

Though it may seem daunting at first, even a *small* step in the right direction will get you to your goal. Just keep going!

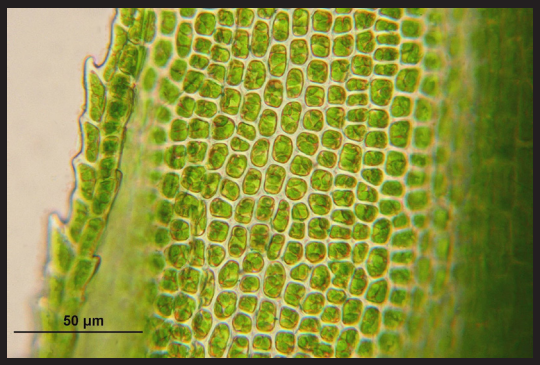
Greatest lesson learned:

Consistency is key! Every small, seemingly unrelated, event may be important to complete the puzzle. Have faith in your dream.

Why entrepreneurship?
We have another postgraduate competition in the pipeline and with this article, we aim to get your *innovative* juices flowing.

What can *you* do?
Start thinking about how your research can generate income and create job opportunities for others.

Instead of asking "Where will I find a job after university?", let's start asking "How can I create jobs for others when I leave?"
Prof Carlos Bezuidenhout



Photography Competition

We invite all UESM staff members, postdoctoral fellows, and postgraduate students to participate in this year's photography competition.

Show off your *Spectacular* photographs / videos!

Photographs / videos taken with professional cameras will be judged separately from those taken by lower-quality cameras (see Rules and Guidelines and Entry Form for details).

Entries are accepted in any of the following prize-winning categories:

Photographs

- Landscape photography
- Macro-organisms / wildlife
- Micro-organisms / microscopy
- Funny features and creatures

Videos

- Spectacular / Extraordinary
- Funny features and creatures

Strictly **one photograph / video per category** will be allowed which totals to a maximum of four photographs and two videos per participant.

Winners will be announced in the *Summer* edition.

Competition Rules and Guidelines & Entry Form

Photo submission deadline:

31 October 2022

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Interactive buttons

Hobby Showcase:
Environmental Management

Photography
Coréne van der Merwe

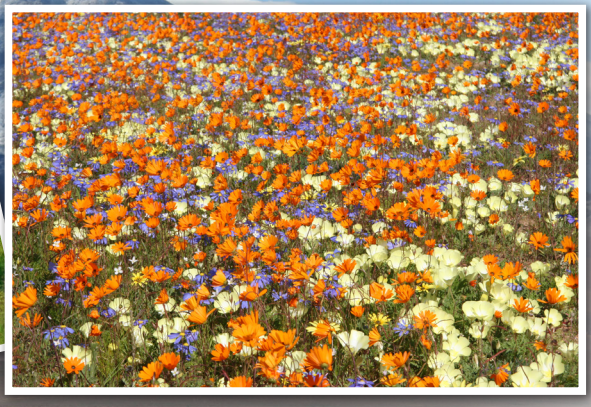
Trail Running
Dirk Cilliers

Golf
Francois Retief

Hobby Showcase:
Environmental Management

Ultra Marathon Running
Reece Alberts

Hiking / Nature Trails
Claudine Roos



Photography
Theunis Meyer

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Acknowledgements

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- Tsebo Mothibedi, for her willingness to participate in this edition's interview
- All authors who readily shared their accolades, community projects, hobbies, reflection pieces, and research with readers of this edition
- Bianca Peterson, the director and trainer at Conquest Analytics and Training, for her time for sharing her knowledge on Entrepreneurship in Biological Sciences, as a foundation for our future entrepreneurship competition
- Prof Nishanta Rajakaruna for editorial assistance to this edition.

All your contributions are greatly appreciated.

Keep a look-out for the upcoming *Summer* edition 2022. We are looking forward to another incredible photography showcase.

Until next time.

Frances and Clarissa

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