

UESM Newsletter

Autumn Edition 2022





News Flash Articles



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Sub-Programme
Leaders**



A stormy night on La Derive



**Showcase:
Environmental
Management**



**Effect-directed monitoring
of water quality**



**Interview with Prof
James Chakwizira**



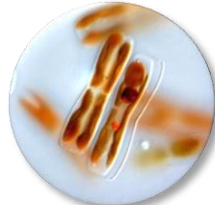
Visiting Scientists



Polar bear protection



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Insect life on a Cycad plant



Scientific Fact Box



**UESM Hobby
Showcase**



New book in Springer Series

Editorial

As the year progresses, the wheels start to turn faster, urging us on to keep the pace. Sometimes it feels too fast too soon. Yet, we remain grateful for the slow return to 'normal' after the pandemic - for being able to do the things that energise and excite us.

The fast-paced year is reflected in the many activities captured in this Autumn issue of ENVIRA. For instance, Botany at NWU hosted a national conference, which was successfully coordinated across the Mafikeng and Potchefstroom campuses - a highlight to kick off the academic year. Furthermore, our colleagues have already won awards and been honoured by international scientists, whilst the *Calliper* shows how our researchers have raised the bar during 2021. In the *News Flash* articles, it is once again inspiring to read that UESM research remains relevant and influential, but also enjoyable. Yes, hard-working colleagues and students do maintain a good, healthy balance - our *Hobbies* section attests to this.

And if being desk bound gets to you, put on comfortable shoes and go for a walk on the *Tree Route* before the leaves start to fall.

Enjoy the Easter season!

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



Elephant enjoying some forbs.
Photo by Elaine Slooten

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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 on this link to visit the UESM eFundi portal:

<https://efundi.nwu.ac.za/portal/site/f39464c0-cfe7-41c4-9ab1-5bbea6d0afbc>

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

POST-GRADUATE COMPETITION

Can you condense your entire research project into one graphical abstract?

View the ENVIRA Autumn Edition 2022 Post-graduate Student Competition [here](#).

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:

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

More information on Ethics [here](#).

REMEMBER TO 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!

ANNOUNCEMENTS

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 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.

NEWLY APPOINTED PERMANENT STAFF MEMBERS



The **School of Geo- and Spatial Sciences** would like to officially welcome:

Professor Frank Neumann

who has joined their team as the Geology Subject-head on 1 January 2022.

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

Theo Motsagi

on his appointment as the Senior Laboratory Assistant in Zoology as from February 2022.

Theo is, however, familiar to UESM colleagues, as he used to be the Laboratory Assistant to the School of Biological Sciences until February 2022



Congratulations

The following awards and accolades demonstrate the high quality and significant impact of research and teaching within the UESM.

National Research Foundation (NRF) rated researchers: 2022–2027

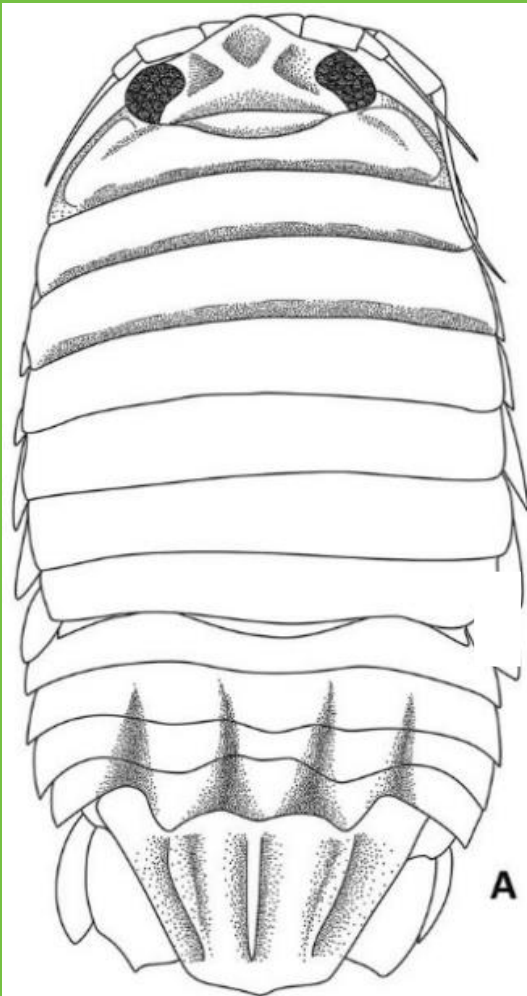
The research rating system of the NRF acknowledges the quality of South African researchers. Researchers that apply for a rating, are evaluated by national and international researchers, and then rated according to the quality and impact of their research over the past eight years.

The following researchers from the UESM were rated as follows:

	Rating	Newly rated / Re-evaluation	Sub-programme
Dr Reece Alberts	Y2	New evaluation	EM
Prof Ernst Drewes	C2	Re-evaluation	SPDI
Prof Dirk Cilliers	Y2	New evaluation	EM
Prof Christo Coetzee	Y2	New evaluation	DRS
Prof Hannalene du Plessis	C2	New evaluation	IPM
Prof Louis du Preez	B2	Re-evaluation	AEH
Prof Rialet Pieters	C2	Re-evaluation	AEH
Prof Francois Retief	B2	Re-evaluation	EM
Prof Stefan Siebert	C1	Re-evaluation	EIER
Prof Frances Siebert	C2	New evaluation	EIER
Dr George van Zijl	C2	New evaluation	EIER
Prof Ché Weldon	C1	Re-evaluation	BCE

Acronyms: EM - Environmental Management; SPDI - Spatial Planning, Development, and Implementation; DRS - Disaster Risk Studies; IPM - Integrated Pest Management; AEH - Aquatic Ecosystem Health; EIER - Ecological Interactions and Ecosystem Resilience; BCE - Biodiversity and Conservation Ecology.





Metacirolana nicosmiti



Prof James Chakwizira

Congratulations to Prof James Chakwizira on the Springer series book *Green Economy in the Transport Sector: A Case Study of Limpopo Province, South Africa*, for which he was one of the three editors.

Furthermore, Prof Chakwizira has also been appointed by the Minister of Agriculture, Land Reform and Rural Development to serve on the South African Council of Planners (SACPLAN: 2021 -2025).

Read more about the book under the [News Flash article](#), and more on the professor behind these achievements in the [Interview](#) section.

Mr Anru Kock

Mr Anru Kock (PhD student) received an award for the best Soil Science presentation by a young researcher at the 2022 *Combined Congress*. The *Combined Congress* is the annual congress of three scientific societies, including Soil Science Society of South Africa (SSSSA), Southern African Society for Horticultural Sciences (SASHS) and the South African Society of Crop Production (SASCP). The title of his presentation was ‘Mid-Infrared Spectroscopy Calibration Models for Soil Property Prediction Within The Western Highveld’, which was based on his Masters research supervised by Dr George van Zijl and Dr Dimakatso Ramphisa (Co-supervisor).

Prof Nico Smit and Dr Kerry Malherbe

Research by these colleagues from the Water Research Group in the Aquatic Ecosystem Health sub-programme, has been acknowledged internationally through the publication of an article in the [Discover Magazine](#) on the tongue-replacement parasites.

Prof Nico Smit has also been honoured by colleagues from Australia, who named a new species of *Isopoda* after him. The new species is from the coral reefs of Fiji and is named *Metacirolana nicosmiti*. The [paper](#) describing the new species was published in the December 2021 issue of the journal *Marine Biology Research*. The etymology (explanation of the new name) published in the paper is as follows:

Etymology: The epithet honours Professor Nico Smit, in recognition of both his contribution to knowledge of the Isopoda, primarily fish parasites, of southern Africa, and to his influence as a colleague and mentor to numerous young scientists.

This is the second species carrying his name, the first is also an isopod, *Lobothorax nicosmiti* and was published early in 2021.

Prof Nishanta Rajakaruna

The Fulbright Program recently awarded a scholarship to Prof Nishanta Rajakaruna, an Extraordinary Professor in the UESM, to visit the North-West University for 10 months. Prof Rajakaruna is from the California Polytechnic State University (Cal Poly), San Luis Obispo (USA), and this award forms part of the Fulbright US Scholar Program. Read more about his prospects for his visit in the [Visiting Scientists](#) section of this edition.



NWU TEACHING AWARDS



SANBI

South African National Biodiversity Institute



Biodiversity for Life



Mr Tsumbedzo Ramalevha

Tsumbedzo Ramalevha has been elected on the 2022 Steering Committee for the Graduate Student Network of South African Environmental Observation Network (SAEON). Tsumbedzo is a PhD student from the Forb Ecology Research Group under the supervision of Prof Frances Siebert and Dr Dave Thompson from SAEON. Read more about the SAEON graduate network [here](#).

Teaching Excellence Awards (TEA)

The NWU Teaching Excellence programme at the Centre for Teaching and Learning recently acknowledged distinguished teaching by academic staff. The TEA award for excellent teaching acknowledges lecturers who make important contributions to the promotion of students' learning through creating and developing innovative learning environments. This year, the following colleagues received this prestigious TEA award:

	Entity	Campus
Prof Rasheed Adeleke	School of Biological Sciences	Potchefstroom
Prof Jaco Bezuidenhout	School of Biological Sciences	Potchefstroom
Dr Christo Coetzee	African Centre for Disaster Studies	Potchefstroom
Dr Claudine Roos	School of Geo- and Spatial Sciences	Potchefstroom
Dr George van Zijl	School of Geo- and Spatial Sciences	Potchefstroom
Dr Adeline Ngie	School of Geo- and Spatial Sciences	Vaal

Dr Madeleen Struwig and Dr Anatoliy Levanets

The South African National Plant Checklist is maintained by SANBI and forms the taxonomic backbone for botanical research projects in South Africa. It currently covers the bryophytes, pteridophytes and lycophytes, gymnosperms, and angiosperms. Algae will be included in the checklist in future. A Plant Checklist Committee was established in 2014 to assist the Plant Checklist Coordinator and to play a leadership role in South African plant taxonomy, by ensuring that the National Plant Checklist is maintained at an internationally acceptable standard and that problems regarding the following of certain taxonomic treatments can be dealt with in a transparent manner.

Congratulations to Drs Madeleen Struwig and Anatoliy Levanets for their election to the SA National Plant List Committee.

Dr Madeleen Struwig also serves as a council member of the South African Associate of Botanists (SAAB). The SAAB council assists the SAAB president on various matters relating to the functioning of SAAB and the South African Journal of Botany.



Special mention of Professors **Adeleke, Piketh, Siebert, Smit and Wepener** for making both top 10 lists for 2021.

You inspire us!

How the top 10 most cited researchers of 2021 were determined:

This list is based on the 2021 citations of UESM-affiliated researchers as reflected by SCOPUS on 23 February 2022. All academic staff of the UESM were considered, but excluding extra-ordinary appointments, postdoctoral fellows and postgraduate students.

How the top 10 most prolific publishers of 2021 were determined:

This list is based on the 2021 publications of UESM-affiliated researchers as reflected by SCOPUS on 23 February 2022. All academic staff of the UESM were considered, but excluding extra-ordinary appointments, postdoctoral fellows and postgraduate students.

Top 10: SCOPUS 2021 PUBLICATIONS

	<u>Sub-programme</u>	<u>Number of Publications 2021</u>
Prof Nico Smit (B3)	AEH	25
Prof Stuart Piketh (B2)	CCAQI	16
Prof Rasheed Adeleke (C2)	EIER	15
Prof Driekie Fourie (C1)	IPM	15
Prof Victor Wepener (C2)	AEH	14
Prof Louis du Preez (B2)	BCE	12
Prof Stefan Siebert (C1)	EIER	11
Prof Hector Chikoore (unrated)	CCAQI	10
Prof Francois Retief (C1)	EM	9
Prof Frances Siebert (C2)	EIER	9

CITATIONS

	<u>Sub-programme</u>	<u>Number of Citations</u>
Prof Sarel Cilliers (C1)	EIER	509
Prof Henk Bouwman (C1)	AEH	483
Prof Victor Wepener (C2)	AEH	467
Prof Johnnie van den Berg (B1)	IPM	430
Prof Nico Smit (B3)	AEH	426
Prof Ché Weldon (C1)	BCE	370
Prof Stuart Piketh (B2)	CCAQI	346
Prof Stefan Siebert (C1)	EIER	344
Prof Rasheed Adeleke (C2)	EIER	317
Prof Carlos Bezuidenhout (C3)	AEH	293

*Codes after names reflect NRF ratings

Research Ethics in Environmental Sciences and Management

Meet the FNAS research ethics committee members from the UESM:



*Prof
Roelof
Burger*



*Madelien
Burgers*



*Dr
Leandri
Kruger*



*Dr
Sheldon
Strydom*

Roelof Burger & Madelien Burgers

The Senate has decreed that all research, including those by MSc and PhD students, should have an ethics number and all studies need an ethics review. Higher degree administration requires that all students have a unique ethics number before they are allowed to submit. Ethics approval is only given for one year. Renewal of the ethics certificate is done after an annual review. Researchers and supervisors should be cognisant that ethics approval should be obtained before research can start.

What you need to know about ethics in the Unit for Environmental Science and Management

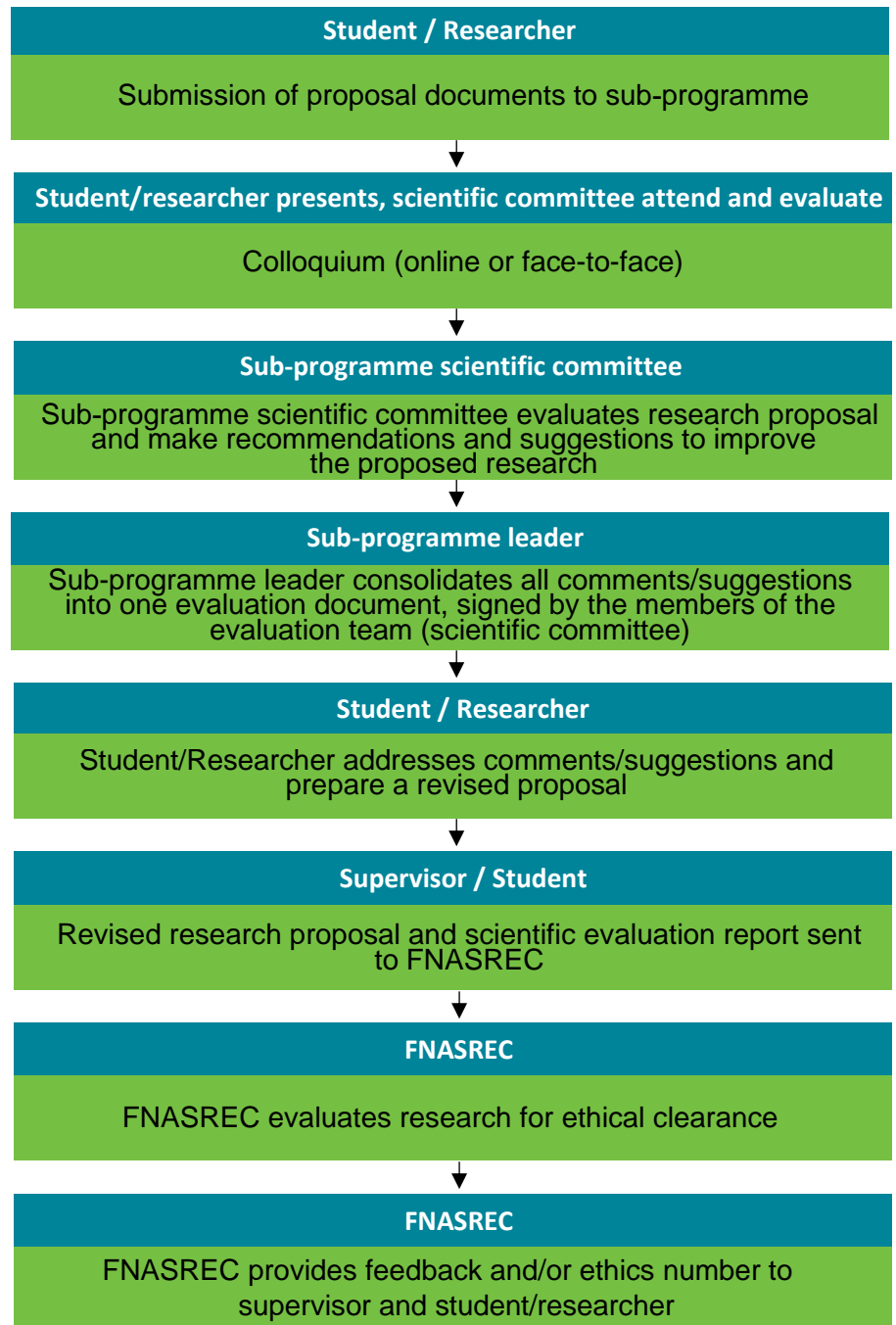
1. All research needs to be reviewed by one of the ethics committees at the NWU, including masters and doctoral students.
2. No research is allowed to start without an ethics number.
3. No student is allowed to submit his dissertation without an ethics number from one of the NWU ethics committees.
4. The ethical responsibility of student studies lies with the supervisor, not the student.
5. For low and no risk studies, the process is fairly quick and painless. Start by submitting an application to <https://tinyurl.com/fnasrec>

See the full ethics process on the next page.

Upcoming FNASREC meeting dates 2022

21 April	25 August
26 May	29 September
30 June	27 October
28 July	24 November

The Ethics process:



Note that MSc and PhD students need to provide an ethics number BEFORE they can register the title of their research at the Faculty.

All research projects with ethics numbers should be reviewed annually.

Click [here](#) for more on the dates, procedures, forms and information to obtain ethics approval described on the FNASREC page.

Having trouble accessing the page? Follow this [link](#).

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

Madelien Burgers: 37630067@nwu.ac.za

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

UESM Sub-programme Leaders 2022

Aquatic Ecosystem Health



Prof Jonathan Taylor

Biodiversity & Conservation Ecology



Prof Louis du Preez

Climate Change, Air Quality & Impacts



Prof Roelof Burger

Disaster Risk Studies



Prof Dewald van Niekerk

Ecological Interactions & Ecosystem Resilience



Prof Frances Siebert

Environmental Management



Dr Claudine Roos

Integrated Pest Management



Prof Johnnie van der Berg

Spatial Planning, Development & Implementation



Prof Ernst Drewes

Environmental Management Masters Programme

Claudine Roos

The Masters programme in Environmental Management was established more than 25 years ago and has evolved into a programme with four specialization streams – Waste Management, Ecological Water Requirements, Conservation Leadership, as well as Air Quality and Climate Change, alongside the original programme. Currently, three of these programmes are offered by the NWU: (i) Masters in Environmental Management; (ii) Masters in Environmental Management with specialization in Waste Management; and (iii) Masters in Environmental Management with Ecological Water requirements. The other two programmes will be offered as from 2023.

Each programme is coordinated and facilitated by a programme manager, with the Environmental Management (SP4) sub-programme manager, Dr. Claudine Roos, being responsible for overall coordination of the existing programmes, and Prof. Francois Retief being responsible for the coordination of new specialization programmes.

The programmes aim to build environmental management capacity required to manage human activities sustainably. Emphasis is placed on the development of analytical skills and critical thinking through high quality research outputs. This will enable students to compete with confidence as environmental management professionals locally and internationally.

The programme consists of lectured academic modules, as well as a dissertation, based on a completed research project. It is offered part-time over two years, with theory modules presented in year 1 and the research component completed in year 2.

[Meet our students here.](#)

Environmental Management Programme Managers 2022



**Masters in
Environmental
Management**

Mr Theunis Meyer



**Masters in
Environmental
Management
with Ecological
Water
Requirements**

Dr Wynand Malherbe



**Masters in
Environmental
Management
with Waste
Management**

Dr Claudine Roos

2023



**Masters in
Environmental
Management with
Conservation
Leadership**

Prof Francois Retief & Dr Reece Alberts



**Masters in
Environmental
Management
with Air Quality
and Climate
Change**

Mr Phathu Mukwevho



General

Where did you grow up? Harare, Zimbabwe.

What is your favourite family tradition? Getting together for Christmas and engaging in family tree renditions, Christian songs, and prayers.

What do you tressure most about SA culture? The food and traditions but above all I think the resilience, diversity, and inclusivity of the cultures is just phenomenal.

As a kid, what did you want to become when you grow up? A soccer player.

Have you ever wished to meet any fictional character in real life? If so, which character would it be? Bart Simpson from the Simpsons series. The series is a satirical depiction of American life, epitomized by the Simpson family. Bart's role, sense of self knowledge, adventure and humour just blows me away.

What is the most courageous thing you have done in your life? Skydiving, it's an unnerving, yet exhilarating experience. On reflection, I would love to do it again.

What is the closest you've come to death? I had a car accident on

Professor James Chakwizira

Interview by Clarissa Minnaar

29 January 2000. To this day, it remains unexplainable how I escaped with only a collar bone injury. I was coming from the University of Venda driving to Makhado when both of my front car tyres burst. The car became uncontrollable and veered off the road. It bumped several times on the curb before I lost consciousness. I woke up in the middle of the road and quickly realised I needed to move away. How I got ejected from the car, I do not know since my seat belt was fastened, windows closed, and doors locked, and it remained so even after the crash. The car was a write off.

What was the last song you sang out loud in your car? 10,000 Reasons (Bless the Lord) - Matt Redman

If you could pick a theme song to describe your life, what song would you choose? God Will Make a Way - Don Moen

What will you say if you were given a free sixty second advert slot during a broadcasted sports game? Play with passion, live your

dreams, enjoy the moment, teamwork is key and celebrate the success.

If you could eliminate one weakness or limitation in your life, what would it be? I am a perfectionist, striving for perfectionism in everything I do or am involved in. I think this puts too much pressure on others as well as on myself.

Favourite quote or motto you live by? "If I have seen further than others, it is by standing upon the shoulders of giants." Sir Isaac Newton

Career / NWU related

Where did you get your tertiary schooling? I did my undergraduate- and post-graduate studies at the University of Zimbabwe, Erasmus University Rotterdam (Netherlands), University of KwaZulu-Natal (SA), University of Venda (SA), Chartered Institute of Logistics and Transport (UK) and National Institute of Public Administration (INTAN) (Malaysia).

Favourites

Childhood game Seesaw

Smell Morning Dew

Music genre Gospel

Sport Soccer, Cricket & Rugby

Cereal Nature's Path Smart Bran

Pizza toppings Hawaiian (Ham & Pineapple)

Celebrity The late Archbishop Desmond Tutu

Disney movie Tarzan

Hobby Meditating, Reading & Writing

Colour socks to wear Neutral coloured

What other jobs did you hold before starting at the NWU?

Various, but I started off working Town Planner, Department of Physical Planning, Ministry of Public Works, Local Government and National Housing, then worked as a Lecturer at University of Zimbabwe, and worked as Deputy Director of the Building Technology Institute, Scientific and Industrial Research and Development Centre (SIRDC), Harare, Zimbabwe. After filling various other positions at different institutions, I was eventually appointed as Senior Lecturer and Head of Department: Urban and Regional Planning, Faculty of Science, Engineering and Agriculture, University of Venda until I resigned to join the NWU.

How did you become interested in Urban and Regional Planning?

I was always fascinated by how rural settlements were organised (or not so organised) and laid out. I dreamt that one day I would plan and change the spatial structure and arrangement of rural settlements. This interest was always re-kindled when I visited home (rural/communal areas).

Which project that you were involved in was most challenging, but also most rewarding in terms of academic growth?

Various, but I'll highlight one. The development and implementation of training material and modules for the Spatial Planning and Land Use Management Act (SPLUMA, 2013), as well as national training and capacity building training sessions.

What is the most exciting project on your research plan for 2022?

I am looking forward to work on a decarbonisation project for South Africa / Africa with Prof Stuart Piketh. I think this would be opportune and very critical once we are able to secure funding for the project.

This or that?

Chocolates or biscuits	Chocolates
Chicken fillet or beef steak	Beef steak
Breakfast or no breakfast	Breakfast
Mild or spicy	Spicy
McDonald's or Burger King	McDonald's
City or countryside	Countryside
Rain or sun	Sun
Work: from home or in an office	Both
Text or phone call	Both
Visit the future or past	Future

Do you have rituals you carry out before doing a presentation?

Let's call them preparation fulfilment requirements: Taking deep breaths; practising and rehearsing the presentation many times before the day of presentation; meditation and thoughtfulness in which I rehearse and anticipate possible questions and answers from the audience. I make sure I sleep well the night before and eat well the morning of the presentation. I also pray for wisdom and humility during the engagement.

What do you consider your greatest career achievement?

Being appointed as the Deputy Chairperson for the South African Council of Planners – SACPLAN 4 (2017 – 2021) and being the Chairperson of the Committee of the South African Planning Schools (CHOPS) for two successive terms.

What do you wish to accomplish during your four-year period as chairperson of the SACPLAN council, Education and Training Committee?

This will be my second and last term before I can take a break from serving the planning profession community. I am appointed to be Chairing the Education and Training Committee (ETC), which is key with respect to accreditation of planning schools, transformation of planning schools

as well as soliciting bursaries for planning students. I expect that in our committee we will be able to conduct outstanding accreditations that were deferred back because of COVID-19, refine the blended accreditation criteria and processes as well as secure bursaries for planning students in planning schools. I'd like to see that the identification of planning work for planners is finalised, improving the financial sustainability of the council as well as improving the marketing and brand of the planning profession nationally.

You have recently published a book, *Green Economy in the Transport Sector, A Case Study of Limpopo Province, South Africa*.

What would you like the main take-home message to be for readers of the book?

The Global South (GS) in comparison to the Global North (GN) is unique in its environments, dynamics, and realities. Unfortunately, the GS lacks in knowledge surrounding complex green economy and transport transition socio-economic and environmental systems. Therefore, this book aims to address these knowledge gaps and to highlight areas for future projects and research to move towards a low carbon economy.

Prof Rajakaruna to visit the NWU as a Fulbright US Scholar

One of the UESM Extraordinary professors, Nishanta 'Nishi' Rajakaruna from the California Polytechnic State University (Cal Poly), San Luis Obispo has been awarded a Fulbright US Scholar Award to spend 10 months at the North-West University. Nishi Rajakaruna is a leader in the field of serpentine ecology and has published 95 peer-reviewed publications and two leading books in the field. He has traveled widely and has collaborations in Iran, Russia, Sri Lanka, India, in addition to South Africa.

The Fulbright Program is devoted to enhancing mutual understanding between citizens of the United States and the people of other countries and is considered as the world's largest and most diverse international educational exchange program. Since its inception in 1946, more than 400,000 Fulbrighters have participated in this prestigious program. Fulbright alumni include 61 Nobel Laureates, 89 Pulitzer Prize winners, 76 MacArthur Fellows, 40 Heads of State of Government, and leading journalists, artists, scientists, and teachers.

During his time as a Fulbright Scholar at NWU, Prof Rajakaruna will co-teach a postgraduate course in Geocology with his host and collaborator, Prof Stefan Siebert, and carry out descriptive, experimental and applied research in geocology with students and postdocs of Prof Siebert and his collaborators. He also has invitations for presenting seminars and for initiating collaborative projects from University of Pretoria, University of Witwatersrand, University of Cape Town, University of KwaZulu-Natal, University of Western Cape, University of Limpopo, and University of Fort Hare, as well as South African National Parks and South African National Biodiversity Institute. Prof Rajakaruna will also guest lecture in several botany-focused courses at NWU, including Environmental Botany and Plant Ecology and participate in outreach efforts carried out by Prof Frances Siebert and colleagues in rural Limpopo and Lekwana Nature Reserve, as well the NWU Botanical Garden. Prof Rajakaruna has served as Cal Poly's Faculty-in-Residence for the past four years and will be collaborating with Dr Corrie Rheeder, Director of Student Life at NWU, on projects on approaches to building community on residential campuses.

This is Prof Rajakaruna's second Fulbright US Scholar Award. His first was to his motherland, Sri Lanka, in 2016-2017 where he conducted research at National Institute of Fundamental Studies, and visited the Aligarh Muslim University in India for presenting seminars and workshops and initiating collaborative research. His efforts during his first Fulbright led to numerous publications and conference presentations with Sri Lankan students and scientists, research seminars at many secondary schools and universities, and opportunities to interact with and mentor students from all ages. Prof Rajakaruna is excited about his upcoming year in South Africa, where he hopes to foster long-lasting personal and professional relationships with the people of South Africa.



Prof Nishanta Rajakaruna





I really enjoyed working with a variety of different students from different academic institutions across South Africa - it is truly a network by students for students! Serving on the GSN provided me with the opportunity to give back to the scientific community while also benefiting by gaining new skills and knowledge. I am very grateful for being afforded this amazing opportunity, thanks to everyone that made the journey extra special and all the best to the new committee!

~ Marlize Muller ~

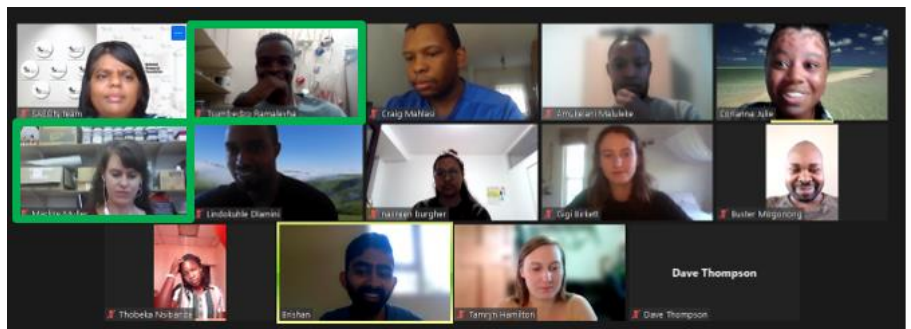


FERG PhD students take part in SAEON-GSN

Tsumbedzo Ramalevha

Graduate students of today will no doubt become the scientists of tomorrow. The South African Environmental Observation Network (SAEON) established a Graduate Student Network (GSN) in 2006 to promote interaction among graduate students within the realm of long-term environmental research (LTER) in South Africa. PhD students in the NWU's Forb Ecology Research Group (FERG) have been fortunate in being selected on this prestigious committee. Marlize Muller formed part of the SAEON-GSN committee for the past two years (March 2020 - February 2022) as an internal communication liaison member, while Tsumbedzo Ramalevha will form part of the 2022 - 2023 GSN committee, taking over from Marlize as the member to oversee internal communication. The GSN is a multidisciplinary network of young scientists working across various fields in environmental sciences with the aim of deepening engagement, communication and academic excellence among students in South Africa. As a network, the GSN ensures that young scientists are kept up to date with groundbreaking research information as well as long-term ecological monitoring. This is achieved mainly through networking with fellow students and obtaining new information from top scientists within SAEON and its national- and international collaborators on a variety of topics. SAEON-GSN also organizes the *Indibano*, an annual student conference, which provides a meeting place for postgraduate students to share their research, attend workshops and engage with leading researchers from various science and social fields. Due to the importance of enhancing soft skills, such as communication, networking, management and leadership during a doctorate program, we are grateful to have such opportunities provided via the GSN

For more information on the SAEON-GSN and to register as a member, please visit the [GSN website](#) and follow the GSN on [Twitter](#), [Facebook](#), and [LinkedIn](#) for information on career and workshop opportunities



Outgoing and incoming SAEON_GSN steering committee members during an induction meeting



From Academic Student Associations to Student Academic Chapters

Krupa Daya
FNAS Chapter Chairperson

The year has started off as a fantastic new experience as we could revert to in-person training for members of the Student Academic Chapter (SAC), which promises to positively affect communication and bonding within the committee. We also had the privilege to have the first chairperson introduction, which added to the excitement to kick-off a new year.

With the change from Academic Student Association (ASA's) to SAC's, it has definitely been a roller-coaster with all the uncertainty. Nonetheless, as the FNAS Chapter, we have made the required modifications and executed them to the best of our ability, and we can't wait for the term ahead of us.

SAC is a representative council for all students in their various faculties that works to develop a balanced academic and social life. A modification was made to SAC in order to increase the overall efficiency of these structures, raise awareness of the prestigious structure, and foster inter-campus cohesion among Academic Student Leadership structures.

We are delighted to meet students from our faculty after being away for over two years. We have a variety of activities to facilitate these interactions, including formal academic debates, TED talks presented by students, movie nights, and picnics. We are certain that students are motivated and excited to conclude the academic year with hard work, devotion, and a positive attitude. SAC will be there every step of the way to assist students in any way they can if they encounter any difficulties.



SAC training with our PC and SCC guardians



Student Academic Chapter chairperson introduction.

Champion Trees: The London Planes of Lovers' Lane

Stefan Siebert

After the United States took gold for endowing us with the largest tree on the Potch campus (with their sycamore in the Spring edition), and Australia came a close second with a bluegum (see Summer edition), the United Kingdom officially takes bronze in this Autumn edition. The third largest tree specimen on campus is a **London plane** (*Platanus x acerifolia*), which again is an exotic species. It belongs to the same genus and family as the largest tree on campus, *P. wrightii* (Arizona sycamore). Other large specimens of the London Plane can be observed in a majestic 60-year old grove, which was estimated to have been planted on campus in 1962 (pers. comm. Pieter Theron in 2012), and which is better known as Lovers' Lane by the campus fraternity.

Our third largest tree is located in front of the Totius Hall along *Wasgoedpennetjelaan*. It is 22 m tall, has a mean crown width of 26 m, and a stem circumference of 583 cm. With a Size Index of 152, it is one of four trees on campus that have an index score over 150. The London plane is not a true species, but a fertile hybrid between *Platanus occidentalis* (American plane) and *P. orientalis* (Oriental plane). Crossing occurred between two plantings of the parent species at Vauxhall Gardens, London. The resultant hybrids proofed more disease and cold resistant. It gained popularity during the industrial revolution (1800s) as an urban roadside tree because of its tolerance to atmospheric pollution and soil compaction. Even today it is widely regarded as one of the most efficient trees in removing small particulate pollutants in urban areas.

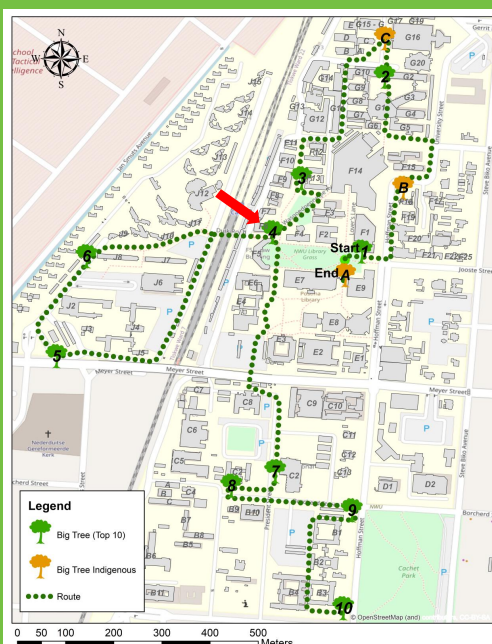
London planes are deciduous and grow up to 30 m tall. The bark is characteristically grey-green, smooth and exfoliating, or dull-brown and not exfoliating. Leaves are palmately 3-5 lobed, 100–200 x 120–250 mm, lobes pointed, triangular and toothed, green above, and paler below. Young leaves are coated with short stiff hairs which fall off with age to render mature leaves hairless. The dehisced short, stiff hairs can cause breathing problems, especially for asthma sufferers. Flowers are monoecious, carried inconspicuously within inflorescences of 1-3, mostly 2, button balls during spring. The fruit ripens into a cluster of achenes with numerous stiff hairs which aid wind dispersal. The cluster breaks up slowly in winter to release numerous 2–3 mm seeds.

London planes are often difficult to distinguish from the parent species because its leaf and flower characteristics are intermediate between the two. As a general rule, the leaves of the London plane are more deeply lobed than *P. occidentalis* and less so than *P. orientalis*, and the button balls are predominantly two per inflorescence (one in *P. occidentalis*, 3–6 in *P. orientalis*).

Older suburbs of Johannesburg are lined with spectacularly large London planes, but in recent years the trees have been infested with the Polyphagous shot hole borer beetle, which has led to substantial mortalities. Unfortunately, this fate also awaits our campus trees in future.



A) Largest London Plane outside of Lovers' Lane; B) bark; C) leaf and seed shape.



[View enlarged map](#)

A Champion Tree route has been developed for the campus. It takes you to the 10 largest trees (and 3 largest indigenous trees) on campus and is a nice 5 km walk. (Map created by Wynand Muller).

Put on some comfortable shoes and explore the campus tree route

Stefan Siebert, Chris van Niekerk and Wynand Muller

In 2019, the AP Goossens Herbarium and the NWU Botanical Garden decided to develop tree routes to commemorate 100 years of botanical science on the Potch Campus. The main idea with these routes was to develop a fun way for students, staff and visitors to get those legs moving while they are also learning about plants. We set about developing three tree routes, but then 2020 came and went, and 2021 came and went! But somehow and somewhere between all the social distancing, restricted access and general chaos we did manage to finish this project. The next step is to also roll out similar tree routes on the Mafikeng and Vanderbijlpark campuses. We have already identified champions for these initiatives who are running with the idea.

The [Potch Campus tree route](#) was developed in collaboration with the 2019 and 2020 2nd year Botany students. This is an intermediate route both in terms of species numbers and walking distance compared to the NWU Botanical Garden and the Champion Tree routes, respectively. The route is approximately 2 km long and features 85 trees along the way. Each tree is identified with a tree tag which depicts its scientific name, English common name and often a QR code, which links you to more information about the species.

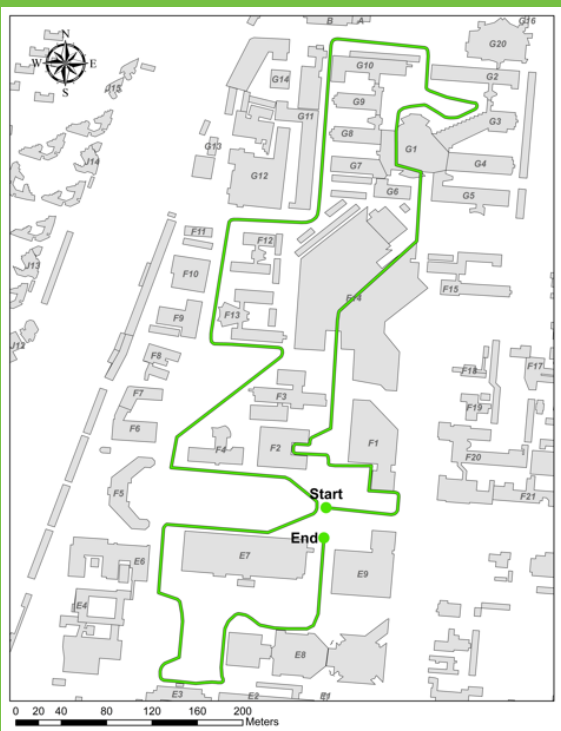
So how did we develop the route? Students were given an assignment in line with the curriculum of PLKS211 Environmental Botany to locate a large or interesting tree on campus, identify it, record its locality and to find information about its value and ecosystem services. This information was captured into a database from where we then extracted interesting trees for the routes. This data set has even become valuable to advise the municipality and schools about non-invasive tree species most suited for the environmental conditions in Potchefstroom. Our data have also recently been requested by the South African National Biodiversity Institute (SANBI).

We involved experts to guide us during the development phase and to share information regarding best practises. All the tree routes were designed to be relevant to public education, such as young scholars visiting the campus, but also to train our own students. It creates a legacy of learning and contributes towards making the campus more informative and interesting. We linked the Potch Campus tree route to the public artwork of a steel [Vachellia](#) tree on campus as the starting point. This creates a good focal point for both initiatives. And the route also connects the outdoor study spaces on campus.

Many people contributed to the development of the tree routes. We would like to thank Prof David Modise for his interest and funding the project, Prof Sandra Barnard for her support as part of the 100-year festivities, Dr Arthurita Venter for all the admin support, Prof Sarina Claassens for her interest, ideas and for literally walking the extra mile, Mr Jean Stidworthy and Ms Ilse Beyers for including the tree route within their initiatives to give the project a NWU identity, Mr Mark Greeff for his enthusiasm, guidance and support throughout, TreeTags for producing the nameboards, and the Green Team for their participation and taking it to the students. And a special thanks to all the energetic staff, students and scholars who tested the route, too many to name here.



Tree tags show the trees' scientific and common names, as well as some additional information. Some trees have tags with QR codes linking to more information.



[View enlarged map](#)

The Potch Campus tree route features 85 trees and is roughly a 2 km walk. (Map created by Wynand Muller).

Reflecting on the first quarter of 2022

The 47th Annual SAAB conference: the first-ever virtual SAAB conference

Sandra Barnard & Madeleen Struwig

Southern Africa is not only well-known for its immense diversity in vascular plants. Our country also hosts some of the most renowned botanists internationally, who have published cutting-edge findings since early on (Christiaan Hendrik Persoon, 1762–1836). Small wonder then that when the Corona pandemic struck the world, South African botanists were not deterred and held the first-ever virtual meeting of the South African Association of Botanists in January of 2022. The Botany Subject Group on the Mafikeng campus of the NWU hosted the 47th annual meeting of this association online with the assistance of Millennium Travel using the REMO platform. The theme for this year's meeting was: *Botany: Science for the Future*.

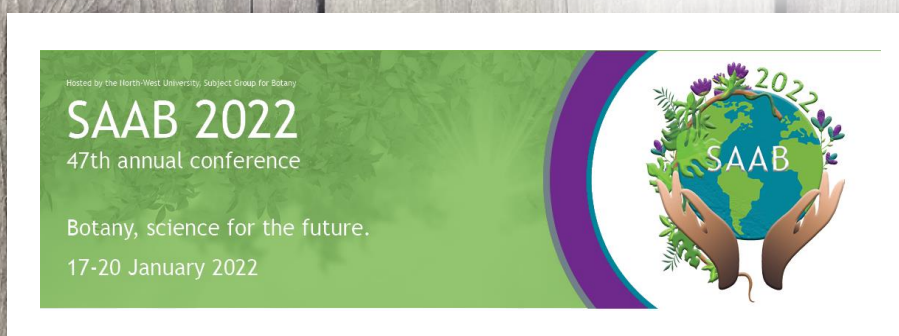
The event was very well supported by members of SAAB, several students from universities across the country, and botanical researchers from various disciplines. We had the pleasure of hosting several national and international plenary speakers, including an internationally eminent botanical researcher, Prof Ben-Erik van Wyk, as the keynote speaker. Amongst the international speakers were Dr Matt Buys, a previous lecturer in the Department of Botany on the Potchefstroom campus of the NWU, who now lives and botanize in New Zealand. In keeping with the tradition

of “botany or die” of his predecessors and contemporaries, Dr Hugo Bezuidenhout recorded his plenary talk before being admitted to the hospital for an emergency procedure.

We had the privilege to listen to, and interact with well-prepared speakers and delegates over the course of four days after which well-deserved students were acknowledged during the awards session. Under the supervision of Prof Jacques Berner, Sarel Cilliers and Roelof Coertze, Me Soané Ludick from the NWU, Potchefstroom campus, was awarded the prize for presenting the best speed talk. The best presentation given by students at Honours (Me Jo Cobbold, UFS), Masters (Mr Martin Mushomba, UP) and PhD level (Me Aarifah Jakoet, UWC) were also awarded. The overall best presentation was awarded to Me Lauren James from Rhodes University. The SAAB council also honoured upcoming and professional botanists for their dedication and contribution to botany with the bronze (Dr Daniel Zhigila, UCT), silver (Prof Edward Witkowski, Wits) and gold (Prof Brian Huntley, retired SANBI Director) medal awards.

Listen to SAAB recordings:

<http://natural-sciences.nwu.ac.za/south-african-association-botanists/recordings>



Reflecting on the first quarter of 2022

The Seeds and The Buds... and The Butterflies

**Tsumbedzo Ramalevha (PhD),
Wynand Muller (MSc) & Yani Steyn (Hons)**

In an ideal situation, soil seeds germinate and belowground buds outgrow following top kill of vegetation either by fire, herbivory, or both. However, in a real situation, not all soil seeds are able to germinate and not all belowground buds are able to outgrow. The consequences of these can be a shift in plant community composition, structure, and function, which may affect other trophic levels, such as butterflies.

African savannas are disturbance-prone ecosystems and often strongly dependent on natural disturbances, such as fire and herbivory to shape the plant composition and structure. Resprouting and seedling establishment are two broad mechanisms utilized by plant populations to persist in disturbance-prone systems. Therefore, understanding how savanna vegetation responds to fire and herbivory, and how they affect plant-insect interactions, is crucial for the management of biodiversity and ecological processes in grassy ecosystems globally. One of the objectives of the Forb Ecology Research Group (FERG), is to study the responses, and the functional adaptations of herbaceous plants, particularly forbs, to natural disturbances. Three FERG postgraduate students (Tsumbedzo (PhD), Wynand (MSc), and Yani (Hons)) embarked on a month-long field survey 'expedition' in the long-term Satara-N'wanetsi experimental burn plots of the Kruger National Park. The experimental burn plots (EBPs) trial was initiated in 1954 and is among the few long-term fire ecology research projects in Africa. These

sites provided the FERG team with the opportunity to study how different fire and herbivory treatments affect herbaceous plant regeneration strategies, as well as how fire frequency affects butterfly communities. Tsumbedzo's project focuses on the role of the belowground plant 'regeneration station' (the bud bank) when herbaceous plants are defoliated by fire and herbivory, and how these patterns relate to soil productivity. (Note that the meaning of 'bud' in this context, refers to a vegetative growth structure – of course it can be seen as a plant population's best 'buddy'). Yani studies the effects of fire frequency on the soil seed bank. Since soil seed banks represent a 'snapshot' of future vegetation, understanding the interaction between seed viability and fire is of utmost importance for managing fire in fire-adapted ecosystems. Wynand studies the intricate relationship between forbs and butterflies in a system where the forbs are adapted and/or in need of fire to adequately feed the butterfly larvae hosts. Although a lot of hard work still lies ahead for us, we are excited to produce results that will improve our understanding of interactions between fire, herbivores, butterflies, seeds and buds for future ecosystems in Africa.

For updates on these projects and other FERG projects, us on Twitter ([FERG NWU](#)), Instagram ([forb ecology research group](#)) and on Facebook ([NWU Forb Ecology Research Group - FERG](#)).



*Wynand about to catch
some butterflies*



*Discussions on floristic
sampling with
Prof Frances Siebert*



Yani sieving soil

Post-graduate competition:

Graphical Abstract

Competition deadline: 20 May 2022

- Submit a written abstract (250 words)
- Condense this written abstract into a graphical abstract ([view examples](#))

The winning abstract will be published in the ENVIRA Winter Edition 2022

Cash prize (sponsored by [BlueTek](#)) up for grabs!

Click [here](#) for more information and follow this [link](#) to submit your abstract.

TIP: The use of design programmes such as Biorender, CANVA, Inkscape is allowed.

Any questions may be directed to ENVIRA.Newsletter@gmail.com



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SCIENCE FACT BOX



A million years to adapt to 1°C



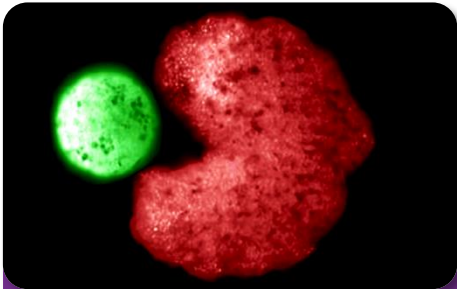
Okra and Aloe to combat microplastics in water



Zebra finch males sing in dialects



Invertebrates have emotions too



Designed by computers, made from frogs



Good news for coffee lovers: Heart benefits



Space trash could kill astronauts



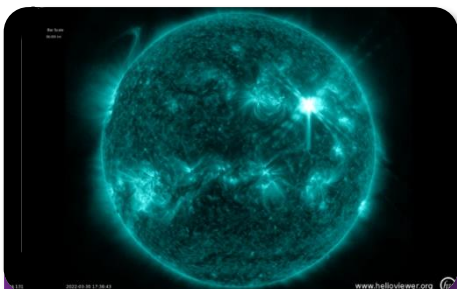
Terrifyingly Cute Parasite Eats Tongues



Complete human genome sequenced



Geology: Organics in meteorite - not alien life



The Sun is getting downright ornery!



9,000 tree species still to be discovered

Capers on coral reef islands: Part 3

A stormy night on La Derive: Broken doors, broken GPSs, and broken stomachs

Henk Bouwman

It does not get more hectic than when you are lost at sea, in a storm, being tossed around, at night. Worst of all, everything started off so well. Remotely chartering a vessel to take us from Mauritius to St. Brandon's atoll, 450 km north of Mauritius, seemed like a good idea at the time. What could go wrong? We had a nice flight across to emerald Mauritius, nice hotels, buying supplies (and beer solely meant for after-hours consumption). All seemed set for a fantastic adventure. Getting to the quay in Port Louis's busy harbour, two things overwhelmed our senses simultaneously. The eedie beedie small size of the boat, and its terrific odour. La Derive (our conveyance) transports salted fish from St. Brandon to Mauritius, and salted fish has an aroma that literally sticks with you long after – everywhere. The boat was so small, the bridge served as the passenger cabin. Nonetheless, we were tough young men, ready to tackle every eventuality. Except, we were not.



La Derive (the Drifter), our conveyance. At least she floats.

Slowly leaving the harbour at full speed (get it?), we got the swell, now combined with the smell. Tough young men turned into green bits of discombobulated tissue as nothing stayed in place for longer than a second, organs included. At least, while we had daylight, we could fix our eyes on the horizon. Eating was out of the question



Steven, Nik, Robert (did not come along), and Henk. The brave young men.

and so was drinking water because there was nowhere to go as the pump for the lone toilet was broken. Hooking an arm around a post and aiming over the side...well...wind does all sorts of things.

The autopilot kept us on course when dark set in. It got stormy, and lots of clouds started rolling in, so we had nothing to orientate with. At times, the boat drove into a wave, pitched, turned, rolled, and went backwards, all at the same time. Nic Cole, the local biology expert then told us that La Derive means "The Drifter". Now, it made sense, but brought nought comfort. We had to close the windows as the waves were getting us all wet. So, the salty fish smell combined with salty sweat odour and a super high humidity created an intoxicating eye-watering perfume. No wonder the paint was flecking of the wood. Pure misery. Steven Evans by then had already started feeding the fish, leaning through a sole open window and getting his hair washed in the process.

Then, oops, the GPS broke. The GPS feeds the position to the autopilot. Without a course, and no way to see the sky, we started turning circles going nowhere, or so it felt. No problem, there was a backup GPS. Installing a GPS in a tossing boat was not easy, but the crew managed. Trying to help was not a good idea – stupid actually. I was thrown backwards twice, against a wooden door, whose posts were rotten, and the door

smashed open outwards every time. I managed to remain on board by the skin of my elbows. The backup GPS refused to switch on. Oh dear. When the salted crew got worried looks on their faces, one begins wondering where the life rafts are, and if there were any.



Trying to fix the GPS, looking very worried.



All ahead, together, at full speed, we hope... (I think we only had one engine). The cargo hold with our backpacks that held the magic GPS is the big white box structure on the larboard stern.

Trying to lighten the mood, I asked (stupidly again) "We do know where we are, right?" "Yeah, somewhere between Madagascar and Australia" - the most laconic answer I ever got. Serves me right. In any case, Nic remembered he had a GPS in his gear, but this was stowed away in the empty salted fish cargo hold, right at the stern, where the boat's movement in rough seas really gets accentuated. Vaguely remembering we were brave young men before we boarded, we set off without flashlights (which were also in the backpacks), trying to be heroes. I lifted and held open the super heavy lid (don't drop it!), while Nic leaned over searching for his backpack and retrieved his little yellow Garmin Gecko GPS. Years later, he told me that in the pitch dark, he reached, and the first thing he touched was his backpack, and the first pouch he touched held the GPS. Meanwhile, I was holding on for dear life (for both of us) in the pitch dark with hardly anything to brace against. His GPS worked, and the captain could plot a course on his charts, with manual corrections for drift.

The seas calmed and we got a couple of hours of sweaty rest. Late morning, St. Brandon hove into view. What a glorious sight! Solid, flat stuff that does not move! Three dehydrated, hungry, smelly, dazed young(ish) men started to reclaim their supposed braveness, indeed a very fragile attribute we learned.



Land ahoy!

PS: The backup GPS that did not work will actually work when you put the batteries in the right way.

PSS: There was lifesaving equipment on board.

The need for effect-directed monitoring of water quality

Annika Kruger (MSc student), Rialet Pieters, Suranie Horn, Catherina van Zijl & Natalie Aneck-Hahn

The quality of available freshwater is declining daily due to changing weather patterns and anthropogenic activities that contaminate this precious resource. Chemicals such as pesticides, personal care products, and pharmaceuticals end up in water sources due to ineffective removal by wastewater treatment plants and runoff. In South Africa, there is legislation and guidelines set in place to protect, manage, and provide water of good quality to citizens. Despite these laws, water quality is declining at a rapid rate due to mismanagement, failed infrastructure, lack of expertise, and financial issues. The Department of Water and Sanitation implemented the Blue and Green drop

programs in 2009 in an attempt to improve drinking water quality provided by municipalities and ensure efficient treatment of waste water, but after only five years these programs were disbanded. This is only but one example of several monitoring programs that failed to be maintained. Other programs never even saw the light.

Traditionally, water quality is determined by measuring the concentrations of a few pre-selected compounds through chemical analyses. Comparing concentrations to a maximum permitted value according to a standardised guideline is commonly used to assess the

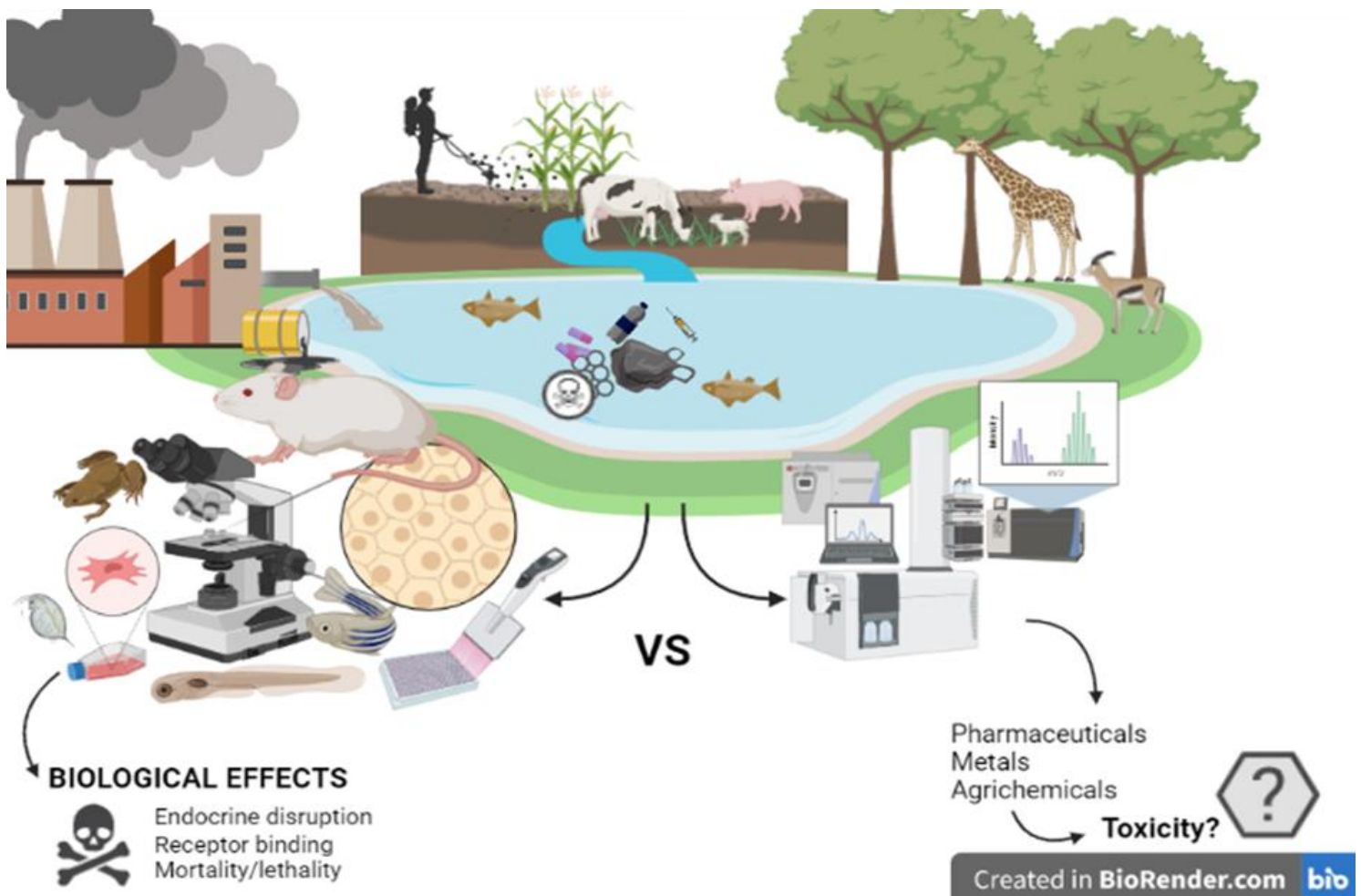


Figure 1: Biological analysis compared to chemical analysis.

quality of water. Unfortunately, this approach does not consider the effect of chemical mixtures. Chemical analysis also overlooks unknown chemicals and transformation products. Furthermore, no chemical analysis, irrespective of the list of compounds, is capable of reporting the biological effects of a chemical 'cocktail' on the biota in the studied ecosystem. It is therefore important to consider biological analysis when monitoring the quality of drinking and environmental water.

Bioassays are an effective tool to use because they indicate how the chemical mixtures in the water would influence animal and human health (Figure 1). Combining the chemical and biological analyses will provide results of the active chemicals present in the sample as well as the joint biological effect caused by the chemical mixture. Worldwide *in vivo* and *in vitro* bioassays are increasingly used to determine water quality. Bioassays, based on different levels of biological organisation (cells → tissues → organs → individuals → populations → communities) (Figure 1) can be employed.

Organisms commonly used for *in vivo* assays include algae, *Daphnia*, frogs, and fish. *In vitro* assays, which are mostly cell-based (although they also include bacteria, and yeast), are used as a first-tier screening tool, and reduce the use of whole organisms. South Africa has the capacity to measure toxicity at different trophic levels, which is important as sensitivity to pollutants varies among species and across trophic levels. The laboratories in South Africa can test water quality using a wide spectrum of assays through endpoints such as lethality, swimming behaviour, hatching rate and germination. The capacity to determine water quality with reporter gene assays, where endocrine disruption and dioxin-like activity are investigated, also exists but needs to be incorporated to current ways of determining water quality on national level. The application of bioassays in water quality management will not improve the failing sanitation and water distribution infrastructure in South Africa, although it is envisaged to create a holistic overview of the water quality.

Polar bear protection - Wrangel Island style

Henrik Kylin

Polar bears are the world's largest "land carnivores", although with a semiaquatic lifestyle. Some large males can weigh in at over 700 kg. Kodiak bears have been larger, but on average the polar bear tops all. Also, as the Arctic is a rather meager environment, polar bears are usually always hungry. We have experienced polar bears attacking a 13 000-tonne icebreaker to investigate if it could be eaten!

Because of the risk of polar bear encounters, preparations for my first expeditions to the Arctic included weapons training. If you are working on the ice or on shore and meet a polar bear, there are only two possible outcomes: either you or the bear dies! For those of us that had made military service this was not

i.e., the area around the Bering, Chukchi, and Beaufort Seas, and then via the North Pole back to Sweden. During the past glaciation the sea level was below what is now the bottom of these seas, which allowed the migration of humans across Beringia to North America,



A



B

A) The "Mammoth steppe" on Wrangel Island. B) Due to permafrost, surface runoff the only way for the meltwater to reach lower lying ground.

a big deal, but some of the younger scientists found the handling of weapons ideologically problematic. Some even suggested that they would rather be killed by, than kill a polar bear. This, of course, is an untenable way of running an expedition: all that go out with the ship must come back! Consequently, some years into the 21st century when expeditions became more frequent, the weapons training was replaced by including several crew members with extensive weapons training and hunting licenses.

The expedition *Beringia 2005* took us with the icebreaker Oden via the Northwest Passage to Beringia,



Polar bear protection Wrangel Island style.

Photo credit: Henrik Kylin

after which they could follow the coast via a series of ice-free islands down to the continental Americas.

There were several "peculiarities and complications" visiting Russian territory. One of them was that the authorities did not allow foreign nationals to carry weapons on Russian soil, not even on the essentially uninhabited tundra. Therefore, for the duration of our operations in Russia, local hunters, two Chukchi and one Russian, were enrolled for polar bear protection.

Our final destination in Russia was Wrangel Island, an island that held a population of dwarfed mammoths until 3000-5000 years ago. Today it holds the densest population of polar bears in the world. The whole island



Mammoth tusk on the tundra.

Photo credit: Open photo collection Beringia 2005, Swedish Polar Research Secretariat.

is a national park, and a small staff of rangers is stationed there year-round.

We were greeted by the chief ranger that read us the code of conduct for a Russian national park. Nothing very strange until he got to the point of how to avoid polar bear attack. "As this is a national park no weapons are allowed, not even for polar bear protection". Our local hunters were most upset; "How could anyone expect to protect against polar bear attack without weapons?" The answer was logical but not entirely reassuring. "Here on the island, there are so many seals that we only need to hit the bear on the nose with a stick for it to turn around". After a few seconds he continued: "But whatever you do, don't lie down on the beach! If you do, the bear will think you are a seal."



Halos occur all over the world, but denizens of lower latitude often have never noticed them. The motif in this case was the halo, my head was only used to block the sun. Photo credit: Rebecca Dickhut



A) A stranded juvenile Grey Whale (*Eschrichtius robustus*) with the icebreaker Oden in the background. Grey Whales migrate from the Gulf of California where they breed and give birth, and the Bering, Chukchi, and Beaufort seas where they feed. Strangely, for a baleen whale, they are bottom feeders. Lying on their right side, they filter the surface sediment and surface in a cloud of mud that attracts some birds that feed on organisms that have passed through the baleen sieve. B) A vertebra of a Bowhead Whale (80 cm across) that winter storms has blown several hundred meters inland. C) Plastics contamination is found in all the world's oceans. Here a jaw bone of a Bowhead Whale (*Balena mysticetus*) and plastic debris on an Arctic shore. The plastic did not kill the whale though, the jaw is decades, maybe centuries old. Bowhead Whales are the only large whale that stay in the Arctic year-round and may grow very old. The oldest specimen with confirmed age was >214 years old.

The African BioGenome Project (AfricaBP): The sequencing of African genomes should be inclusive and Africa-led

Roksana Majewska

Pilot Committee Chair of the African BioGenome Project

Despite the enormous progress in molecular sciences made over the last decades, our ability to explore and understand Earth's biodiversity is severely limited by the low number of high-quality genome sequences available for the known species. It is estimated that there are about 12-15 million eukaryotic species on our planet. Among these, only ~1.84 million have been taxonomically classified and named. Among the named species, less than half percent have had their genome sequenced, and among the sequenced genomes, only a fraction is of high enough quality to be used in comprehensive functional and evolutionary studies ([Blaxter et al., 2022](#)). So, can we characterise nature by decoding genetic instructions hidden in genomes of all known eukaryotic species? The Earth BioGenome Project (EBP) scientists believe we can, and they have already started making very significant steps towards their goal of sequencing all currently known eukaryotic species within the next ten years ([Lewin et al., 2022](#)).



A sea turtle-associated diatom, *Craspedostauros danayanus*, is one of the first species sequenced within an EBP- and AfricaBP-affiliated project, the Epizoic Diatom Genome Project based at NWU. Scale bar = 10 μ m

There are currently 49 EBP-affiliated projects that focus on sequencing the genomes of eukaryotes, either within a certain geographic region or habitat or within a certain taxonomic group. One of these projects is the African BioGenome Project (AfricaBP; <https://africanbiogenome.org>).

The idea of AfricaBP was born a few years ago, just after the Earth BioGenome Project was started. It was initiated by a small group of African and Africa-affiliated scientists who recognised the importance of including African researchers and communities in the genomics revolution that will be fuelled by the further technological developments and the coordinated efforts made by the EBP scientists. Unfortunately, due to many complexities and challenges specific to the African terrain, Africa and African scientists have been left behind when it comes to some more significant scientific breakthroughs. For example, the first human genome that cost about 3 billion US dollars (at the time) provided direct economic gains of more than 100 billion US dollars and kept generating additional 265 billion dollars per year across the United States alone ([Tripp and Grueber, 2021](#)). However, the

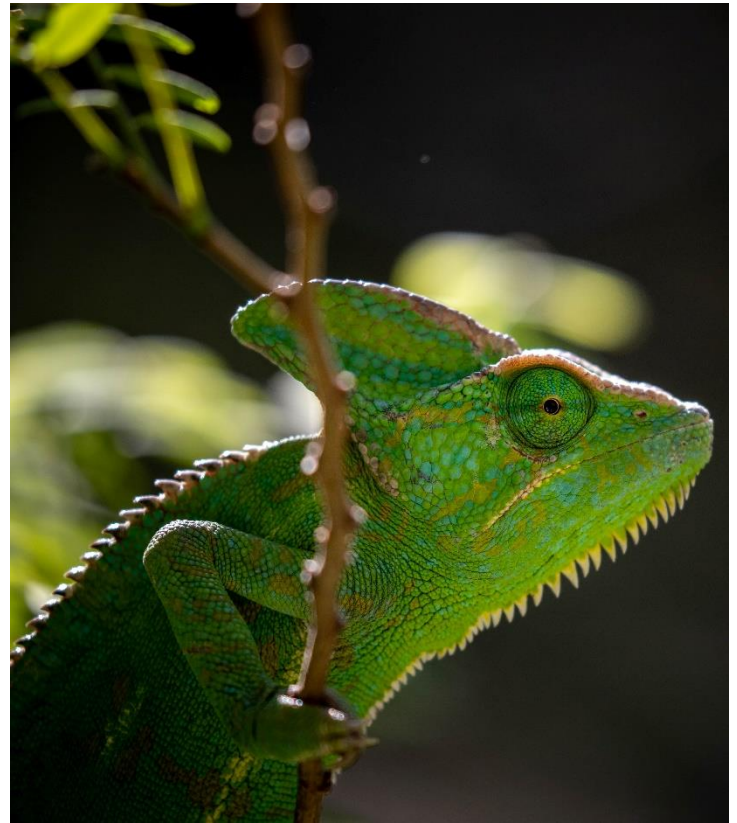


AfricaBP logo.

gains to Africa were nearly non-existent, as Africans were not involved in that study, neither as scientists nor the study subjects. Because most of the genetic and genomics studies using African samples are run outside Africa, the continent's priorities are often overlooked, and long-lasting capacity building across Africa is not happening.

Genomics-based technologies and innovations could alleviate and eventually solve some of Africa's key problems, including biodiversity loss, food insecurity, and economic and technological impasse. These problems will only be exacerbated by the progressing climate change, rapid human population growth, and political instability of many African countries. Therefore, the overarching goal of AfricaBP is to sequence the genomes of eukaryotic species native to Africa while building environmental, agricultural, and biotechnological capacity in the continent within a 10-year framework. Despite limited financial and technical resources, the AfricaBP community, which currently includes 22 African organisations and several international partners, has managed to develop a preliminary roadmap for sequencing the genomes of the indigenous plants, animals, fungi, and protists in Africa. The ambitious goals, priorities, reasons for making this effort *now* - despite the challenges, and appeal for support from the African governments have been highlighted in the AfricaBP position paper published recently in Nature:

<https://www.nature.com/articles/d41586-022-00712-4>



Africa is rich in economically valuable natural resources and unique biodiversity. For example, most of the ca. 200 extant chameleon species are found only in Africa.

Photo source: Unsplash



Finding a needle in a haystack: DNA metabarcoding and some important considerations

Danielle Botha (MSc student), Frances Siebert,
Morné du Plessis (NICD) & Sandra Barnard

What if you can use a DNA sequence as a barcode to identify the organisms in soil, water or even faeces (Figure 1)?

Studies in ecology face an ongoing challenge of collecting data from degraded environmental samples, where morphological characterization is no longer possible. As such, adequate precision and accuracy of species identifications and the sampled ecosystem representation, are of immense importance. The development of DNA metabarcoding as a biodiversity observation tool provides a promising alternative to micro-histological studies. DNA barcoding, as well as metabarcoding, are biodiversity identification tools that use short, standardized regions of the genome to identify

individual taxa ([Hebert et al., 2003](#)). Unlike DNA barcoding, where only individual organisms can be identified, metabarcoding allows for simultaneous organism identifications by high throughput sequencing (HTS) on next-generation sequencing (NGS) platforms which yield hundreds to thousands of reads (sequences) per sample at the same time.

Consistent with the rise in NGS and the “big data” era, there has been a surge in bioinformatics tool development for analysing these large amounts of data generated by these platforms. A bioinformatic pipeline is composed of three main steps: quality screening of the sequences generated, DNA sequence clustering into similarity groups, and finally the identification of unique

sequences, also called taxonomic assignment ([Lamb et al., 2016](#)). There is an array of web applications and command-line software available for the first two steps of a bioinformatic pipeline (Figure 2). These programs should be carefully considered since filtering parameters may differ and may be too stringent for the nature of the DNA, which will lead to no or even false identification of the organism from which the sequence initially came from.

Taxonomic assignment is achieved through search

Figure 1: An example of what a faecal sample looks like (Photo credit: Frances Siebert). It represents a heterogeneous sample consisting of various species with no defining morphological characteristics.



algorithms that find regions of similarity between the query and reference sequences. NCBI's GenBank and BOLD Systems are often used as global DNA reference sequence databases, but the identifications cannot always be trusted as they may contain sequences of unvouchered specimens, erroneous sequence data, and identifications that are often geographically irrelevant. "Custom" DNA reference databases are created by consulting study area-specific species lists and implementing sequence download quality criteria and has become vital to ensure the accuracy of a DNA metabarcoding study. A preliminary comparison of a custom (2 015 sequences) and global (418 591) reference database for the *rbcL* and *trnL* plant barcodes yielded some promising results when tested against 24 cattle faecal samples from a communal rangeland at Welverdiend rural village, Mpumalanga, as queries. Despite the global database being vastly larger, the number and taxonomic coverage of identifications for both reference databases were relatively similar (Table 1). Therefore, the number of

species identifications does not have to be sacrificed to include curated sequences that are sure to occur in the study area and are of good, validated quality.

Two important considerations in metabarcoding studies for any type of environmental sample are therefore (i) the bioinformatic pipeline with its constituting programs and (ii) the contents of the reference database which will be used to identify the unknown sequences. A successful study will allow for the identification of the entire targeted taxonomy from an environmental sample and allow the researcher to gather an accurate representation of the sampled ecosystem, which may be inferred to management and ecological practices.

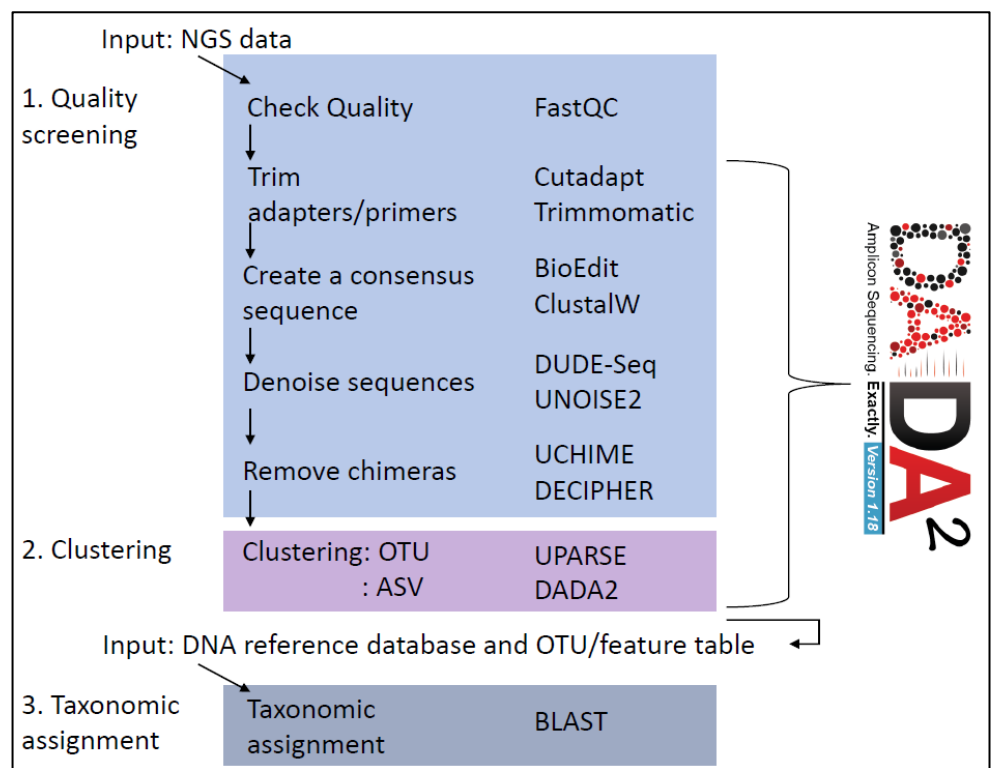


Figure 2: A general overview of a bioinformatic pipeline to generate taxonomic assignments from NGS data with some possible programs to perform each step. For clustering and the steps that follow checking NGS data quality, it is recommended to use an all-encompassing program like DADA2.

Table 1: The number of unique plant families and genera and the total number of query sequences that could be identified for the *rbcL* and *trnL* plant barcoding marker with the use of the global and custom DNA reference database.

Barcoding marker	Taxonomic level	Identifications with the global database	Identifications with the custom database
<i>rbcL</i>	Family	39	31
	Genus	62	56
	Total number of identifications	168	178
<i>trnL</i>	Family	39	36
	Genus	76	76
	Total number of identifications	183	189

Insect life on a Cycad plant

Paul Janse van Rensburg (PhD student)
& Johnnie van den Berg

Cycads are relic Gondwana plants. They witnessed the arrival of insects, reptiles, dinosaurs, birds and mammals. They survived at least two mass extinctions that nearly blotted out all life on earth and occurred nearly everywhere on the planet. Today, cycads are a mere shadow of their former glory as a result of over-collecting and the destruction of their natural habitat. Nearly 90% of Africa's cycads are of conservation concern, making them one of the most threatened plant life forms on earth. Research to better understand and conserve these ancient species is urgently needed.

South Africa is a centre for cycad diversity. A high diversity of insects associated with these ancient plants are therefore expected for this region. One of the most striking insect species associated with cycads is the leopard moth (Figure 1). Their caterpillars chew away on the toxic leaves, all the way sequestering the toxins to defend them against predators. For wacky design, however, the prize probably goes to the seed predators (Figure 2). The females use their long snouts to drill

holes into the seeds where they lay eggs with an equally long retractable ovipositor. There's even a group of beetles that developed specialized feeding behaviour on the dead and decaying leaf and cone tissue of cycad plants (Fig. 3).

However, cycads' true ingenuity comes forth during their pollination. Cycads are dioecious, which implies that



Figure 2: Cycad seed predator (*Antliarhis zamiae*). Top: male and bottom: female.

Photo credit: Paul Janse van Rensburg



Figure 1: Leopard moth (*Zerenopsis lepida*).

Photo credit: Paul Janse van Rensburg



Figure 3: *Apinotropis verdoornae*.

Photo credit: Paul Janse van Rensburg

pollinators have to visit both male and female plants to enable pollination. The bulk of cycad pollination is performed by beetles (Figure 4). The pollen and starch-rich tissue of male cones serve as a nutritional reward for pollinators while the less palatable female cones provide little reward. Cycad cones utilize different cues of heat production and volatile emission to mediate pollinator movement between male and female plants. In certain species, the male cones heat up during certain periods of the day producing harsh odours that drive pollen-covered beetles away while the cooler female cones attract them with milder, more alluring volatiles. For other species, different patterns of heat production and volatile emissions have been demonstrated and it remains a mystery how these cues control pollinator movement.

Cycad-associated insects and the services they provide are under increasing threat from anthropogenic sources, including habitat fragmentation, changes in land use and cycad population declines. Of particular concern is the lack of new seedlings in some Cycad species. Poor recruitment of these species has been linked to the production of non-viable seeds, which is suggested to be the result of pollinator extinctions.

Our research is aimed at investigating the insect assemblages associated with threatened cycad species in South Africa and to identify the most important pollinators. This study will provide insight into several vital attributes and ecological processes of cycads. Furthermore, the study will improve our limited understanding of cycad-insect interactions. Considering the extinction threats that cycads face globally, it is essential to understand their pollination biology to preserve them in the future. In many cases, pollinators still need to be identified, while others may even be extinct already. We have only begun to scratch the surface of cycads and their pollinators.



Figure 4: Cycad pollinator (*Porthetes* sp.).

Photo credit: Paul Janse van Rensburg

New book in Springer Series: Green Economy in the Transport Sector: A Case Study of Limpopo Province, South Africa

Editors: John Ogony Odiyo, Peter Bitta Bikam, James Chakwizira

James Chakwizira

An excerpt from a recent feature story posted on the Organisation for Economic Co-operation and Development (OECD) website highlights how critical green economy is in the transport sector:

“Transport” features prominently on the green growth agenda for two reasons. First, transport has major environmental impacts in terms of greenhouse gas emissions, local air emissions and noise. Managing congestion more effectively is also part of the broader agenda for more sustainable development and better use of resources invested in infrastructure. Second, a large part of public expenditure to stimulate green growth has been directed at transport sector industries. This concerns most notably alternative vehicles, and particularly electric cars, a key part of strategies to decarbonise transport”.

A key factor towards addressing *green economy in the transport sector* is building more sustainable green resilient transport in cities and human settlements. Disciplines of Geography, Mining and Environmental Geology, Water and Hydrological Engineering, Urban Ecology and Urban and Regional Planning, to name a few, are uniquely positioned to understand and enhance complex green economy and transport transition socio-economic and environmental systems. However, current knowledge of these systems is not equitably distributed across the globe. Much more is known about green economy and transport

John Ogony Odiyo · Peter Bitta Bikam ·
James Chakwizira *Editors*

Green Economy in the Transport Sector

A Case Study of Limpopo Province,
South Africa

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transition socio-economic and environmental systems in the Global North (GN). Consequently, there remains a considerable knowledge gap in the Global South (GS), especially within the setting of predominantly rural areas and communities. Addressing this gap is essential, as GS contexts are often unique and starkly different to that of GN urban and countryside areas.

This timely book aimed to directly address these knowledge gaps through a collaboration of authors from the GS rural based provinces. The book highlights that the GS has unique environments, dynamics and realities that do not reflect GN situations. This, in turn, emphasizes the importance of addressing the lack of research in the GS.

The eight book chapters revealed several recurring and emergent themes that dominate the GS discourse. These themes are discussed within the context of rapid urbanisation and migration in Limpopo province, vulnerabilities and opportunities for the agricultural sector, legacies of human settlement systems and spatial distortions, and finally, inadequate institutional and implementation governance systems and context matters.

By situating the green economy and transport sector in the context of South Africa and in particular, the Limpopo Province, this book manages to explore the impacts of growth and development on the green economy and transport sector. In the final chapter of the book, themes are proposed on which future research and policy efforts should be focused to advance and enhance green economy and transport transition socio-economic and environmental sustainability understandings of GS cities and human settlements, and how they fit into current GN-GS relational framings and paradigms. The future research themes and policy action areas include broadly: (i) implementation and management of innovations and solutions that support

economic prosperity and human well-being; (ii) stimulation of a resource-efficient, low-carbon economic and social development pathways and technological uptake; (iii) safeguarding people from environmental health risks as well as updating and aligning curriculum to the overall decarbonisation agenda.

This open access book is interdisciplinary and provides cross-sectoral and multi-dimensional exploration of sustainable development and transportation in South Africa. Drawing on work from different disciplines, the book contributes not only to academia but also seeks to inform urban and regional policy. We look forward to the book or selected chapters becoming core literature for researchers and students in various institutions all over the world. We trust that this book will encourage research in the GS, specifically to aid global debates and frameworks in multi-disciplinary approaches to tackling green economy in the transport sector issues from multiple perspective and dimensions covering the social, economic, physical, political, and environmental sectors.

Book Springer Link:

<https://link.springer.com/book/10.1007/978-3-030-86178-0>

The book was edited through a collaboration between scientists at different departments of the University of Venda's Faculty of Science, Engineering and Agriculture (the late Prof John Ogoni Odiyo from the Department of Hydrology and Water Resources, Prof Peter Bikam from the Department of Urban and Regional Planning) and Prof James Chakwizira from Urban and Regional Planning at the North-West University. The work is a sequel to the Transport Chair Research Work on Green Economy in the Transport Sector funded by the Transport and Education Training Authority.

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All your contributions are greatly appreciated.

We are excited to share more research articles in the upcoming *Winter* edition 2022.

May you have a wonderful Easter season.

Frances and Clarissa

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