



UESM Newsletter

Winter Edition 2020



Interactive buttons



Editorial

Welcome to the first edition of ENVIRA for 2020! It is an honour to announce the return of the Newsletter of the Unit for Environmental Sciences and Management (UESM).

ENVIRA was established in 2008 by Prof Leon van Rensburg, a former Research Director of the UESM (2006–2014). The initiative was supported by Prof Huib van Hamburg, the Director of the former School of Environmental Sciences and Development (1998–2013).

The rebirth

The revival of ENVIRA came about amid the doom and gloom of the COVID-19 global pandemic and the subsequent extended 'lock-down' period. Although we rightly perceive the COVID-19 pandemic as a disastrous event having severe impacts on human health, lives and economy, the pandemic (and the subsequent complex, unplanned issues) nevertheless stimulated lateral thinking in many spheres which has led to some positive outcomes and innovations. Just think of the now famous 'Tjop Tjop Health Screening App' developed by the NWU.

After numerous telephone, Skype, Zoom and WhatsApp discussions between colleagues over the past months, it became clear that we all miss the morning chats over a warm coffee. Participating, or even only listening to stimulating conversations, sharing novel ideas and celebrating research outputs is part of a scientist's life. It has become increasingly difficult for all of us to remain informed about the latest happenings during these times.

After some inspiring discussions with Prof Carlos Bezuidenhout, we agreed that it is time to once again collate and share all the recent research highlights and achievements from colleagues, and to provide a platform to circulate important information on our facilities and from our ethics office. With the permission and support from the UESM director, we have actively started with the collection of achievements, recent research news and more.

We decided to retain the name for the sake of familiarity and continuity. The origin of the name is unknown, but we may assume that it refers to the 'environment' given the nature of our research in the unit.

The vision of ENVIRA

With this Newsletter, we envisage to share research, innovation and community service that originates from our research unit. The vision of ENVIRA is therefore to proudly report on current research activities and achievements of the UESM.

Each edition will have *Regulars* and *Features*. The *Regulars* will include updates on general UESM matters, announcements and interviews.

Articles in the **Features** section are aimed at reporting news flashes (one contribution per sub-programme per edition) on significant research results that are current and relevant. This could either be interesting early findings from a research team, or how research contributed to an improved understanding of a complex global environmental issue. Please follow the link to [ENVIRA Guidelines to Authors](#).

The first edition of 2020 and the way forward

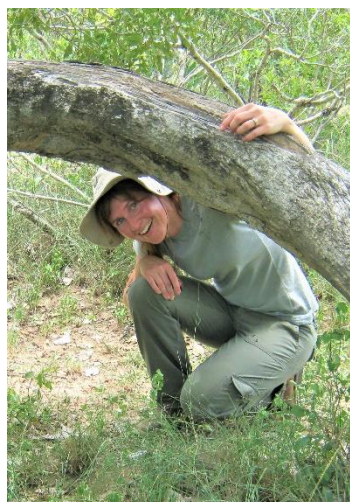
In this edition, we present to you an interview with our Research Director, Prof Carlos Bezuidenhout – the *person* – from hobbies to complex management challenges. In editions to come, we hope to introduce the ‘off-campus lives’ of all our Directors. Under **Regulars**, you will receive the latest news on UESM achievements over the past four months, recent activities from our student association, *Ad Vivendum*, feedback on community projects, the latest on ethics, recent citation updates from the UESM and a brief overview of METSI, one of several UESM facilities. In upcoming editions, we will regularly introduce more of these facilities. We also hope to expand **Regulars** by including a section on published books from the UESM, an introduction to the ‘media-person’ of the past four months, introducing our extraordinary appointments and newly appointed post-doctoral fellows, and an environmental photography section.

The **Features** section of our first edition represents interesting news feeds from seven out of the eight sub-programmes in the UESM – some of which are directly COVID-19 related! We appreciate every positive response and timeous submission to our first edition! We are looking forward to learn more from fellow-researchers, colleagues and friends in future editions of the Newsletter.

Care to Share? Please send us your news, stories and achievements!

Until Spring 2020!

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





Research Director

Prof Carlos Bezuidenhout

Interview conducted
by Clarissa Minnaar

Flash Q's

Coffee or tea	Both
Cat or dog	Dog
City or countryside	Countryside
Book or movie	Movie
Chocolate or vanilla	Chocolate
Superman or Batman	Superman
Dream holiday destination	Bahamas
Favourite dish	Oxtail
Favourite sport	Rugby
Favourite hobby	Woodwork
Coolest accent	Caribbean

General

What is your favourite family tradition? **Coming together over special days as a family and having a good meal.**

If you could interview any internationally famous person, who would it be and why? **Professor Karim, leader of the advisory committee on COVID-19. To get an idea of his thinking and his personal take on the COVID-19 situation and response to it.**

What skill would you still like to master one day? **Flying a plane**

Do you have a motto by which you live? Care to share? **I live by the motto of the school where I matriculated and that motto is *Perseverando Vincimus* which means "Those who persevere shall overcome"**

If you could go back in time, what advice would you give your younger self? **I would probably tell myself to be more diligent right from the word go and not wait until you mature before you apply diligence.**

Career/NWU related

Where did you go to school? **Uitenhage High School**

Where did you study? **Undergrad and Postgrad at Rhodes and I also did a Teachers diploma at the University of the Western Cape.**

How did you get interested in Microbiology? **I was always interested in Biology and as many young science students in the 70's we had very little knowledge of subjects other than Botany, Zoology and Chemistry. Then Microbiology popped up and that was one of the choices at Rhodes University. What are your favourite topics to teach? **DNA technology, particularly the history of it and the potential of it going into the future.****

What other types of jobs did you hold before starting at the NWU? **I was a High School teacher! (Interesting side note: "one of my matric students was Professor Mark Maboeta")**

Have you ever had any other career in mind? **Medicine, and I am sure there are many colleges currently in Science that wanted to follow a career in either medicine or veterinary medicine.**

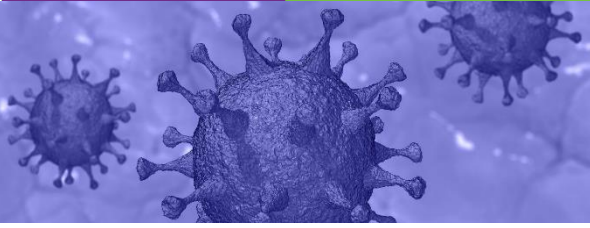
What is the best part of being the UESM research director? **To support staff, particularly young staff that need guidance and proper mentorship. Furthermore, to inspire staff to achieve maximum goals and maximum outputs.**

What projects are you currently

working on that lie exceptionally close to your heart? **We have just secured funding to set up a surveillance of pathogens that you find in the environment, particularly in waste water systems and to use the waste water system for potential epidemiological work. This project is mainly associated with antibiotic resistance. We have another project associated with sewage waste/municipal waste water going out into oceans and this is being conducted with a Norwegian partner, where the focus is the potential to transport antibiotic-resistant bacteria and resistant genes by means of microplastics.**

What kind of work situation makes you feel satisfied? **A work situation in which research is being conducted, but also where you see the development of students. From young and sometimes insecure BSc honours students into confident PhD's and Post-docs.**

What is your vision for the UESM? **To build upon structures that were established by previous directors. Finding opportunities to expand and strengthen these structures is envisaged to maintain sustainability in the UESM.**



Research Director's take on COVID-19

COVID-19

In light of the current COVID-19 pandemic, how do you balance family and working from home? Fortunately for me, my children are all adults. My wife is an essential worker who had to work since Level 5 of the lockdown period. Having most of the day to do my work from home, I try to switch off from work from late afternoon or early evening to spend time with my family. When urgent matters arise I would get up very early in the morning to attend to them. It is important that we set these limits to ourselves to avoid distractions during family time.

If you could be President Cyril Ramaphosa's advisor for one day, what would your advice be? My advice would be for him to use the models currently available to them to ensure that the current systems that they have in place are sustainable. If these systems are not sustainable all the discomfort experienced during the "lockdown" will go to waste, as infection rates may increase to the extent that it will be extremely difficult to manage.

What is the greatest lesson you've learned so far during this pandemic? That it is possible to work remotely (for teaching purposes as well as for some research activities). That as humans, as people, as a community we are resilient. We have adapted our current conditions and we have put in place the means to remain productive despite the challenges we were faced with. We've managed to acquire new skills, specifically electronic skills, in ways that we never thought possible. What was the biggest challenge for you during the pandemic? To ensure that we get and we maintain administration- and financial

processes to ensure that we have all staff electronically linked up. We've managed to do that. There's also support staff for students that were getting despondent. Initially, academic staff had queries that we didn't have answers to. Most of the challenges were faced during "lockdown" level 5 and level 4 which were the most strenuous because of limited movement and getting permits for individuals to be able to attend to essential maintenance services on campus. It worked out in the end.

What advice do you have for readers on handling the pandemic? Having a sounding board, a senior mentor to listen, and to advise is very important. The answers that you get back might not always be what you want to hear, but one could always do with another opinion. From a scientist perspective it important that from a young age (from honours onward), students get answers from seniors and though these answers are not always what they want to hear, they should be constructive and not destructive in nature.

What influence do you expect Lockdown/COVID-19 to have on research in the UESM? A definite negative impact on research, particularly for individuals that have planned to complete their research within this first semester and those who planned on finalizing dissertations and theses in November for submission. Seasonality has a major impact on ecological studies where surveys are conducted. Many of these surveys were supposed to be

conducted before the onset of winter. This could mean that some of these studies can only be completed next year. In all cases there will be cost implications. A number of students completing research projects are dependent on external funders and will be impacted. We expect financial implications into the next 4 to 5 years and we will have to find ways of addressing those implications.

What opportunities do you expect will result from COVID-19 in the UESM? A major opportunity in the lockdown was that we could detect the flaws in our systems. For example, where students were responsible for buying data in order to access eFundi. There were discussions with network providers and companies providing infrastructure for internet to allow zero rated university sites. Another opportunity could also be in terms of our software that we require. We could have a system set up with the central university so that more of us can have access to larger computing capacity. Another great advantage was for researchers to go back to some of the datasets that they have and write and submit those publications. There is also quite a bit of thinking around how we could work together to put forward competitive funding proposals for COVID-19 related research on how we could optimise our different skill sets. I think that the legacy of the COVID-19 period will be innovative thinking that will encourage the development of larger multidisciplinary and/or transdisciplinary research projects.

Congratulations

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

Prof Juaneé Cilliers

Juaneé was elected on the Scientific Committee of [the International Society of City and Regional Planners \(ISOCARP\)](#).

Prof Klaus Kellner

Klaus was elected on global committees for the [United Nations Convention to Combat Desertification \(UNCCD\)](#), regarding the Committee for Science and Technology (CST), the Science and Policy Interface (SPI) and Ad Hoc Working Group on Scientific Advice (AGSA).

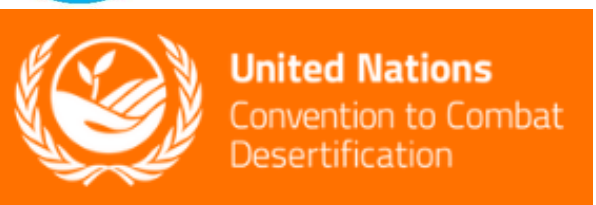
Ms Marlize Muller

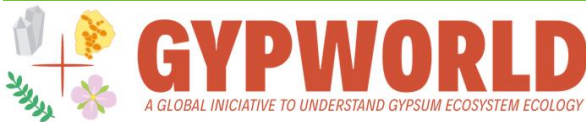
Marlize Muller has been elected on the 2020 Steering Committee for the Graduate Student Network of South African Environmental Observation Network (SAEON). Marlize is a PhD student under the supervision of Dr Frances Siebert and a team of co-supervisors and project collaborators (Prof Anja Linstädter from University of Bonn, Dr Dave Thompson (SAEON) and Prof Stefan Siebert).

<https://enews.saeon.ac.za/issue-02-2020/new-graduate-student-network-steering-committee/>

Prof Francois Retief

Francois was selected by the International Association of Impact Assessment (IAIA) as the recipient of the [IAIA 2020 Individual Award](#). The IAIA Individual Award acknowledges personal contribution to the discipline of impact assessment. It recognises major achievement and advancement in theory and/or practice over a period of time at an international level.





**SUPPORTING
CONSERVATION
LEADERS**



WIOGEN

West Indian Ocean Governance Exchange Network

Welcoming

Welcome note from the UESM Research Director

Carlos Bezuidenhout

A special word of welcome to the eight colleagues from the Centre for Environmental Management (CEM) that officially joined the UESM on 1 June 2020. It is my hope that you will get the necessary academic fulfilment in your new roles within the UESM. In the near future we will have a feature on the history of the CEM. It is important that we document this.

Accolades continued

Prof Stefan Siebert

Stefan was recently elected onto the global GYPWORLD Management Committee as the representative from sub-Saharan Africa. [GYPWORLD](#) is a global initiative of the European research programme Horizon 2020, which strives to understand the ecology and evolution of plant and lichen life on gypsum, and including ten gypsum-rich regions from five continents that differ in geological origin, climate, and flora.

Dr Jeanne Tarrant

Jeanne was a Masters and PhD student under the supervision of Prof Louis du Preez and Ché Weldon. She continued as a PostDoc in Louis' lab. Jeanne was recently awarded one of the GREEN OSCARs ([Whitley Prize 2020](#)) for her work on frogs in Southern Africa. She is nicknamed "frog lady" and has honed her research skills for her work with frogs in the laboratories of the NWU. Links to media coverage and some of the write-ups for the work of Jeanne is provided below:

<https://whitleyaward.org/winners/a-country-wide-strategy-for-south-african-amphibians/>

<https://www.heraldive.co.za/weekend-post/your-weekend/2020-05-10-sa-amphibian-expert-snaps-up-green-oscar/>

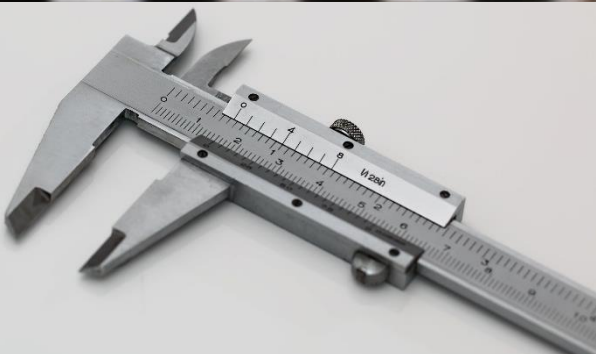
<https://www.iol.co.za/saturday-star/news/sas-frog-lady-scoops-a-green-oscar-47455005>

Dr George van Zijl

The [Fulbright](#) Programme recently awarded a scholarship to George van Zijl, a Senior Lecturer in the new Agriculture Programme on the Potchefstroom Campus, to visit the University of Florida as a visiting researcher. This award is part of the Fulbright South Africa Research Scholar Program. The aim of the visit is to observe a tertiary precision agriculture module, as well as to conduct research in soil spectroscopy. The research visit which was supposed to be conducted in 2020 has been postponed to January 2021 due to COVID-19.

Ms Veronica van der Schyff

WIOGEN (West Indian Ocean Governance Exchange Network) acknowledged the contributions of Veronica van der Schyff to marine research in their recent [Newsletter](#). Veronica is a PhD student under the supervision of Henk Bouwman.



Why 'The Calliper'?

A calliper is a measuring instrument to measure the diameter of something. In this *Regulars* item, we measure and reflect on scientific outputs in the UESM.

How the top 10 most cited papers were determined:

This list is based on citations as reflected by SCOPUS on 19 May 2020. To qualify for inclusion, the paper had to be published after the establishment of the UESM in 2004, and at least one author had to be employed by the NWU and be affiliated with the UESM at the time of publication. Highly cited contributions by extra-ordinary appointments which did not include UESM staff were not considered. This list is therefore a reflection on the most cited papers originating from research within the UESM and will be updated once a year. In the next edition we will include a list of the top ten most cited researchers in the UESM based on their total career citations in SCOPUS.

SCOPUS: Top 10 most cited UESM papers

1. Sarel Cilliers and Stefan Siebert: 480 citations

Aronson *et al.*, 2014, A global analysis of the impacts of urbanization on bird and plant diversity reveals key anthropogenic drivers, *Proceedings of the Royal Society B: Biological Sciences*, 281 (1780): 20140038

2. Ché Weldon and Louis du Preez: 354 citations

Weldon *et al.*, 2004, Origin of the amphibian chytrid fungus, *Emerging Infectious Diseases*, 10(12): 2100-2105.

3. Ché Weldon and Louis du Preez: 280 citations

Farrer *et al.*, 2011, Multiple emergences of genetically diverse amphibian-infecting chytrids include a globalized hypervirulent recombinant lineage, *Proceedings of the National Academy of Sciences of the United States of America*, 108(46): 18732-18736.

4. Gert Kruger: 201 citations

De Ronde *et al.*, 2004, Photosynthetic response of transgenic soybean plants, containing an Arabidopsis P5CR gene, during heat and drought stress, *Journal of Plant Physiology*, 161(11): 1211-1224.

5. Henk Bouwman: 198 citations

Eskenazi *et al.*, 2009, The pine river statement: Human health consequences of DDT use, *Environmental Health Perspectives*, 117(9), 1359-1367.

6. Gert Kruger and Riekert van Heerden: 189 citations

Strauss *et al.*, 2006, Ranking of dark chilling tolerance in soybean genotypes probed by the chlorophyll a fluorescence transient O-J-I-P, *Environmental and Experimental Botany*, 56(2): 147-157.

7. Louis du Preez: 170 citations

Solomon *et al.*, 2008, Effects of atrazine on fish, amphibians, and aquatic reptiles: A critical review, *Critical Reviews in Toxicology*, 38(9): 721-772.

8. Ché Weldon and Louis du Preez: 162 citations

James *et al.*, 2009, Rapid global expansion of the fungal disease chytridiomycosis into declining and healthy amphibian populations, *PLoS Pathogens*, 5(5): e1000458.

9. Henk Bouwman: 151 citations

Bouwman *et al.*, 2006, Simultaneous presence of DDT and pyrethroid residues in human breast milk from a malaria endemic area in South Africa, *Environmental Pollution*, 144(3): 902-917.

10. Sarel Cilliers: 134 citations

Ahern *et al.*, 2014, The concept of ecosystem services in adaptive urban planning and design: A framework for supporting innovation, *Landscape and Urban Planning*, 125: 254-259.



Research Ethics in Environmental Sciences and Management

Ethics

Roelof Burger

Research ethics sends shivers through the spine of most natural scientists. The concept of ethics has its origins centuries ago, but its application in research was pioneered in the field of human health after the Second World War. Today, even at the NWU, this is still the primary driving force behind research ethics. The NWU adopted a research ethics policy in 2018 that decreed that all research should be conducted following national and international ethics standards, and be subjected to approval by an independent ethics committee. The Faculty established a committee, FNASREC, to oversee low risk and no risk projects in November 2018. Prof Roelof Burger was appointed as acting chair of FNASREC in April 2020.

The Faculty currently has around 845 students on records, of which 372 has ethics approval and 120 registered their titles before FNASREC were formed. Researchers must ensure that all studies under their supervision is approved before work starts. In the Unit for Environmental Sciences and Management, 337 postgraduate students are on record. This comprises of 102 first year postgraduates, 111 second years, 69 third years and 26 who has been registered for more than three years. Most of the 116 students in the unit that still require ethics approval are first-year postgraduates, but there are a few senior students that still have to apply for approval.

The current process involves submitting the same documentation to FNASREC as to Faculty after a study has gone through the scientific review process in the sub-programme. This is largely managed by the unit administrator and the sub-programme chairs for postgraduate students, but researchers are responsible for their studies. It is therefore important that you confirm the status of ethics approvals for all research under your supervision.

The new policy was introduced with little consultation or involvement of researchers. However, it acknowledges that each discipline has to develop its own procedures. FNASREC is currently formulating risk level descriptors and policies that are relevant to the field of environmental sciences and management. Please contact Prof Burger if you are interested in participating (roelof.burger@nwu.ac.za).

Read more about the NWU ethics policy here
<http://services.nwu.ac.za/sites/services.nwu.ac.za/files/files/Ethics/NWU%20Research%20Ethics%20Policy%20and%20ToR.pdf>

METSI

Clarissa Minnaar, Frances Siebert & Carlos Bezuidenhout

METSI (Mooi River Ecosystem Trials for Scientific Investigations), formerly known as ‘the Gerhard Minnebron site’, was established by the UESM as a facility for practical training and interdisciplinary research within the research unit.

METSI is a ~21 ha natural area situated roughly 25 km outside of Potchefstroom. Various essential water sources surround METSI, giving rise to the double meaning of the acronym, since “metsi” also means “water” in Setswana. The facility provides access to the Gerhard Minnebron River, roughly 2 km downstream of the well-known Minnebron ‘eye’ which flows into the Mooi River some 2.5 km downstream. In addition to these water sources, METSI also hosts a sensitive peatland and a small patch of dolomite grassland - a grassland ecosystem known for its high plant species diversity. A gradient from natural to degraded or transformed habitats in both aquatic and terrestrial ecosystems provide opportunities to test the effects of land-use change on biodiversity.

The multifaceted nature of METSI encourages long-term, interdisciplinary environmental research of international interest which could improve the understanding of current and future global change. Through revolutionary technological equipment, valued and promising experimental systems and infrastructure available to researchers, the UESM anticipates quality long-term monitoring research and esteemed environmental research partnerships emerging from projects at the facility.

Early in 2019, prof. Nico Smit agreed to coordinate and lead an interdisciplinary long-term research project proposal to the NRF/SAEON platform, better known as the Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON). He congregated specialists in various research areas to participate in the EFTEON Landscape proposal. Recently, the UESM received a [notification](#) that the METSI Cluster was identified as a potentially suitable EFTEON landscape. The SAEON/EFTEON initiative received a total of 57 landscape nominations, of which METSI was one of the few landscapes to be invited to submit a full proposal. The METSI landscape will join hands with the Magaliesberg Headwater Streams from the University of the Witwatersrand to submit a full proposal for the METSI-Magaliesberg Landscape in the METSI Regional Cluster.



Access to water sources.



Accommodation and location of various infrastructure and experimental systems.



Plant-insect interactions at METSI.

Facilities



Aloe greatheadii



Planning future forb research experiments at METSI.



International bud-bank workshop, May 2019.

Mooi River
Ecosystem
Trials for
Scientific
Investigations

Apart from larger initiatives, such as EFTEON, METSI provides research and training opportunities for all UESM researchers. With the advantage of low travelling costs due to METSI's close proximity to the NWU (North West University) and free accommodation if need be, the UESM would like to encourage UESM members to get involved and consider planning future research projects among those currently running at METSI.



The official opening ceremony was held on 26 November 2019 after the naming of METSI. Researchers were given informative presentations by Prof Nico Smit, Dr Frances Siebert and Mr Lieb Venter on the history, location and available infrastructure, followed by the vision for METSI as well as current projects and future research opportunities at the facility. Thereafter, interested researchers proceeded to METSI, where they were introduced to the facility.

For more information on the facility, or should you be interested to register for a research project at METSI, visit the website via: <http://natural-sciences.nwu.ac.za/metsi/home>

Photo credits:
Frances Siebert, Clarissa Minnaar, Stefan Siebert

Community projects

Food for thought during a world pandemic!

Karen Puren



Site before intervention



Site in preparation for community garden



Community members planting vegetables



Collaborators - Cecilia (owner of Fresh Pick), Thabo Kolodi (Community project leader), Karen (Urban and Regional Planning, NWU)

Almost 11% of the total global world population die of hunger each year and a fifth of the fatalities occur in Africa (FAOSTAT, 2020). The words of Robert Louis Stevenson's, "*Don't judge each day by the harvest you reap, but by the seeds you plant*", describes the local effort of a transdisciplinary team to establish a multipurpose community garden in Ikageng as a response to the global food security challenge that is currently on the rise due to the COVID-19 pandemic. The spatial vision for the area that was earmarked for transformation is to eventually include a combination of food gardens, worm farms, waste management and recycling areas, compost production, small business initiatives and play areas for children. Up until now the site has been a crime hot spot and is used as a dumping site.

Transdisciplinary collaboration formed an important point of departure for the project and various stakeholders are involved. Collaboration involves Karen Puren (a senior lecturer in Urban and Regional Planning), Thabo Kolodi (community project leader), community members, councillors and various local businesses. Permaculture is used as the overarching framework to guide the community about the spatial planning and design of this initiative. Permaculture was coined by Bill Mollison in 1978 as: "*the conscious design and maintenance of agriculturally productive systems which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of the landscape with people providing their food, energy, shelter and other material and non-material needs in a sustainable way.*" A final year Urban and Regional student, Denise Janse van Rensburg, who is conducting research on how permaculture principles can be used to transform small scale public urban spaces into sustainable and vibrant urban spaces is using the community garden-project as a case study to develop spatial and design guidelines for the area. The project will also be used later in the year to teach Urban and Regional Planning students about the importance of community engagement in research. While the primary aim of the project is to contribute towards developing a more sustainable and resilient urban community, it also provides food for thought for academics and students about ways to descend from the academic ivory tower to engage with communities as part of research in the field.

Photo credits:

Vanessa Van Der Westhuizen, Thabo Kolodi

Community projects

Changing children's minds: insects are our friends!

Johnnie van den Berg & Paul Janse Van Rensburg

It has become a highlight of the academic year of post-graduate students in the Integrated Pest Management sub-programme to organise events during which they interact with school children of all ages and show off interesting live insects as well as exhibitions of insect collections. During the 1st quarter of 2020, two such events were hosted, one for kindergarten kids, and the other for high school learners of the SETH academy (Science Engineering Technology and Health). During one of these events which was hosted in the Botanical Garden, approximately seventy 4-5 year olds participated in cockroach races, insect "hunting", and insect "tasting" where the willing ones were provided with an opportunity to eat some sour worms.

On another occasion, learners from the SETH academy participated in "experiments" where they were shown how predatory insects such as preying mantids smell and catch their prey. The day's activities saw SETH learners touring the Eco-rehab laboratories to get a taste of university life. They also had the opportunity to interact with, and hear from current students about what it is like to study at NWU. Post-graduate students also had the opportunity to test their communication skills and how to convey the value of science to these high school learners.

The programme started with a video presentation on weird and wonderful insects. Insects are a part of so many people's lives, whether they realise it or not. Learners got to view large display cases of a variety of "oh my" insects and they were given the chance to ask questions and learn about the biodiversity of insects

and the role they play in ecosystems, agriculture and public health. The programme ended with a short video on genetically modified crops followed by a spirited debate on this topic.

These annual events provide an opportunity for curious kids to learn about the wonderful world of 'creepy-crawlies' out there, and to expose high school students to some activities and academic programmes in the School of Biological Sciences.



Neil Roos, son of Dr Claudine Roos, is a passionate 'creepy-crawly' fan, while his friend, Zayley de la Rose, peaks cautiously over his shoulder.



Photo credits:
Augusta Retief

Ad Vivendum

Sloane Munro

As the academic student association (ASA) under the Faculty of Natural and Agricultural Sciences (FNAS), Ad Vivendum has been striving to make student-life easier and more pleasant at the university for undergraduate and post-graduate students alike. Ad Vivendum is Latin for 'alive', which loosely translated means 'together, alive'. We are all in this together and our fields of study encompass the chemistry and biology pertaining to life.

Before being faced with the COVID-19 global pandemic, Ad Vivendum has had a busy year with lots going on. At the beginning of the year we had a special surprise for our first years that very few students get the opportunity to encounter. We took them to the aquarium/research labs on campus. We have actively been engaging with Little Angels, a small primary school in Ikageng, having numerous outings playing with- and teaching the young children about hygiene and life in a fun and interactive manner. Ad Vivendum, the proud winner of Wellness Week, enthusiastically participated in Environmental Week where we even had a live tarantula at our stall! Our Valentine's Picnic and Mini-Open Day events were received very well by all who attended.

Ad Vivendum has been able to engage with online meetings via Zoom as well as keep our students up to date with all matters related to the COVID-19 pandemic. Communications being sent through via the university is continuously communicated to students. Where possible we have directed queries from students to the correct personnel and ensured everyone is able to continue with their studies via this new online distance learning platform. We are pushing forward to ensure every student experiences student life to the best they can, while maintaining a high academic standard. Amidst the pandemic, we are excited to see how Ad Vivendum will continue to support students in FNAS. We remain enthusiastic and excited about what Ad Vivendum is still to accomplish in 2020.



For more information
follow us on Instagram

https://www.instagram.com/ad_vivendumnwu/

The Interesting Fact Box



Barcelona Opera Reopens with an Audience of Plants



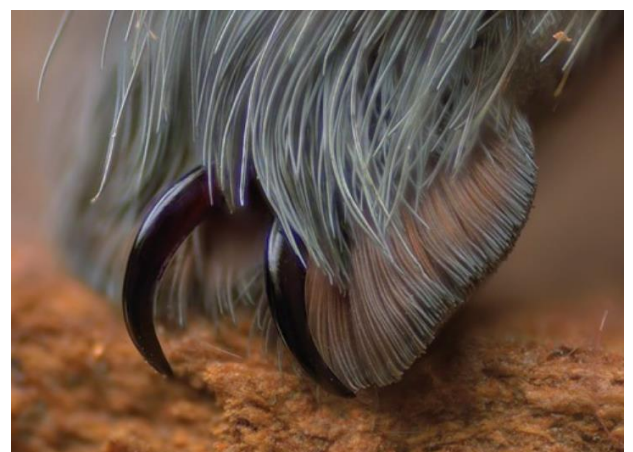
Remains of 60 Mammoths Discovered in Mexico



A new social role for echolocation in bats that hunt together



A different kind of 'boerewors': *Neofoleyellides boerewors*



Realizing Spiders Have Tiny Paws Might Change the Way You Look at Them

COVID-19 pharmaceuticals to contaminate water resources

Rialet Pieters

The current global pandemic, due to a novel coronavirus responsible for causing COVID-19, might have a slew of side-effects, which were not anticipated from its outset. One of these is the added load of pharmaceuticals likely to hit the already strained water resources of South Africa.

Prof Henk Bouwman steered two Water Research Commission projects on the levels and the effect of anti-retroviral drugs (ARVs) on unsuspected aquatic organisms. This was necessary because South Africa has the highest number of people living with AIDS and is also the country using the most ARVs. Prof Carlos Bezuidenhout and his team studied how ARVs might influence natural occurring viruses. In the light of these previous experiences, we wondered about the effect of even more pharmaceuticals in already strained fresh water systems and Dr Suranie Horn, which was involved in the chemical analysis of the ARV research, together with Ms Bianca Vogt, drafted a paper to highlight emerging issues into perspective, which was published on-line in April ([Horn et al., 2020](#)).



Wastewater treatment plants are still not geared towards effectively removing pharmaceuticals as they, in combination with personal care products find their way into freshwater systems. Since the outbreak of the 2020 pandemic, researchers looked towards drugs developed to treat other diseases for effective treatment. Research has illustrated similarities between COVID-19 and HIV, because the same convertase enzyme has the potential to cleave the viral envelope of both viruses. Lopinavir/ritonavir (HIV treatment), chloroquine phosphate (antimalaria treatment), ribavirin (broad-spectrum antiviral), arbidol (influenza virus treatment) and interferon α (IFN- α) (hepatitis treatment) are some of the drugs that have been included in the latest version of the “Guidelines for the prevention, diagnosis, and treatment of novel coronavirus-induced pneumonia”, issued by the National Health Commission of the People’s Republic of China for tentative treatment of COVID-19 ([Dong et al., 2020](#)).

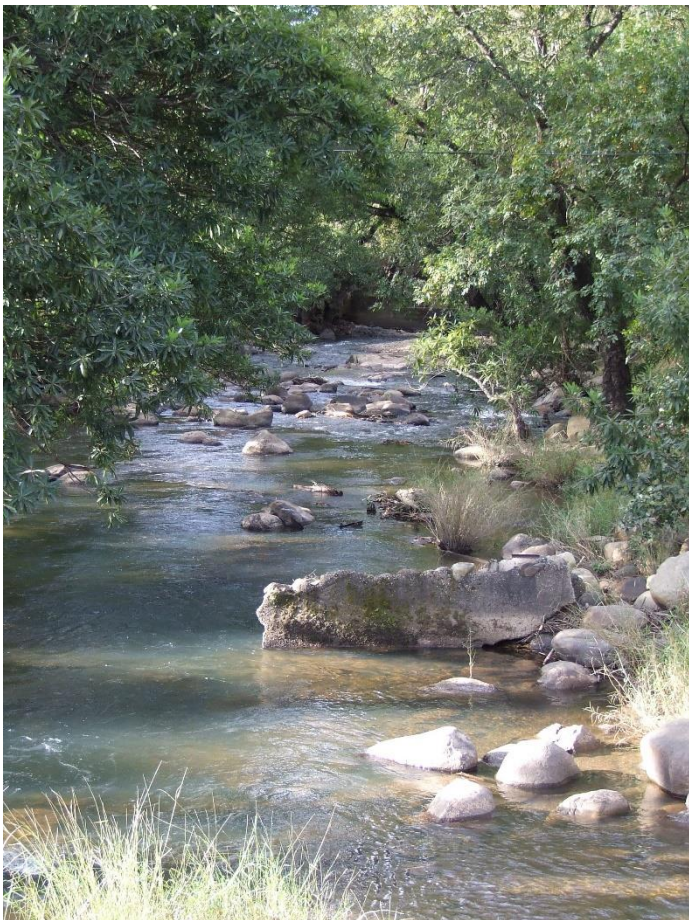


In 2004 a lopinavir/ritonavir/ribavirin combination had been more successful in treating Severe Acute Respiratory Syndrome (SARS)-infected patients than ribavirin only. In a recent study a COVID-19 patient took lopinavir/ritonavir orally on day 10 of the illness. The viral load decreased and almost no coronavirus titers were detected after the first day of the treatment ([Lim et al., 2020](#)). A second-generation HIV-1 protease inhibitor, darunavir, is also being investigated as a potential treatment of COVID-19. It has proven to inhibit SARS-CoV-2 infection in vitro ([Dong et al., 2020](#)).

If ARVs and associated pain medication, antimalarials, and antibiotics provide relief and are incorporated into treatment programs, with already ARV-polluted water, we can expect a sudden and dramatic increase in the amount of active pharmaceutical ingredients released into the environment. The increase in antibiotics might also exacerbate another problem the world already faces: antibiotic-resistant organisms. The risks posed by high levels of ARVs in the environment are not well understood. May this lead to potential antiviral resistance?

Also, chemicals in sanitizers such as triclosan, triclocarban, and acrylate copolymers may also pose environmental problems.

Indirect effects on the environment may therefore outrule short-term solutions to the global pandemic.



Further reading:

Dong *et al.*, 2020, Discovering drugs to treat coronavirus disease 2019 (COVID-19), *Drug Discovery and therapeutics*, 14(1): 58–60.

Horn *et al.*, 2020, Impact of potential COVID-19 treatment on South African water sources already threatened by pharmaceutical pollution, *Environmental Toxicology and Chemistry*, 39(7): 1305-1306.

Lim *et al.*, 2020, Case of the index patient who caused tertiary transmission of Coronavirus disease 2019 in Korea: the application of lopinavir/ritonavir for the treatment of COVID-19 pneumonia monitored by quantitative RT-PCR, *Journal of Korean Medical Science*, 35(6): e79.

Photo credits:

Photos displayed in this article represent water courses in the Lowveld of South Africa. All photos were taken by Rialet Pieters.

COVID-19 may lead to significant global ‘cutting of green tape’

Francois Retief

The following is based on an article in ‘The Conversation’ on 14th May 2020 by Alan Bond (University of East Anglia), Angus Morrison-Saunders (Edith Cowan University), Francois Retief (North West University) and Meinhard Doelle (Dalhousie University).



As the global pandemic lockdown continues to affect the way that human beings live their lives, numerous media reports have recorded significant positive environmental change. For example, there are reports of [cleaner air](#), [nature coming back in urban areas](#), and [reductions in wildlife trade and poaching](#). Whilst there is recognition that [not all this news is as good as it seems](#), COVID-19 is, at least for the time being, reducing human impact on nature. Thoughts have started to turn to what the ‘[new normal](#)’ might look like. The [global economy is in trouble](#), and businesses and Governments are mapping pathways for a post-lockdown recovery. A significant concern is that many Governments seem keen to weaken existing regulatory controls (under the narrative of cutting ‘green tape’) by exempting recovery efforts from environmental regulation or worse, proposing deregulation itself as a path toward recovery. Once the world emerges from the COVID-19 pandemic, the

need to emerge from potentially the [worst recession ever experienced](#) will be driving Governments to facilitate rapid economic development. We have previously shown that [environmental legislation is shaped by this neoliberal agenda](#), and in a context where emerging from the economic downturn will be the key priority for Governments, pressures to dilute environmental controls will be severe ([Bond et al., 2020](#)).

In previous periods of economic downturn, we have seen examples of Governments striving to [weaken environmental legislation](#) where it is perceived to be a barrier to development. The economic imperative post-pandemic will be of a scale and urgency not previously experienced. And in preparation of the ‘new normal’, we are already seeing impacts on environmental legislation. In India, some observers have concerns about the [weakening of Environmental Impact Assessment legislation](#), with environmentalists arguing that the revision “*legitimises violations by those who start projects without environment clearance, weakens the public consultation process and gives a lot of discretionary powers to authorities*”. In Canada, Manitoba Hydro have requested a [relaxation of environmental regulations because of COVID-19](#). The Australian commonwealth government is looking to [amend the national environment laws](#) to ‘cut green tape’. In South Africa, the mining sector started again in the third week in April whilst most of the rest of the country remained in lockdown. [New regulations have been adopted](#) that suspend timeframes for regulatory processes for the duration of the lockdown period which means potentially weaker enforcement and oversight.

Environmental protection measures were hard won over decades by citizens, governments and industry alike. A significant concern is therefore that, under the ‘new normal’, environmental regulatory safeguards will be abandoned in the name of short term economic recovery at any cost.

Further reading:

Bond *et al.*, 2020, Explaining the political nature of Environmental Impact Assessment (EIA): a neo-Gramscian perspective, *Journal of Cleaner Production*, 244(2020): 118694

Challenging ‘The Challenge’ or maintaining the myths?

Frances Siebert & Stefan Siebert

Hyper-diverse ancient grasslands around the globe have come under increasing pressure after [The Bonn Challenge](#) announced its goal to ‘restore’ 350 million hectares of deforested and degraded land by 2030 to combat climate change effects. The [global tree restoration potential report](#) incorrectly demarcated ancient grassy biomes as ‘degraded forested areas’ - an action that threatens our already waning grassland ecosystems. In South Africa alone, the Grassland Biome covers almost 30% of the land surface, but large-scale mining, crop production and exotic timber industries have left merely 1.5% of it to be formally protected. The high-altitude grasslands of South Africa (SA) is often referred to as ‘the water tower of Africa’, due to numerous sources of clean water.



Grasslands are more than grasses only. They are hyper-diverse, ancient ecosystems and, contrary to popular belief, they are NOT degraded forests that need to be restored through planting of trees.

Furthermore, SA’s grasslands play host to a vast array of indigenous flora which not only support nutritious forage for livestock, but also provide important goods and services to human livelihoods, including important traditional food- and medicinal plants. Grasslands have evolved with natural disturbances, such as fire, herbivory and climate variability (dry and cold, frosty winters and wet, warm to hot summers). Grassland plants therefore have adaptive strategies, e.g. [belowground bud banks](#), to tolerate such disturbances. Therefore, complete top-soil disturbances imposed by ploughing/tilling or mining practices push grassland ecosystems beyond natural recovery. Efforts to restore such grassland ecosystems are often overlooked or poorly understood, since research and associated policies are largely influenced by forest restoration practices, or programmes to enhance pasture productivity, and not diversity or functionality.



Grasslands have evolved with large mammalian herbivores.

The global misinterpretation of ancient, natural disturbance-driven grasslands as degraded forest areas, together with a poor understanding of restoring grassy ecosystems to their full ecological potential, have established several myths regarding grassland restoration. During the 2019 international conference of the Society for Ecological Restoration (SER), a group of international grassland ecologists took hands

to [challenge these common myths](#). These myths include the following: (1) Grasslands originate from degraded forests, 2) Tree cover is a reliable indicator of habitat quality, 3) Planting trees is always good for biodiversity and ecosystem services, 4) Grasslands are biodiversity-poor and provide few ecosystem services, 5) Enhancing plant nutrition is always needed in restoration, 6) Disturbance is detrimental, 7) Lessons from temperate grassland restoration can be readily applied to tropical grassland restoration, 8) Grasslands represent early stages of ecological succession, 9) Grassland restoration is only about grasses, and 10) Grassland restoration is fast.

The Forb Ecology Research Group (FERG) here at UESM was responsible for challenging the myth that grassland restoration is only about grasses. FERG has a specific focus on an improved understanding of forbs ('wildflowers') - the 'neglected plants' that fall outside the tree and grass categories, but provide important ecosystem goods and services, and contribute substantially to the resilience of grassy ecosystems.

'Please, Lorax, continue speaking for the trees where they *do belong*, but allow us speak for our ancient grasslands where tree plantations *do not belong*'.



Erythrina zeyheri (Afr: Ploegbreker; Eng: Ploughbreaker) (left) and *Agapanthus inapertus* (Afr: Bloulelie; Eng: Drooping agapanthus) (right) are only but two examples of grassland species with disturbance-avoidance strategies through specialised underground structures from where they can resprout when conditions are favourable. Belowground carbon stocks in ancient grassland ecosystems are also underestimated. Not only are most grassland forbs frost- and fire tolerant, some species are even dependent upon shocks such as fire for flowering.

Photo credits:
Karlien Muller, Werner Muller

Discovery of a very small insect with a very large impact

Johnnie van den Berg & Hannalene du Plessis

The fall armyworm, a moth species endemic to the Americas, invaded Africa during 2016, and is now the most important pest of maize on the continent. After the first report of this pest in West Africa, it spread throughout Africa and reached South Africa within a few months. This rapid spread was due to it having all the characteristics of an *r*-selected species. This pest can complete its life cycle (from egg to moth) within 20 days and therefore has several generations per cropping season. A moth can lay up to 1000 eggs and more than 350 host plant species have been recorded. The absence of effective natural enemies of this pest on the African continent prompted planning of classical biological control programs that rely on the importation of specialised natural enemies from the area of origin of the pest. Without an effective biological control agent of this pest, food security on the continent is threatened.



Telenomus remus. Parasitoid of the Fall armyworm.
(Scale bar = 200 µm).

During a field trip conducted by staff and post-graduate students of the integrated pest management (IPM) sub-programme to research sites in the Mpumalanga Lowveld, several egg batches of this invasive species were observed on plants. These egg batches were collected with the intention of augmentation of the fall armyworm rearing colony at

the IPM laboratory at the NWU.

While watching some of the egg batches in the field, many small black parasitic wasps started to emerge from an egg batch. These wasps were collected and after a long process which involved classical taxonomy and molecular research, it turned out to be *Telenomus remus* (Hymenoptera: Platygasteridae), an egg parasitoid of various Lepidoptera species. This species was originally from Malaysia but introduced



Telenomus remus wasps on moth eggs

against armyworm species in various parts of the world, including India, Pakistan, Australia and New Zealand. In Africa, it was also released in the Cape Verde Islands in the early 1980s but was never reported to have established. The presence of this exotic parasitoid can only be explained through natural migration from areas where it was previously released, 1000's of kilometres from South Africa.

This serendipitous discovery of a parasitoid of the fall armyworm at its most southern distribution range surprised the world and initiated searches for this beneficial species throughout Africa. It was soon realised that it established in many African countries, where it contributes to suppression of pests that threaten food security.

This shows that Big things come in small packages, and that being at the right place at the right time, can have huge impact.

Further reading:

Kenis *et al.*, 2019, *Telenomus remus*, a candidate parasitoid for the biological control of *Spodoptera frugiperda* in Africa, is already present on the continent, *Insects*, 10(4): 92.

Photo credits:

Hannalene du Plessis, Paul Janse van Rensburg, Reynhard Erasmus

Watch the emergence of *Telenomus remus* from an egg batch:

<http://natural-sciences.nwu.ac.za/unit-environmental-sciences-and-management/integrated-pest-management>



Planning the 1.5m City

Jauneé Cilliers

The COVID-19 pandemic has brought along unprecedented changes to society, to the way we move and interact, and ultimately to the way we use space, especially in cities. Cities have seen to withstand previous pandemics, recessions, and the internet age. Cities are known for their adaptability, dealing with conflicting demands on limited space, in attempt to create the balance between social, economic and environmental considerations. The role of planning healthy cities and planning as part of urban risk management, it now more prominent than ever before. The new reality brought along by the COVID-19 pandemic placed quality of life under the limelight, emphasising the great inequalities, but also challenged the way in which cities was designed and business as usual was conducted. Physical distancing recently became the new normal and is challenging the contemporary layout, design and functioning of our cities. Cities across the globe are engaging in

innovative design and spatial plans to accommodate the new 1.5m city. The International Society of City and Regional Planners (ISOCARP) hosted its first Cyber Agora event on 29 May 2020, initiating a global online platform for professionals and planners to share best practices, ideas and knowledge of how we could move forward to co-create the sustainable post-COVID-19 (1.5m) city. The event saw 253 participants from across the globe who contributed with enthusiasm and creative designs in illustrating the potential of post-COVID-19 cities. From the collaboration and polling it was insightful to learn that according to participants, only 37% of communities are currently fully engaged to COVID-19 mitigation measures. Only 19% indicated that their communities are seizing the momentum of the pandemic health crises to advocate and implement more sustainable development options. Results from another question called for more action to mobilise city and regional planners to help mitigate and adapt cities to post-COVID-19 urbanism, as data illustrated that currently only 7% of communities are engaging in such approaches. From the open discussions it became evident that physical distancing is a privilege for some, with speakers providing evidence from India and other



Online group photo of some of the participants of the Cyber Agora event.



Highlights of the 1st ISOCARP Cyber Agora event, with curator Juaneé Cilliers

Asian cities in this regard. The global debate concluded that physical distancing measures, and planning for the 1.5m city, are most probably temporary, and that the need for human interaction will in future again steer urban planning initiatives. Cities will return to enhance human interaction through well-planned public spaces and strategic movement patterns. COVID-19 brought along a blank page for city planners, to rethink the functioning, focus and opportunities of cities and to co-create sustainable solutions to enhance the unique selling points of our cities. In planning the 1.5m city, much focus will be placed on healthy cities, safe spaces and

digital infrastructure. Our response to the COVID-19 pandemic will shape our cities, and our society, for decades to come. The 1.5m city is introducing a novel era for spatial planning.

Link to the Cyber Agora information:

https://isocarp.org/app/uploads/2020/05/Cyber-Agora-29-May-2020_Feedback.pdf

<https://isocarp.org/about-cyber-agora/>

A bucket list moment - Finding a lungfish

Louis du Preez

If ever there was a plant or animal that you really would love to see in its natural habitat, what would that be? For me this “bucket list species” was the African lungfish *Protopterus annectans*. This bizarre eel-like fish, with long thin pectoral and pelvic fins, inhabit shallow waters like seasonal pans and are found from central Mozambique northwards to Central-Africa.

What makes this animal so special is that it is a living example of the evolutionary transition from primarily water breathing organisms using gills to air breathing organisms using lungs. Lungfish are often exposed to water with low oxygen content and live in environments that usually dry in winter. Their adaptation for dealing with these conditions is a



primitive lung. Although the lungfish still has rudimentary gills, it is an obligate air breather.

Another and possibly even more bizarre characteristic of the lungfish is its ability to aestivate. As the water body dries up they burrow into the mud and shrink into an oval “patty” approximately a third of its original size (50–70 cm). Lungfish can survive in bone dry soil for several years until the rains return and fill the pans allowing them to rehydrate, swell out to their full size and swim off.

They breed in spring and will construct a nest in the form of a U-shaped tunnel-nest in the bottom of the pan and the male will stay behind, aggressively guard the nest.

As an honours student I had the dream of doing a project on African lungfish, but since they do not occur in South Africa and at the time we were sanctioned from visiting Mozambique, and so meeting my dream animal had to be cast aside, at least for the time being.

Earlier this year I had the opportunity to undertake a field trip in Mozambique to document herpetofauna diversity and study parasites of frogs and terrapins. In the back of my mind I knew there was always a remote chance of encountering a lungfish. On the first day we set off to scout for sampling sites taking along nets to look for freshwater turtles. Within 10 minutes we had the first catch, not a turtle, but a fully grown lungfish. It is probably best that nobody recorded my reaction when I realised that it was indeed a lungfish in the net. For the first time in my life I gazed upon my bucket list “dream fish”, I found my lungfish and ticked off a dream I carried for 25 years. One happy zoologist!



Prof Louis du Preez holding a lungfish

Over the next 10 days we discovered that these lungfish are common, they dominate the pans and are ferocious territorial animals that will not hesitate to attack each other. In the upper jaw are prominent razor-sharp fang-like teeth. At a first glimpse the lower

jaw is toothless, however if you press down on the lower jaw a razor-sharp blade appears. Many of the locals carry the scars of a lungfish attack to the feet and lower legs.

Photo credits:
Louis du Preez, Edward Netherlands



A recent spate of tornadoes in South-Africa, and NWU-FNAS's little known connection to tornado research in the USA

Henno Havenga, Roelof Burger & Stuart Piketh

In 2019 South Africa experienced one of its most prolific storm seasons. Tornadoes along the eastern escarpment caused destruction, displacement, and economic damage throughout parts of Kwazulu-Natal, Mpumalanga and Eastern-Cape. Despite the recent media attention on social media platforms, South-Africa is no stranger to these unpredictable and severe local scale events. While research on hail storms and flash flooding has dominated meteorological research in the South-African severe weather context, past work by [De Coning & Adam \(2000\)](#) and the South-African Weather Service (SAWS) database on severe weather events) provides insights into the frequency of these phenomena.

A not so strange stranger

The reported occurrence of tornadoes indicates that these events are not a unique phenomena for SA (Figure 1), but nevertheless they remain extremely rare in space and time, sometimes even going unnoticed and unreported. SAWS's database highlights the need to direct research to these events in turn helping the South-African community to better understand lightning, flash floods, and hail storms, all associated with supercell thunderstorms.

The NWU-FNAS link to tornado research in the USA

The Climatology Research Group (CRG) has had a little known part in the largest tornado research project of the last decade. Henno Havenga, a CRG PhD student, joined the Targeted Observation by Radars and UAS of Supercells 2019 ([TORUS19](#)) field campaign ([Garcia de Jesus, 2019](#)) as part of Colorado University Boulder Integrated Remote and In Situ Sensing (IRISS) team. The study was a ground-breaking collaborative project during which

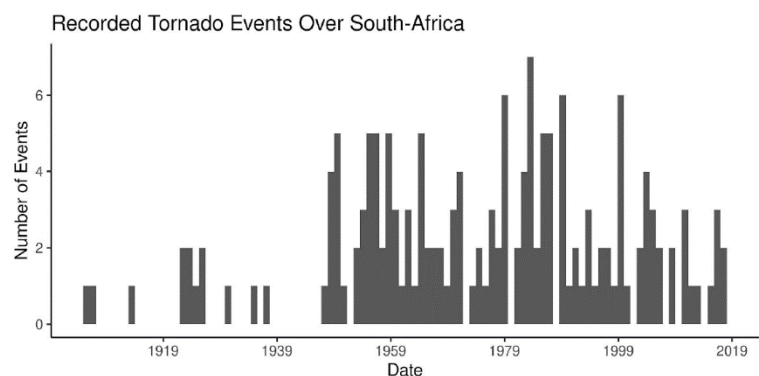


Figure1: Tornado reports in South-Africa as documented in the SAWS Caelum database indicates that the country is no stranger to tornado events, however, they remain elusive and often unnoticed, but nevertheless extremely dangerous.

Unmanned Aerial Systems (UAS) gathered atmospheric data within tornadic supercells to better understand the formation of tornadoes thereby improving numerical weather prediction models and early warning systems. Henno (Figure 2) was part of the “near inflow team” which gathered atmospheric data ahead of the storms. The field campaign was extremely successful, over the course of a month the team intercepted 18 supercells, and 8 tornadic supercells ([Frew, et al. 2020](#)).

The answer is blowing in the wind

The rare nature of tornadoes and their negligible damage, except for the late 2019 event, discourage the urgency for local research. However, we do not understand the formation and small-scale dynamics of these events in the South-African context. This might be cause for alarm if there is an increase in frequency and exposure in the future.



Figure 2: Henno Havenga, PhD student, holding the RAAVEN UAS somewhere in Nebraska, USA during the TORUS19 field campaign to study tornadic supercells.

The CRG is actively runs daily weather forecasts using the Weather Research and Forecasting Model (WRF), and with the addition of the NWU Lekwena Radar (<http://www.lekwenaradar.co.za/>), the CRG is improving our understanding of local-scale events with class leading infrastructure.

Links:

CRG Weather Forecasts and Radar

<http://www.lekwenaradar.co.za/>

TORUS Project Page

<https://torus.unl.edu/targeted-observations-radars-and-uas-supercells-torus>

Further reading:

Caelum, 2018, History of notable weather events in South Africa, Data provided by South-African Weather Service.

De Coning *et al.*, 2000, The tornadic thunderstorm events during the 1998-1999 South African summer. *Water SA*, 26(3): 361-376.

Frew *et al.*, 2020, Field observation of tornadic supercells by multiple autonomous fixed-wing unmanned aircraft, *Journal of Field Robotics*, 2020:1-17.

Garcia de Jesus, 2019, Tornado scientists send drone fleet into violent thunderstorms.

Nature, URL:

<https://www.nature.com/articles/d41586-019-01486-y>

Malaga's, 2019, Homes damaged after another tornado rips through KZN. *News24*, URL:

<http://tiny.cc/ruagpz>

Photo credits:

CU-Boulder IRISS

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- All the authors who willingly shared their stories with readers of the first edition.

We appreciate each contribution and are looking forward to share more of these inspiring stories in the Spring edition.

Frances and Clarissa

Photo credits:

Frances Siebert, Clarissa Minnaar, Stefan Siebert, Vanessa Van Der Westhuizen, Thabo Kolodi, Augusta Retief, Rialet Pieters, Karlien Muller, Werner Muller, Hannalene du Plessis, Paul Janse van Rensburg, Reynhard Erasmus, Louis du Preez, Edward Netherlands.

Additional photos were obtained from websites providing freely available stock photos: <https://unsplash.com/>; <https://pixabay.com/>; <https://www.pexels.com/>