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Science Matters

Science Faculty Newsletter

Message from the Dean

Scientific discoveries have been critical to the growth of science, and the Eureka moment associated with them has been an invaluable source of energy and inspiration for generations of scientists in various fields. The objects of discovery generate interesting scientific debates, many of which form part of broader public discourses. The recent detection of Omicron as a new variant of the SARS-CoV-2 resulted in much public discussions and diplomatic manoeuvring. Some questioned whether South African scientists should have announced their findings. Others wondered whether the timing of the announcement should have been sensitive to geopolitics irrespective of WHO protocols.

The consequent travel ban on southern African countries revealed several dimensions of the relationships between scientific inquiry and dynamics in society. The ban went beyond protocols for disease control at the global scale to reveal the realities of unequal power relations and the place of Africa in the world. Public comments and the actions taken by governments raise important questions about the role of scientists in society as well as their knowledge of the society they serve. In the pages of this second issue of Science Matters, you will read about how our colleagues in the faculty engage with, and respond to societal challenges. You will also read the stories of our young researchers, whose own life experiences have shaped their worldviews and the scientific questions they tackle. In this Newsletter we celebrate colleagues and students who were recognised for excellence in their fields.

As I reflect on the year that was, I am inspired by academic and PASS staff who showed a high level of dedication to their units, departments, and the faculty. Deputy Deans Becky Ackermann, Jeff Murugan and Adam West managed their respective folios very well under very difficult circumstances, and I am grateful for the important role they played in the Deanery. Thank you for your service to the faculty!

I hope all staff will take a break during this festive season and enjoy the company of family and friends.

Best wishes for 2022!

Maano Ramutsindela

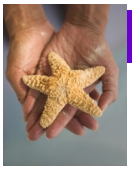
UCT College of Fellows and Royal Society of South Africa induction for Prof Nicci Illing

Professor Nicci Illing from the Department of Molecular and Cell Biology was recently elected a Fellow both of UCT, and of the Royal Society of South Africa, on the basis of her research. Induction to the College of Fellows at UCT is one of the highest recognitions an academic staff member can receive for their work. It signals original, distinguished academic work that merits special acknowledgement.

Science flies high in the Global Ranking of Academic Subjects

In May 2021, ShanghaiRanking placed UCT among the top 100 universities for five subject areas in its Global Ranking of Academic Subjects 2021. UCT performed best in **Environmental Science** and Engineering, placing 23rd in the world. This significant jump up from the previous year is as a result of a prestigious award in this research field that was conferred on a retired UCT staff member, Dr Jackie King, who became the first South African woman to win the prestigious Stockholm Water Prize – regarded as the water community's equivalent of an Oscar or Nobel.

Another UCT subject ranked in the top 50 was **Oceanography,** which maintained 48th position.



Our Science Stars:

Science "Oscar" Award for Professor Sheetal Silal

In recognition of her outstanding contributions to science, engineering, technology and innovation in South Africa, the University of Cape Town's (UCT) **Professor Sheetal Silal** received the TW Kambule-NSTF Emerging Researcher award at the NSTF-South32 event. This award is in recognition of Silal's contribution through combining knowledge from biology, clinical medicine, public health and economics to develop mathematical disease models to help shape health policy and improve the health of the people.

Silal, an associate professor in the Department of Statistical Sciences at UCT and director of the Modelling and Simulation Hub, Africa (MASHA), is an expert in the development of mathematical models for predicting the dynamics of infectious diseases. Her work has become a crucial part of evaluating the potential of control programmes to reduce morbidity and mortality, as well as supporting policy development around public health systems. In January 2020, she was invited by the World Health Organization (WHO) to join an international taskforce of mathematical modellers to study the dynamics of a novel coronavirus outbreak in China. In March 2020, when the first COVID-19 cases were reported in South Africa, Silal was well placed to respond to the South African National Treasury's request to develop a mathematical model to investigate the dynamics of the local outbreak.

She and her team at MASHA joined other researchers to form the core modelling team of the South African COVID-19 Modelling Consortium. Responsible for projecting the spread of the virus to support the South African government's policy and planning, the consortium created a COVID-19 dashboard alerting the public to infection rates and providing analyses of the various waves at a district and provincial level. Prior to COVID-19, Silal's work largely focused on developing models to track the successes and failures of, as well as the challenges facing, the fight against malaria in Africa. Her models synthesise data to create a cohesive computer-based representation of malaria, which can then be used to test the impact of interventions such as new drugs or prevention methods in silico, at no further cost.

Top Science Faculty Scholars in South Africa Honoured

Fourty-three of the country's leading scholars and scientists were inaugurated as Members of the Academy of Science of South Africa (ASSAf) at the annual Awards Ceremony in October. The Science Faculty at UCT is delighted to announce that **Professor Patrick Woudt**, from the Department of Astronomy and **Professor Shadreck Chirikure**, from the Department of Archaeology at UCT were inducted. As the official Academy of South Africa, ASSAf's core function includes honouring the country's most outstanding scholars by electing them to Membership of the Academy. Membership of the Academy is a great honour and is in recognition of scholarly achievement. Members give of their time and expertise voluntarily in the service of society.

Professor Patrick Woudt is Professor of Astronomy and Head of the Department of Astronomy at the University of Cape Town. He obtained his PhD in 1998 from the University of Cape Town. He is past President of the South African Institute of Physics and holds an adjunct professor position in the Department of Physics at the University of Venda. He is the co-principal investigator of the MeerLICHT telescope and the MeerKAT large survey project on astrophysical transients. He is currently vice-president of IAU Commission B4 (radio astronomy) and the co-chair of the international SKA Science Working group on radio transients.

Professor Shadreck Chirikure is in the Department of Archaeology at the University of Cape Town. He obtained the degrees of MA Artefact Studies (2002) and PhD in Archaeology (2005) from the Institute of Archaeology, University College London. His doctoral thesis explored the technology and socio-cultural metaphors associated with pre-colonial iron production in southern Africa. Shadreck's Archaeological Materials Laboratory is Africa's only facility dedicated to the study of pyrotechnology practiced by farming communities of the last 2000 years of the sub-Saharan past.

Climate change expert bags Social Responsiveness Award

Associate Professor Gina Ziervogel has received UCT's prestigious Social Responsiveness Award in recognition of her work on urban water resilience and social justice and her ongoing efforts towards achieving social justice in her discipline.

Who can forget Cape Town's record-breaking, once-in-a-century drought? Dam levels were at an all-time low, and that ominous phrase "Day Zero" dominated the news agenda both locally and abroad. Associate Professor Gina Ziervogel, UCT geographer and climate change adaption expert, was part of a multi-disciplinary team who raced to find solutions for the region's water crisis.

Based in the Department of Environmental and Geographical Science in the Faculty of Science, Associate Professor Ziervogel was appointed to the City of Cape Town's Water Resilience Advisory Committee in 2017 to provide expert input on the City's drought plans. Since then, she has not looked back. Her work on urban water resilience and social justice sheds much-needed light on the manner in which the City handled the region's drought, and how a metropole should better engage with residents around water issues. "This award is very special to me. I have sometimes wondered about my place in academia. But over the past few years I feel I have really been valued as an academic [who] engages in socially responsive work."

Winning the Social Responsiveness Award is a "wonderful and moving" recognition of her work in this field. And to further support and enforce social responsiveness in academia, Ziervogel also created a competition aimed at UCT students. Part of the requirement criteria was that they submit their ideas on how they'd use their winnings to make their research accessible to those outside academia. The competition necessitated that the students' research topics be related to the environment and social justice. Ziervogel donated her award winnings as the prize.

Award for world-first textbook on ontological engineering

Associate Professor Maria Keet of the Department of Computer Science has won the University of Cape Town's (UCT) Open Textbook Award for her "exemplary resource", *An Introduction to Ontology Engineering*. It is her first open textbook, and a world-first textbook on the subject for computer scientists. The award recognises outstanding open textbooks written by UCT staff and students that advance the university's transformation and social justice agenda. In her congratulatory message to Associate Professor Keet, DVC for Teaching and Learning Associate Professor Lis Lange wrote, "The award committee was very complimentary about your work, particularly with regard to localisation, technical innovation, accessibility, and the integration of assessments and other ancillary components. Congratulations on this important, ground-breaking work."

As the first textbook on ontology engineering (OE) for computer scientists in the world, it is not only used at UCT but also has become a textbook of choice elsewhere in the world. As a first for computer scientists in this area, it effectively demarcates the field as well. Also, it contributes to a maturing of the research area and the science conducted within it, as it forms a basis for educating the next generation of researchers in the field. There's also some guidance for reading the content for visually impaired people, particularly when it comes to logic symbols. It also incorporates technical and pedagogical innovations, such as software-supported exercises and several tools developed in-house to assist students to transition from the theory to hands-on engineering aspects of ontologies. It has slides and tutorial materials, and assignment examples and solutions to selected exercises, to make it a textbook package rather than a 'mere' PDF. The book is geared to African students and their contexts, as exhibited in the examples and tutorial material used throughout the book, which have local relevance (for example, African wildlife), and in the chapter on multilingual ontologies, where it considers African languages as well (thanks to the research Maria conducted with colleagues and students).

NSTF Public Engagement with Research Award to Professor Rachel Wynberg

Professor Rachel Wynberg from the Department of Environmental & Geographical Science at UCT, was awarded the NRF Public Engagement with Research Award at the NRF Awards.

Professor Wynberg holds the DSI-NRF Research Chair in Environmental and Social Dimensions of the Bio-economy. The bio-economy covers a broad range of areas from healthcare and food security to poverty reduction and environmental remediation. It includes, among other things, the commercial use of biodiversity and traditional knowledge, genetic engineering, the processing of biological raw materials, biofuels and waste management.

Located at the interface of fast-changing genetic and information technologies, and the juncture of a wide range of social, environmental, political and ethical concerns, Prof Wynberg's Research Chair asks critical questions about the governance of the bio-economy and who stands to benefit; the involvement of local and Indigenous communities; sustainable agricultural futures; and the environmental and societal implications of biotechnology.

Prof Wynberg consciously seeks to engage society with her research, tailoring her message to different audiences, including policy– and decision-makers, civil society organisations, local communities and Indigenous groups. She does this by utilising a range of communication approaches such as policy briefs, pamphlets, posters, zines and blogs, innovative videos, podcasts and use of the creative arts; community capacity-building and research feedback workshops; and multi-actor seminars, conferences and webinars. This has enabled her to reach a wide audience while remaining mindful of the architectures of different knowledge systems and multiple ways of knowing.

Prof Wynberg's work has narrowed the knowledge gap between science and society and has helped to foster critical thinking of the environmental, social and political dynamics of the bio-economy among community members, and how these affect society.

R13 Million funding for Towards Gender Justice in STEM Research in Africa

"Towards Gender Justice in STEM Research in Africa" is a research collaboration under the leadership of **Prof Ulrike Rivett** in the Department of Information Systems in the Faculty of Commerce and **Associate Professor Melissa Densmore** from the Department of Computer Science in the Faculty of Science, that has received funding for 3 years from the International Development Research Centre (IDRC) of the Government of Canada for ZAR 13million (CAD 1.2 million). The project is one of the many initiatives that also shows the cross- faculty collaborations within the School of IT.

As part of the IDRC's "Pathway to Change Programme", the research project intends to create pathways, resources and tools to facilitate women and gender-diverse people to be fully and actively included in STEM Research. Together with three African partner countries and the UK, the project looks at using co-design as an approach to analyse the motivations, barriers and success factors for women and gender diverse people in the fields of IT, Data Science, Human Computer Interaction and ICT for Development. The team is particularly excited about the opportunity to develop and pilot a curriculum focused on women students in Data Science and to encourage a new generation of data science researchers. Building on a previous project "GeDia – Gender Just Design in Africa" that was funded by the UK GCRF since 2018, this project will extend the established network of women and gender-diverse researchers to support the ongoing professional development of future leaders.

Computer Science project wins first prize in global Connecting the Unconnected challenge

The iNethi project, which is led by **Associate Professor Melissa Densmore**, **Dr David Johnson** and **Dr Josiah Chavula** from the Department of Computer Sciencer at UCT have just been announced as first prize winner of the annual IEEE CTU Connecting the Unconnected Challenge. They won the Community Enablement Proof of Concept 1st Place Award, winning an amount of $7,000.

iNethi seeks to work with communities to co-design a content sharing and services platform for community wireless networks. Their goal is to build more resilient communities by using information technologies to help them tap into local creativity, innovation, and other resources, with an eye towards improvement of socio-economic status. The reality is that the cost to communicate for lower income users is far higher than for higher income users. For example, in South Africa, lower income users purchasing small pre-paid data bundles can pay as much as 50x more than higher income users on 24 month contracts. Dr Johnson says, "The key issue here – is the importance of diversity of choice for low-income users rather than just costly mobile access. We need to ask what "access" even means – we think of access as access to the global Internet … but what if the content we need was not on the global Internet but hosted in our local communities – this is the heart of the iNethi platform."

Ocean View on paper has an estimated population of 13, 569, but local leaders puts this number close to 30, 000 people. The community has an unemployment rate of just over 60%, and severe food insecurity of 53%. The community is situated 40 km outside of the City's central business district and they do not manufacture or produce anything: everything is bought in and all the energy (money and skills) leave the community. They struggle to get government to implement the poverty alleviation policies within the community and instead welfare solutions are opted for instead of empowerment and sustainability options. There is very limited access to landline infrastructure with no internet cafes.

The vision for Ocean View is to develop an OpenCellular platform which offers voice communication, local data communication, an online communal radio station, newspapers, magazines, (so that they can tell their own story), a digital library and most important of all, a crypto ledger, which allows them to exchange energy digitally. With this communal crypto currency, they can then give value to underutilized resources currently treated as waste, and because they will own these resources, they will be able to determine how they grant themselves access to this network and services. Ganief Manual, a director of OVCOMM Dynamic community network in Ocean View says, "We are determined to find solutions, to the challenges we face, to design and build automated food growing systems to lower the costs and make them available to everyone, to use technology as an extension of intention and not just as a means of extraction. We envision robotic systems growing food for us whilst we pursue other challenges. This network is going to change the way we live."

Current connectivity options in low-income communities do not take advantage of the strong locality of interest that exists between users. For example, If an artist in South Africa uploads a 3 min music video to YouTube, their local fans would pay between R12 ($0.80) and R48($3.20) to download this song on a pre-paid data bundle. The solution is to build a local managed and owned community network and to host all the local content on a local server in the community that provides free localized services and access to locally relevant content. This is the core of iNEthi - a community-centric network and services platform. iNethi works with communities to co-design content and services that are relevant to the communities. Unlike many services on the Internet, iNethi seeks to build **ownership** into the services and content that are provided to a local network. Decisions about choices of services and content are made **collectively**, for example, through **workshops** with community members.

iNethi teaching platform launched at Ocean View High School during Covid-19 to connect teachers with learners

STUDENTS IN THE NEWS:

Oceanographer wins best presentation award at International Conference

Congratulations go to **Sive Xokashe**, an MSc student in the Department of Oceanography won the best presentation award at the International Global Atmospheric Chemistry conference. His prize includes registration and travel to the 2022 IGAC conference which is being held in Manchester, UK. "He was one of only a few MSc students, so it is quite an honour for him to win this prize" said his supervisor **Dr Katye Altieri .**

Interview with Sive:

KW: Tell us about your upbringing and what led to your interest in Science

SX: I was born and raised in Eastern Cape, in a village called Emkhanzi at Engcobo. I lived a typical life of a village boy - taking care of livestock was a priority i.e. missing school during days when the livestock had to go to faraway villages for dipping to kill ticks, etc or when they had to be injected for diseases; plumbing is none existent in villages, so, going to the stream by foot to collect water for drinking, doing laundry, etc was an ordinary thing.

At primary school, there were often two grades in one classroom and because of reduced space, you could hear what was happening in the other class (the walls separating the classes were not closed off). There were about five houses in our village and then next village was about 10-15minutes away. I lived with my grandmother who never enforced any belief system on us but rather allowed us to experience life through our own lenses, thereby making me more curious and inquisitive. There were just too many questions and not enough answers and that made me yearn for more out of life and science became and still is, the drug/food that continuously satisfies that yearning.

My mother took me to start high school in Cape Town at Phandulwazi High School and thereafter I went to UCT. I want to believe that the challenges I faced when I was growing up i.e. poor schooling system, lack of resources, amenities , role models, all became unconscious weapons that allowed me to face situations that I would have otherwise seen as challenges had my background been different.

KW: *Why Oceanography?*

SW: The choice to study Oceanography was motivated by a realization when Prof Roger Hunter taught 3rd year chemistry in such a way that made me feel that I missed out a lot from the previous lecturers that had been taught to us in undergrad. Oceanography motivated me to use what I knew and further mould it to what I was interested in and that, is the beauty of Oceanography`s multi-disciplinarity.

I like the research that I am doing because it exposes me to adventures and takes me to places that are beyond my wildest dreams. It took me to Antarctica (2019) but also more importantly, it immerses me into a field of science where I get to tackle portions of big questions related to issues ranging from human health, climate change, and ecosystems productivity. These questions were basically the broader scope of the poster I presented at IGAC. In the research that we are doing in the Southern Ocean, we are interested in the particles that are largely released from the ocean into the atmosphere (we call them aerosols) but in particular, the acidity of these particles, in order to improve our understanding of their impacts on climate change (they largely scatter radiation, thus helps in cooling the planet), human health (acidic particles are associated with adverse health effects) and ecosystem productivity (the particles acts as one of the sources of nutrients for food productivity in various ecosystems).

KW: *Where to from here?*

SX: My plan is to continue to do a PhD, there`s still a lot to be done on the project as a whole.

Palaeobiologist shines in FameLab competition

Caitlin Rabe a Masters student in the Palaeobiology lab in the Department of Biological Sciences took part in the FameLab SA 2021 competition where she talked about her passion for palaeosciences. As an avid public speaker, encouraged by both of her parents whose combined experience in the entertainment industry offered her a glimpse into the power of good communication, Caitlin entered FameLab with the hope of learning the nuances of science communication and preparing for a future in education and science advocacy. Congratulations to Caitlin who was declared the runner-up.

In her own worlds, Caitlin explains: "For my FameLab Semi-final entry I really wanted to convey my passion for palaeoscience, and explain the relevance of the work we do. To do this, I used examples from my own research to illustrate how palaeoscientific methods can reveal amazing clues about our past and help to create a window through which we can look at prehistoric life with awe and curiosity. I started, as every good story should, in the beginning - not the beginning of the Earth, mind you, but rather *my* beginning as a scientist - where I fell hopelessly in love with Spielberg's cinematic masterpiece 'Jurassic Park'. Once I had seen the wonder of those charismatic creatures, the gentle giants and ferocious beasts, I was hooked. I go on to explain that palaeoscience may seem like an odd choice of career, in the face of global change, economic uncertainty and social unrest, and I offer an explanation for my choice of vocation. A fossil, while superficially inanimate and rock-like, transforms into a prehistoric portal in the hands of a palaeoscientist. I describe a journey through time to the Permian period (approx. 250 MYA) where, through the careful examination of fossils, sediment cores, isotopic analysis and more, we can see the story of a little Dicynodont family unfold. The adults greet the day, stepping out onto the same sand where people now walk, while their young lie sleeping in a subterranean spiral burrow. Concluding my story, I mention that although the dicynodonts eventually became extinct, their pioneering cousins forged ahead to give rise to the same branching lineage that we are a part of. Palaeohistory is our history, and it is humbling to remember that we have shared this planet with so many unique and wonderful living beings. Ending with an iconic Jurassic Park quote, "Life finds a way..." I conclude that when faced with such uncertainty around our future, one need only look to the past to be reminded of the power and resilience of life on Earth. "

Caitlin's MSc research focuses on a small species of dicynodont called *Diictodon feliceps*. These little burrowing animals from the Karoo Basin of South Africa are an interesting mix of reptilian morphology and mammal-like characteristics, and their remains are uniquely abundant in the South African fossil record.

UCT student ties for first in SA Tertiary Mathematics Olympiad

Tim Schlesinger's win marks the ninth time a UCT student has claimed the top spot at the South African Tertiary Mathematics Olympiad since 2012. UCT third-year BSc student **Tim Schlesinger** tied first with two other students at the South African Tertiary Mathematics Olympiad. Two university students from the Western Cape have come up top in the South African Tertiary Mathematics Olympiad

The Olympiads aims to include a culture of mathematics, to appreciate and acknowledge the critical role of mathematics in the technological environment. To develop programmes that will contribute to the mathematical development of South Africans, to impact positively on the standard of mathematics teaching and learning and to promote research in mathematics and mathematics education.

Tim said mathematics had been a passion and gift of his since his mother nurtured it in him from an early age. "I think God gave me a natural gift for numbers, and doing mathematics is a way for me to glorify him," he said. He said he had done the Olympiads throughout high school and university, and the latest was just another one among the many, and he first competed after being picked up by the South African Mathematics Foundation coach from the later rounds of the UCT maths competition. "This Olympiad went particularly well. I felt good about it on the day, and it ended up showing in the result. I was tied first with two other learners, with 18/20," he said.

STAFF NEWS

WELCOME TO NEW STAFF

The Science Faculty welcomed the following new staff members during the second half of the year:

Astronomy—IDIA
- Ms Adrianna Pinska—Senior Systems Engineer

ACDI: African Climate and Dev Initiative
- Dr Christopher Trisos—Senior Research Fellow

Biological Sciences:
- Ms Raeeza Rayner—Senior Secretary
- Ms Sonto Mtolo—Research Assistant
- Dr Celiwe Ngcamphalala—Lecturer
- Ms Hana Petersen—Research Assistant

Chemistry
- Mr Frederick Esau—Senior Laboratory Assistant
- Mr Adrian Jooste—Laboratory Assistant
- Mr Kenneth Sigam—Senior Laboratory Assistant
- Ms Carol Stanley—Senior Laboratory Assistant

H3D Drug Discovery & Development
- Mr Tinavhuyo Matundu—Laboratory Assistant
- Ms Jessica Akester—Senior Research Scientist
- Dr Stephen Fienberg—Investigator

Statistical Sciences
- Dr Wessel Oosthuizen—Junior Research Fellow

Mathematics & Applied Mathematics
- Assoc Prof Elena Berdysheva—Associate Professor
- Ms Morgan Vandeyar—Lecturer

Molecular & Cell Biology: Biopharming Research Unit
- Ms Dolly Marubelela—Laboratory Assistant

Faculty Office
- Ms Christina Mazivila—Administrative Assistant

FAREWELL TO STAFF

The Faculty said goodbye to the following staff:

Chemistry
- Mr Molefi Makuebu
- Assoc Professor David Gammon—Retiring
- Dr Eileen Murray—Retiring

Environmental & Geographical Science—CSAG
- Dr Lorena Pasquini

H3D Drug Discovery & Development
- Dr Renier van der Westhuizen
- Dr Gregory Basarab
- Mrs Sumaya Salie

Mathematics & Applied Mathematics
- Dr Julien Larena

Molecular & Cell Biology
- Mr Mario Paulse

Congratulations to the following staff on their Ad Hominem Promotions

Name	Department	Promoted to
A/Prof. Adam West	Biological Sciences	Professor
A/Prof. Merle Sowman	Environmental & Geographical Science	Professor
A/Prof. Marcello Vichi	Oceanography	Professor
Dr Deano Stynder	Biological Sciences	Associate Professor
Dr Robert Thomson	Biological Sciences	Associate Professor
Dr Samson Chimphango	Biological Sciences	Associate Professor
Dr Geoff Nitschke	Computer Science	Associate Professor
Dr Jonathan Shock	Mathematics & Applied Mathematics	Associates Professor
Dr Sahal Yacoob	Physics	Associate Professor
Dr Thomas Dietel	Physics	Associate Professor
Dr Suhail Rafudeen	Molecular & Cell Biology	Associate Professor
A/Prof. Lynne Shannon	Biological Sciences	Principal Research Officer
Dr Olivier Crespo	Environmental & Geographical Science	Senior Research Officer
Dr Geoffrey Howarth	Geological Science	Senior Lecturer
Mr Aslam Safla	Computer Science	Senior Lecturer
Dr Katie Cole	Physics	Senior Lecturer
Dr Tom Leadbeater	Physics	Senior Lecturer
Dr Siyabonga Ngubane	Chemistry	Senior Lecturer
Mr Stephan Jamieson	Computer Science	Chief Scientific Officer
Ms Tatiana Millard	Molecular & Cell Biology	Principal Scientific Officer

NEW IN THE FACULTY

New Master's degree in Artificial Intelligence at UCT

Artificial Intelligence (AI) already shapes our everyday lives and has the enormous potential to both solve complex industrial and social problems and create new and innovative products and solutions. However, many organisations are still grappling to understand the relevance and future impact of AI on their activities, and what they should be doing about it. This is one of the pressing issues to be addressed by the new Master's degree in AI, to be offered by the Department of Computer Science at the University of Cape Town from 2022.

The new degree will complement the current Master's in Computer Science by introducing students to a broad base of AI and Machine Learning (ML) techniques, ranging from classical logic and ontologies to statistical approaches, biologically inspired AI, and natural language processing. The degree will offer an array of modules on various AI topics, as well as a dissertation component, enabling students to immerse themselves in a specific AI research topic under the supervision of one of UCT's AI experts in the Computer Science department. This specialisation in AI further aims to provide practical training in doing scientific research that makes substantial and significant research contributions, as well as building theoretical knowledge on a broad range of topics in AI, and solving critical research problems that contribute to, and advance the state of the art in the overall field of AI. The University of Cape Town is one of only a few tertiary institutions in South Africa that offers a Master's degree in AI with coursework and a dissertation component. Further information about the degree and application procedure is available at: http://www.sit.uct.ac.za/sit/postgrad/masters-ai

Vaccine Research at UCT: Vaccines made in Africa, for Africa...

Professor Ed Rybicki, Director of the Biopharming Research Unit (BRU) in the Department of Molecular & Cell Biology at UCT, participated in a Vaccine Extravaganza which **Professor Kelly Chibale** was moderating. Prof Rybicki, speaking about vaccines made in Africa, for Africa, was the only person speaking from the Faculty of Science. He spoke about how the BRU Professor Anna-Lise Williamson's Vaccine Research Group (VRG) in the Institute of Infectious Disease and Molecular Medicine (IDM) have been involved in design, production, testing and upscaling of the production of vaccines through clinical trials, working with the UCT Research Animal Facility. There is a range of candidate vaccines being developed in the BRU and the VRG, and several have been tested in the target animals, including humans.

This work has given rise to numerous patent application and granted patents, so that the BRU and VRG have the largest vaccine patent portfolio in Africa. As an object example of the possible scope of work, a combination HIV vaccine has been locally designed and developed, and put into human clinical trials twice. These vaccines are based on two genes in the form of plasmid DNA and a recombinant poxvirus, and have performed as well as any other contemporaneous HIV vaccine. The consortium then put in to the SAMRC SHIP programme to make next generation HIV vaccines, which would considerably improve what they had previously. These contained a mosaic Gag protein and improved envelope protein (Env) designs and an enhanced DNA expression vector, as well as soluble Env protein made in both mammalian and plant cells. This combination was much more immunogenic in head-to-head comparison with the older version, and they are currently trying to get this into human trials.

Rybicki used the metaphor derived from the film Deep Impact to describe what SARS-CoV-2 has done to humanity and to the planet. The moment the BRU/VRG group heard about this virus, Dr Mani Margolin designed a suitable gene encoding the virus S protein to be expressed in mammalian and plant cells, based on the same design already used for HIV Env. They have gone on to successfully make that protein in plants, and have also put the genes into DNA-based and poxvirus vectors . This combination has given excellent T-cell responses and neutralising antibodies in mice, and will go into hamsters at UCT for SARS-CoV-2 challenge studies.

To date, the only funding the researchers have received for this entire research programme since February 2020, has been from UCT for hamster cages and buying hamsters. Despite the feasibility of quickly pivoting their research from HIV vaccine to COVID vaccine research, as was done elsewhere in the world, there has been no support for such vaccine development from any national agency. Despite this, they still hope to be able to make a candidate COVID vaccine or vaccines locally.

Representation in science: SuperScientists Programme

The SuperScientists programme aims to bring the achievements of scientists closer to children.

Imagine a world where children colour in pictures of their favourite scientist, or dress up as a real-life researcher for costume days at school. Imagine a world where scientists are celebrated as much as Spiderman or the Black Panther. That world is here. UCT researchers and academics are among the heroes of a programme that aims to bring the achievements of scientists closer to children, to inspire their interest in maths and science. Two years ago, non-profit organisation (NPO) Codemakers started the SuperScientists programme, which has since been sharing the superpowers of science with children through an activity book, posters and calendars.

Dr Justin Yarrow of Codemakers says they started the initiative to expose young people to scientists, while appealing to their love for comic heroes.
SuperScientists brings diverse faces to represent who scientists can be. It features scientists from across Africa, including Ghana, Uganda, Kenya, Botswana, Zambia and Rwanda. "Racial and gender inequity in science is a problem. It limits who becomes a scientist, and it limits young people when they don't see scientists who look like them," said Yarrow.

Oceanographer and UCT PhD candidate **Kolisa Sinyanya** is one such scientist; she has been depicted as superhero Nitro. In an activity booklet, she challenges children to find their way through a maze in the deep oceans. They also get to colour in a picture of her in a superhero costume, featuring a crown that says 'OCEANWOMXN'. And she's an achiever: Sinyanya is completing her PhD in Marine Biogeochemistry, and works with the Oceanography department's Dr Sarah Fawcett to examine and calculate the relationships between phytoplankton communities and nutrient cycling in the sunlit surface waters of the ocean. "Having little boys and girls colour in photos of Nitro, who is a character based on me, is mind-blowing. It makes me proud to be the woman I chose to be today – a black woman who stands tall and speaks loudly about the science that I am so passionate about. I'm especially proud of my decision to have heeded the call to join SuperScientists, when Dr Justin Yarrow picked me from an 'ocean' of scientists to be Nitro," said Sinyanya. "Initiatives like SuperScientists are key in society, because they create awareness that there are black and POC [people of colour] scientists out there in the various science fields. The series of educational materials additionally educates young and old about scientific concepts that surround us [but that] we hardly – or never – pay attention to. We are unapologetically addressing what we see that is lacking: representation."

While superhero Nitro looks after the oceans, Galactica – or **Dr Rosalind Skelton** – studies the stars. Dr Skelton is a Southern African Large Telescope (SALT) astronomer at the South African Astronomical Observatory, and an assistant lecturer at the UCT Department of Astronomy. Between helping to maintain and improve the telescope and studying its data, she lectures for the National Astrophysics and Space Science Programme at UCT, which trains postgraduate students in astronomy. Of being portrayed as a superhero, Skelton said, "It's a bit scary to put oneself out there and be described as a kind of superhero – not something I'm used to, as a scientist! I feel somewhat embarrassed, and proud at the same time. I'm happy to be sharing what I do in a novel way, and would be very happy if it inspires a child to follow their interests into a career in science. "It's a wonderful initiative that highlights the relatively unknown work being done in South Africa, in many very interesting areas of science. I like that it includes diverse fields, and I think it will open children's eyes to career options they may not have realised were possible. It provides role models who are real, local people, hopefully up-ending outdated ideas of what scientists look like," Skelton added.

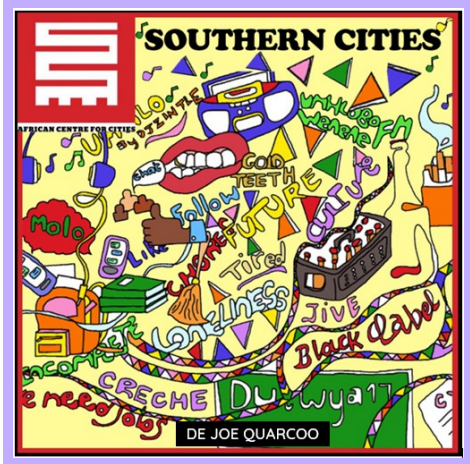
From Student to Change Agent. The Story of De Joe Quarcoo and the African Centre for Cities (ACC).

De Joe Quarcoo, an MPhil student in the Southern Urbanism Cohort at the African Centre for Cities (ACC) at UCT, has used his unique niche as a musical voice on urbanisation and cities, to write and produce a song called "Southern Cities" De Joe is a musician and practicing urban planner in Ghana. With a background in Social Psychology, De Joe experienced tensions with the fact that planning practice in Ghana focused mainly on hard core planning with little regard for the human factor – behavioural and cultural dynamics. This planning model has outlawed expressions of informality in Ghanaian cities. His search for answers led him to ACCs Southern Urbanism programme in the Environmental & Geographical Sciences Department (EGS) at UCT.

De Joe writes, "Our cities are our futures but they elude us. Why? Safe and sustainable cities call for inclusivity. However, city managers and planners are apprehensive about incorporating informality hence the persistent marginalization of the majority of urban dwellers. Meanwhile, the geography of poverty is rapidly shifting from rural locations to 'urban peripheries'. Change comes when it is insisted upon by citizens. Citizens can only insist on change when they understand the issues. The Southern cities song breaks down the urban phenomenon to the understanding of the ordinary person. This song therefore advocates for inclusive planning and engenders an increased awareness of the urban complexities in the global South, particularly Africa's."

He said his training as a Southern Urbanist has equipped him to be "an activist scholar (an insurgent planner), positioned within the hemmed space of research, policy and practice. The trans-disciplinary approach of the Southern Urbanism programme has empowered me to combine my musical art, passion as a social justice advocate and my training as a Southern urban scholar." This has led to the birth of a new project - *the Southern Urban Sensitization Project*. This project is focused on translating complex literature and thoughts from Southern scholarship into easy to understand lines channelled through sensational melodies. The project will feature other young talents from across Africa and other parts of the global South towards urban sensitisation and advocacy for a just, inclusive and sustainable cities post Covid-19. This project is currently seeking partnerships.

De Joe says, "Attaining the Sustainable Development Goals will take a collective effort. We can only win when everyone particularly the youth is involved. In a generation that's attuned more than ever to watching and listening, music is a potent medium to communicate important information and more so, to educate and sensitize. While personal, and evocative, the lyrics of the *Southern Cities* song also carry food for thought about cities in the global South, including provocations from renowned scholars".



The Southern cities song was recorded in collaboration with the 2020 Cohort of the Southern Urbanism Programme, a very diverse group who come from Ghana, Zimbabwe, Egypt, Djibouti, South Africa, and Italy. Listen to Southern Cities on all digital channels. Watch the video here. Connect with De Joe Quarcoo on instagram @insurgentplanner. To partner the Southern Urban Sensitization Project, contact De Joe music.dejoequarcoo@gmail.com or QRCJOS002@myuct.ac.za

Research Bytes

Explaining the super-groups of humpback whales on the west coast of South Africa

Over recent years since 2011 and apparently at random, super-groups of humpback whales (*Megaptera novaeangliae*) ranging from 20 to 200 have been observed in the coastal region of the Southern Benguela current between St Helena Bay and Cape Point on the west coast of South Africa. The sightings have been reported since then by several members of the public during the months of October, November and through to December. This occurrence is unique as while humpback whales in the Southern Hemisphere are well known for their annual migrations between the summer high-latitude Southern Ocean feeding grounds and the winter mating and calving grounds in low-latitude, tropical and subtropical coastal waters, the feeding strategy of such densely packed feeding individuals is unprecedented in this region (at such low latitudes ranging from 32.5°S to 34.5°S). Globally it has also been unprecedented until recently when super-groups have been reported in Australia too.

A new study co-led by **Dr Subhra Prakash Dey** and **Associate Professor Marcello Vichi** from the Department of Oceanography at UCT and the *Marine and Antarctic Research Centre for Innovation and Sustainability (MARIS*), aimed to understand this phenomenon. In collaboration with an international team of marine mammal experts, marine biogeochemists, and numerical modellers, they combined satellite observations and a physical ocean model to understand environmental drivers of this occurrence in the Southern Benguela Upwelling System (SBUS) off South Africa.

"The formation of super-groups in recent years suggests that there might be a change in oceanographic or ecological characteristics." Dey shared: "The formation of super-groups in recent years suggests that there might be a change in oceanographic or ecological characteristics which provide the conditions for this novel feeding strategy in the SBUS." The team found that the most prominent necessary condition for the occurrence of super-groups was the occurrence of a higher-than-normal phytoplankton bloom (development of a level of phytoplankton biomass that is uncharacteristically high for a given water body) during the month of October, and within one month prior to super-group events, ie a large phytoplankton bloom occurred around one month prior to each supergroup occurrence. However, this condition alone is not sufficient: changes in the typical northward and eastward transport of waters in the Cape Peninsula along-shore jet current are also required. This change is a reduction in the flow of water during the month of October, which leads to higher retention of the phytoplankton bloom.

"This study provides evidence of causal events that would allow researchers and the whale watching industry to prepare for super-group occurrences at least one month in advance." Both the retention and high chlorophyll concentration, which is used to measure phytoplankton abundance, are found to be significantly higher in October in 2011, 2014 and 2015 compared with other years. According to the team, the combination of a phytoplankton bloom and a reduction in water volume export from the area in October leads to an increase in secondary production and high concentrations of the humpback whales' prey. "Though the detailed atmospheric and oceanographic settings explaining the origin of these anomalies remain unknown, this study provides evidence of causal events that would allow researchers and the whale watching industry to prepare for super-group occurrences at least one month in advance, through the evaluation of chlorophyll and retention indices derived from satellite data and ocean models," explained Vichi.

"Given the upcoming season of possible super-group occurrences, we call for citizen science reports to help us better frame their distribution along the coast." The research is part of the Whales & Climate programme, an interdisciplinary approach to understand the impacts of climate change on the recovering population of humpback whales. Access the study "Oceanographic anomalies coinciding with humpback whale super group occurrences in the Southern Benguela" online.

Tiny pterosaurs dominated Cretaceous skies

An artist's impression of the hatchling pterosaurs. Image credit: Megan Jacobs

Scientists from the universities of Cape Town, Portsmouth, Leicester and Casablanca have found that the newly hatched juveniles of large and gigantic pterosaurs likely outcompeted other smaller adult pterosaur species to dominate the Late Cretaceous period around 100 million years ago.

Pterosaurs were the flying cousins of dinosaurs – some were as large as a Spitfire fighter plane and others as small as a thrush. During the Triassic and Jurassic periods, 252 – 145 million years ago, pterosaurs reached only modest sizes, but by the Late Cretaceous period many were giants – some with a wingspan of 10 metres or more. It had been previously thought that the smaller species of pterosaurs were outcompeted by newly evolving birds, but this research has found that it was actually the babies of giant pterosaurs - known as flaplings - who overshadowed their small adult rivals.

Co-investigator, **Professor Anusuya Chinsamy-Turan**, from the Department of Biological Sciences at UCT, is a world expert on the bone microstructure (histology) of pterosaurs and dinosaurs. She said: "By looking at the paper-thin sections of the bones under a microscope, I could tell that they were from juveniles as the bone was fast growing and didn't have many growth lines. We also examined the surface of the bones and found they had a rippled texture. This was further evidence they were the bones of immature individuals as mature pterosaur bones have an incredibly smooth surface once they are fully formed."

Roy Smith, from the University of Portsmouth said: "Over the last 10 years or so, we've been doing fieldwork in Morocco's Sahara Desert and have discovered over 400 specimens of pterosaurs from the Kem Kem Group, highly fossiliferous sandstones famous worldwide for the spectacular dinosaur *Spinosaurus*. "We'd found some really big pterosaur jaws and also specimens that looked like smaller jaws - about the size of a fingernail - but these tiny pterosaur remains could have just been the tips of big jaws so we had to do some rigorous testing to find out if they were from a small species or from tiny juveniles of large and giant pterosaurs." Roy and his colleagues examined five small jaw fragments and a neck vertebra using sophisticated microscope techniques to determine the age of the individual when the animal died.

The researchers also inspected the jaws and found that the number of tiny holes where nerves come to the surface for sensing their prey, known as 'foramina', were the same in the small jaws and the big jaws. "This was more proof we were looking at the jaws of juveniles because if the specimens were just the tip of a jaw, there would be a fraction of the number of foramina," said Roy.

Recent findings have suggested that hatchling pterosaurs could fly soon after hatching so they were quickly independent. Professor David Martill of the University of Portsmouth said: "What really surprised me about this research is that the feeding ecology of these magnificent flying animals is more like that of crocodiles than of birds. "With birds, there will be perhaps 10 different species of different sizes alongside a river bank - think kingfisher, little bittern, little egret, heron, goliath heron or stork for a large European river. There are several species all feeding on slightly different prey. This is called niche partitioning. "It's likely that the juvenile pterosaurs were feeding on small prey such as freshwater insects, tiny fishes and amphibians. As they grew they could take larger fishes - and who knows - the biggest pterosaurs might have been capable of eating small species of dinosaurs, or the young of large dinosaur species." said Martill.

Pterosaur jaw fragments from the Kem Kem Group

The ancient African plant that captured Armani's attention

by Natalie Simon

Professor Jill Farrant and Myrothamnus flabellifolia, arguably the most powerful of the resurrection plants, in full bloom

Although it's widely used in African traditional medicine, modern science is only beginning to appreciate the remarkable pharmaceutical and cosmetic applications of the plant *Myrothamnus flabellifolia*. This is why designer, Giorgio Armani, chose it as the main ingredient in his skincare range, Crema Nera. Known as *Uvukakwabafile* in isiZulu, *Umazifisi* in isiNdebele and *Mufandichumuka* in Shona, *M. flabellifolia* is believed to be one of the most ancient plants on our planet. Its name in the indigenous languages where it grows translates roughly as "awake from the dead", an appropriate name for a plant that can dry out almost completely and survive.

For **Professor Jill Farrant**, professor of molecular and cell biology at UCT and scientific advisor to Giorgio Armani, it is vital that as we learn more about this plant's valuable properties, we also ensure its harvesting is sustainable and that the communities from where it comes benefit from its use. Today, a high proportion of papers published about resurrection plants are from Farrant's laboratory, a relatively under-resourced facility compared to those of her colleagues in Europe. "But I am lucky," says Farrant. "Of the 135 resurrection plants that exist, only three or four grow in Europe. The rest are in Africa.

Resurrection plants are known for their ability to 'play dead'. They can lose up to 95% of their water and look completely dead, only to bloom to life again in as little as 12 hours after rain. "What makes resurrection plants in general, and *M. flabellifolia* in particular, so special," she explains, "is the remarkable toolbox of chemicals they use to survive the extreme water loss and heat that would kill any other plant. It is these phytochemicals that serve as powerful antioxidants we can use for pharmaceuticals and cosmetics. The major antioxidant in *M. flabellifolia* protects cell membranes from damage at the microscopic level – more effectively than vitamin C. Antioxidant activation can defend cells against damage caused by pollution, UV rays, dehydration, free radicals and temperature extremes, all of which accelerate skin ageing." *M. flabellifolia* contains the greatest number of antioxidants Farrant has ever seen in a plant, more so than so-called wonder plants like rooibos and aloe vera. *M. flabellifolia* grows on rocks which it breaks down to make soil. And while the species can be grown *en masse* in greenhouses, studies have shown this changes the composition of the plant. In other words, when it does not need to produce strong antioxidants to survive, it doesn't. As interest in this plant grows, so too does the risk of extinction if it is harvested unchecked. Farrant is thus working to ensure steps are taken to protect this valuable botanical resource and remunerate the communities living with it.

As yet, South Africa does not export *M. flabellifolia* and Armani sources the plant from Zimbabwe, in large part because that country sells the product internationally at a very reasonable cost. As a condition of her role as scientific advisor, Farrant has requested that the plants are not sourced from South Africa unless there is investment into studies for sustainable harvesting, Despite not yet securing industry funding, Farrant has initiated studies to measure the growth and reproductive rates of *M. flabellifolia*, which will in due course provide sustainable harvesting practises. Farrant is also working to ensure the farmers who will grow the plant are remunerated in accordance with its value and that royalties are paid to the elders of the communities who first discovered its medicinal properties.

Resurrection plants are known for their ability to 'play dead'. They can lose up to 95% of their water and look completely dead, only to bloom to life again in as little as 12 hours after rain.

Cosmetics companies other than Armani are also very interested in *M. flabellifolia*, and, says Farrant, these conditions for her potential co-operation will remain in place for all of them.

Serendipitous discovery leads scientists to new galaxies in the sky

by Niemah Davids

The discovery was made possible by the ingenuity of the MeerKAT telescope. Photo Morganoshell / Wikimedia

A team of scientists representing three South African universities, including the UCT, were pleasantly surprised when their usual studies of the sky revealed a rather unusual find: 20 new, previously unidentified galaxies. The serendipitous discovery was detected by members of the MeerKAT International GHz Tiered Extragalactic Exploration (MIGHTEE) project team. The team of scientists study the demographics, evolution and conditions of galaxies in a variety of environments. Their recent, ultra-cool discovery was made possible by the ingenuity of the MeerKAT telescope – the South African precursor telescope to the Square Kilometre Array (SKA).

"This is an exciting find and set our expectations high for the remainder of the survey," said **Dr Bradley Frank**, adjunct lecturer at UCT's Department of Astronomy. "The discovery cements the leading role that UCT plays in many MeerKAT projects, which provide a rich environment for discoveries and research excellence to thrive." Dr Frank is also the associate director for astronomy operations at the Inter-University Institute for Data Intensive Astronomy (IDIA), established as a partnership between the University of Pretoria, the University of the Western Cape, and UCT, in close collaboration with the South African Radio Astronomy Observatory. IDIA aims to build capacity and expertise in data-intensive research in the higher education research community in the country, to grow a global leadership cohort on MeerKAT survey science projects and other large projects on SKA pathfinder telescopes.

The latest research was led by UCT alumna Shilpa Ranchod. Part of the research team also included Wanga Mulaudzi, an MSc student at UCT's Department of Astronomy. Mulaudzi's research focuses on determining the rotational velocities of galaxies in a MIGHTEE HI (H one region) early science sample and formed an integral part of this study.

Niémah Davids (ND): What do we know about these galaxies and where were they found?
Bradley Frank (BF): We detected neutral hydrogen in 20 galaxies at a distance of 200 megaparsecs. These galaxies are members of a large galaxy group, one that is possibly in the early stages of assembly. This discovery and the success of our survey were largely due to the university's foresight and commitment to research excellence.

ND: How were these galaxies detected?
BF: The galaxies were discovered using the MeerKAT telescope. The observations were conducted as part of the MIGHTEE project's early science campaign. We used IDIA's ILIFU [which means "cloud" in isiXhosa] facility to complete the data-intensive processing and imaging of the captured raw data. This process produced large 3D images, and we discovered the new galaxies in this group during the initial source finding. It's always exciting to look for clues and to detect things for the first time. Our curiosity really paid off with this discovery.

ND: Tell us about the MIGHTEE project and how it's connected to this discovery.

BF: With the MIGHTEE project, we survey several areas of the sky that have also been observed with other excellent telescopes at different wavelengths. We aim to study the evolution of galaxies, and radio observations usually allow us to study different physical processes by analysing different subsets or data combinations. This early science data highlights the amazing capability of the MeerKAT telescope to help us discover new things and find answers to known unknowns.

ND: What's unique about this find?
BF: These are gas-rich galaxies huddled together in a galaxy group. Such galaxy groups are rare, and it's even rarer to find these many detections in neutral hydrogen. So, it was an exciting and unexpected find for us, especially since the discovery was based on early science data, which surveys a fraction of our total area. On the one hand we were lucky, and on the other hand, this is exactly the sort of thing that we set out to find.

Cape Town's baboon programme: Successful coexistence between wildlife and urban communities by Prof Justin O'Riain

Cape Town's urban baboon programme has resulted in more baboons spending more time in their natural habitats and suffering fewer human-caused injuries and deaths is cause for celebration, writes **Professor Justin O'Riain**, the director of the Institute for Communities and Wildlife in Africa at UCT. These successes are not by chance, but by careful collective design that has involved hundreds of people in countless workshops and meetings since 1998. Welfare organisations, NGOs, scientists, concerned citizens, volunteers and councillors have, together with civic, provincial and national operational managers, devised a successful, largely non-lethal programme to keep baboons out of dangerous urban areas. By contrast, throughout most of Europe, wild boars – a mammalian proxy for baboons, being adaptable, social and no less sentient – are invariably shot on the urban edge by residents with hunting licences, and summarily eaten. International scientific experts who have visited Cape Town and understand the objectives of the programme consider it to be wholly consistent with best practices for ensuring coexistence between wildlife and communities on an urban edge.

Twenty years ago, the Cape Peninsula baboon population was heading for extinction. Ten years ago, numbers were on the rise, but the leading cause of death was trauma suffered in an urban area. Today, baboons need contraceptives to curb their burgeoning numbers and most die of natural causes. However, a reader of *Daily Maverick* would be forgiven for thinking that not only are the Peninsula baboons back on the extinction cliff, but the heartless authorities are right behind them, shoving. This perception has been crafted on select social media platforms and then further curated in mainstream media, which is sympathetic to the "David vs Goliath" parallel of caring citizens standing up to the heartless governance machine. The problem, of course, is that the facts do not support the narrative that the authorities are willingly pushing the population to extinction while being cruel and uncaring in the process.

What the above reveals is that the current anti-authority stance in Cape Town is less about the (f)actual conservation status and welfare of the baboons on the Peninsula, and more about the fundamental differences that exist in any society on how people view their relationships with wildlife and each other. If we rewind to 2008, before the current programme was extended to all troops and was properly resourced, civic halls were packed with irate citizens demanding that the authorities get the baboons out of town by either culling the lot or packing them into a truck destined for the Boland. The authorities rejected both suggestions and opted for a coexistence model that relied mostly on non-lethal methods to keep most baboons out of urban areas for most of the time. Their success means that such incendiary public meetings have largely been extinguished. Yet the methods used to achieve this success have become the focus of equally vociferous groups who have forsaken town halls for social media chat rooms, demanding an end to the programme and attempting to "cancel" all who contribute to it.

Such is the plight of the managers appointed to fix the problems we all created when natural land was transformed to support our modern lifestyle. None of us are exempt in creating the problems, but only a few are tasked with being responsible for the solutions. The problem is that there is no one right or simple solution to fixing a complex ecological system that we broke when we killed all the natural predators and usurped the more productive low-lying land for our houses, schools and shops. How does one simulate natural predators and the profound influence they have on the abundance and behaviour of prey species like baboons? How does one simulate dispersal and emigration in a population isolated and fragmented by our urban sprawl? Through trial and error with the best available science and expert opinion, and with constant education of the public on the how and why, these actions are essential to conserve a healthy population of baboons.

When baboons visit urban areas, they suffer all manner of injury and death, with cars and dogs among the leading causes. You cannot punish people for either driving or having dogs, and so if you genuinely care for baboons, then you can only argue for them to be kept in protected areas where such threats are limited. Furthermore, baboons are generalist, opportunistic omnivores with a penchant for low-lying land.

Compared with the indigenous, less digestible vegetation in the mountains, they consider the average well-watered suburban garden in the valley to be a lush bonanza. So, even perfect baboon-proofing of all other food sources will see baboons attracted to private properties. When a visit to snack on a protea flower coincides with a children's outdoor party and the birthday cake is spirited away amidst screams and wahoos, then the family is justified in demanding that the authorities – to whom their rates are paid – devise methods that prevent a repeat performance. This they have done, and the result after 10 years was a rare four-way win: less damage to property and pets, with more and healthier baboons experiencing fewer welfare harms and contributing more to the natural ecology of the Peninsula fynbos.

This does require deterring baboons from urban areas with tools that are both legal and humane, for if they were not, then users would have long since been charged with violating the Animal Protection Act. It may also mean the death of baboons that do not respond to these tools and, in doing so, present a risk to themselves, pets, people, property and other baboons. Animal rights groups may apply to place such animals in a sanctuary or a rehabilitation centre, provided they satisfy the relevant CapeNature regulations that pertain to such facilities. The general absence of such facilities in the Western Cape, despite repeated attempts to raise funding for such ventures and/or support those in existence, suggests that the vocal denouncing of lethal management on social media is not matched by a financial commitment to provide an alternative option. Furthermore, criticism of the current approaches – while failing to acknowledge the successes and, worse still, failing to provide realistic alternatives that are practical, commensurate with the law and work to the betterment of both ratepayers *and* baboons – serves only to hinder meaningful dialogue and progress.

There are many improvements to be made to the urban baboon programme, including a transition to baboon-proof fencing in conflict hotspots and an associated reduction in the use of paintball markers, improved education and improved waste management. However, efforts to get the authorities to the discussion table to look forward are constantly thwarted by their having to spend most of their time engaged in a rearguard defence of their much-maligned programme, and countering the false, alarmist claims of cruel methods, secret killings and the imminent demise of the population. Understanding this threat, Prof Shirley Strum, an internationally recognised expert in baboon behaviour and conservation who, having visited the Peninsula and met with the role players, advised the following: "I strongly urge the activists to stop this senseless campaign. Instead, they should use that energy to help support the reasonable efforts that are being proposed. If they don't, they will have more baboon deaths on their conscience. The epitaph of these baboons will read: 'Met an untimely end because activists could not face reality'."

It is further important to recognise that anti-baboon sentiment is rife in South Africa and even pervasive among national and private custodians of our protected areas. In many provinces, farmers can kill as many baboons as they wish to protect their property and livelihoods, while in the Western Cape, farmers can kill one per day every day of the year in order to produce the apples and wines we consume. It is against this backdrop, and the absence of viable baboon populations adjacent to any of the other major metropoles despite their historical presence in all of them, that Cape Town's baboons and their ongoing management programme needs to be considered.

Cape Town has shown that we can live next door to wildlife, including the agile and adaptable baboon, and that baboon numbers, welfare and health can improve while our human population continues to grow and our footprint expands. If these successes are not acknowledged and, yes, even celebrated, then other metros both in South Africa and elsewhere in the world will have no incentive to invest the millions of ratepayers' rands it takes to run a successful non-lethal programme that allows wildlife and people to coexist as good neighbours.

Alarming precedent' – Liesbeek River under siege again

by Dr Kevin Winter

Little has been learnt from the long history of development along the Liesbeek River, said UCT's Dr Kevin Winter. The river is under siege again by development along its banks.

The Liesbeek River is living symbol of a South Africa characterised by land dispossession, heritage loss, irreparable damage to ecosystems, accompanied by significant social and political conflict, and risk to water security and climate change. But the river is under siege again by development along its banks, writes **Dr Kevin Winter** of the University of Cape Town's (UCT) Future Water Institute.

The Liesbeek River flows through some of the oldest suburbs of Cape Town. Only a few sections of the river channel would be recognisable to the Khoi and San people who lived in the valley in precolonial times. The same could be said of many urban landscapes, but in the case of the Liesbeek, the significance is not only about what has changed, but how it has changed. About 70% of the river is modified by canalisation, which has altered its physical form and shape. But the physical appearance today hides a history of change and regret.

Record of a bygone era

Until the late 19th century, the Liesbeek provided a reliable, high-quality water supply to the Khoi and San peoples and early colonialists. Accounts found in Jan van Riebeeck's diary describes the condition of the Liesbeek valley and the commercial potential of the natural environment. Extensive hardwood forests surrounded water courses along the eastern slopes of Table Mountain and aligned the Liesbeek River. Van Riebeeck claimed that he saw "the finest and richest arable and pastureland in the world", and that the valley was "wide and level" with "countless fresh rivulets". In 1654 a visitor to the Cape described the Liesbeek as a deep river that was navigable by boat from the fort at Cape Town to present day Bishopscourt. Wildlife was plentiful with herds of antelope, hippopotami, lions, leopards and hyenas. A variety of water birds were found in wetlands of the lower Liesbeek River that flowed directly into Table Bay. By 1657 Dutch farmers, called *Free Burghers*, transformed the natural vegetation on the western side of the river and forcefully dispossessed indigenous peoples from the most arable and valuable land alongside the Liesbeek. In 1659 the Khoi made the first attempt to resist the European invasion of their lands but could not match the Dutch firepower. Subsequently, a hapless peace agreement was reached in 1660 that gave the Dutch sovereignty over the Liesbeek valley. The settlers continued to transform the natural landscape by expanding their agricultural activities and by introducing milling and brewing industries along the riverbanks. Gradually the role of the Dutch East India Company declined with the arrival of British settlers in 1795. The Cape colony was eventually ceded to the British crown in 1814. The British rapidly transformed the Liesbeek valley into residential suburbs, which resulted in significant changes in the natural drainage of the river and its channel. Properties encroached on the riverbanks often had boundaries that extended into the river and gave property owners riparian rights to the water. Unintended consequences followed. Between 1930 and 1960 various stretches of the river were canalised to control flooding and to prevent ponding and a breeding ground for mosquitoes.

Growing awareness of the value of urban rivers

Two complementary shifts in thinking were partially responsible for improving the outlook and potential of the Liesbeek River. In the 1980s the western world became increasingly aware of the impact of development on the environment. This awareness was spurred on by the rise of environmentalism and use of environmental impact assessments (EIAs) as an instrument to inform development decisions and their impact on the environment. There is some evidence of this influence, for example, when the Cape Town City Council adopted the Greening the City report (1982), which proclaimed that the city's rivers should be regarded as vital recreational and aesthetic amenities and conservation corridors of urban environment. The implementation was short-lived or limited at best. A second, and arguably more significant trend, was associated with the preparation and aftermath of the Earth Summit in 1992 that carried the slogan "Think global, act local". In 1991, in anticipation, a small group of concerned citizens formed the Friends of the Liesbeek with the intention of generating public awareness and community involvement in the Liesbeek River.

In its mission statement, the Friends hoped that the public would "regain the freedom of the river", for present and future generations. That aspiration has continued ever since, making it one of the strongest and most respected environmental community-based organisations, which has won several awards for its voluntary work.

Silent protest along the lower Liesbeek River canal.

A river under siege

The struggle continues. "The developers and consultants argue that the site is degraded, but the present state is only the result of neglect and mismanagement."

The current development at the River Club on floodplains of the lower Liesbeek suggests that very little has been learnt from a history of abuse of the river. The development is set to alter a conservation-worthy corridor and infill one of last remaining sections of the Liesbeek River. The developers and consultants argue that the site is degraded, but the present state is only the result of neglect and mismanagement.

Despite the degraded condition of the floodplain, nature bounces back. When the driving range and golf course at the River Club were inoperable because of COVID-19 lockdowns, various species returned to a safe habitat on the site. Threatened western leopard toads and Cape dwarf chameleons that are rarely seen in urban areas along the river, among other species, were found during the search and rescue operation prior to commencement of the development. This shouldn't come as a surprise since the site is a precinct of the Two Rivers Urban Park comprising "sensitive ecological systems and habitats" (City of Cape Town [2003] Two Rivers Urban Park contextual framework and Phase 1 Environmental Management Plan (Final Report), Environmental management Branch, City of Cape Town).

The City's own Spatial Planning and Environmental Management Department professionals appealed the decision for the development to go ahead and cited several reasons including:

- insufficient mitigation of stormwater impacts, including flooding
- that due consideration was not given to climate change impacts and resilience
- that the decision does not appropriately describe, or mitigate, the loss of open space on site
- and that the decision does not appropriately describe or mitigate the high negative biodiversity impact or habitat loss of a high faunal sensitivity.

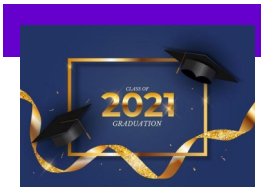
The appeal was rebuffed and dismissed. It sets an alarming precedent.

Regrettably the current development has left many unanswered questions about the integrity of the EIA process and the extent to which social justice and environmental sustainability are considered in shaping the development of Cape Town.

A well-executed, credible Environmental Impact Assessment, especially in this case of a river catchment, considers the integration of site-specific and interconnecting social and biophysical factors, among others, that are informed by stakeholders, and specialist scientific and local knowledge.

The final decision has a hollow ring – a reminder about how excited Van Riebeeck must have been when he reported to his directors in the Dutch East India Company about the commercial benefits of the Liesbeek. History repeats itself: economics take precedence over the environment.

It seems that not much has been learnt from 350 years of the development of the Liesbeek. Future generations will regret that the authorities and private developers did not recognise the need to make room for the river, value the ecological services of a river that will mitigate climate change and secure water resources in the future.



Celebrating some of our Remarkable Graduates 2021

While we may not have our traditional graduation ceremonies thanks to Covid-19—we in the Science Faculty are immensely proud of the labors and achievements of our students graduating….here are just a few inspiring stories from across the departments…

Patrick Chang whizzing through an MSc and 7 papers at high speed….

Patrick Chang graduated with his MSc Mathematical Statistics by research with distinction this year. He completed his research degree in less than a year. What was remarkable about Mr Chang, and inspirational, is that he was able to write 7 papers, one of the papers a single author paper – all in first quartile journals as part of his MSc research (more than most PhD students publish as part of their three years of thesis work). He has just started his DPhil at University of Oxford in Engineering Science, working on Machine Learning in Trading Algorithms. He has seamlessly switched from an MSc Mathematical Statistics at UCT (after his BSc Hons in Statistical Sciences), into a DPhil Engineering at Oxford (as part of the Oxford-MAN Institute for Quantitative Finance).

Patrick started his journey at UCT in actuarial science, but realised that commerce approaches to data-intensive finance were too narrow and limiting because of how the foundations dilute the advanced technologies in the new era of data-science, particularly from the broader technology foundations, and like many dissidents from undergraduate actuarial science who are currently in the Statistical Science Department, he moved over to the Science Faculty to study Financial Markets from a science and engineering perspective by first completing a BSc (hons) Statistical Sciences. In the end he secured a position in one of the most competitive and in-demand engineering/operations research doctorial programs in the domain. This highlights how the mathematical statistics training is a remarkably flexible one for an incredibly rich variety of domains (and not just statistical finance) – and comparable with the best graduate students training in the world.

.Ann Sebastian giving birth to an MSc and baby while working….

Ann Sebastian will graduate with an MSc in Mathematical Statistics in December. She completed her dissertation part time while acting as a fund manager for Standard Bank. **Associate Professor Tim Gebbie**, comments, “What was inspirational for me as a supervisor was her persistence given the many challenges she encountered as both a women in very competitive male dominated environment and giving birth and coping with family illness.

Ann was pregnant and had a baby during the writing of her dissertation, while at the same time as managing a team at the asset management firm where she worked , many of whom where jostling with her and her managers and slip-streaming the space she had created for them. Ann is a very thoughtful and careful person with regards to decisions and processes and when operating in a very male orientated and sometimes assertive business, held her own in her own quiet way.

During the COIVD-19 lock-downs her family got really ill, and yet despite all of this, Ann showed incredible resilience, was optimistic, and an amazing student to work with given the stress and strain she went through to get her dissertation completed. I think she is also a really good role model for what a women working in industry can actually get done despite all barriers created by patriarchy and other hierarchical structures. She is now Head of Equities at Terebinth Capital.”

Marvel Makhubele the Geology "rock" juggling many roles to get his PhD

Associate Professor Emese Bordy proposed **Marvel Makhubele** as an inspirational graduate, commenting, " Marvel studied for his PhD, worked full-time in a demanding job and relocated his young family to the UK (temporarily only, for work reasons) during the pandemic. Marvel did all this (and more!) while actively acknowledging the 'rocks' in his life and inspiring others to do the same." Emese says, "I supervised his MSc at UWC and now his PhD at UCT; he is my #50 postgrad student to graduate. I can't be prouder that he is this milestone student in my career "

Marvel says, "I grew up in a township called Tshikota in Limpopo. When I was in matric, I wanted to be a chemical engineer, and applied to UCT for Chemical engineering as my first choice and Geological sciences as a second choice. Unfortunately, I was not admitted to the Chemical Engineering, but I was accepted into the General Entry Program in Science. Although my marks in matric were not exceptional, I was still top of my class—where only two of us out of 208 leaners obtained university exemption. Overall, my school had a 44% pass rate in matric that year, and I was the first person in the history of my school to be accepted to study at UCT. So, although I was not accepted into my first-choice program, I was glad to be able to go to UCT. Once at UCT, I was told that if I worked hard in first year and got good marks, I could apply for chemical engineering. Sure enough, my marks in first year were very good, and I could get into chemical engineering, however, by then, I realised that I actually loved the geoscience field and was not attracted to engineering at all! As a result I ended up majoring in Chemistry and Geology. In some crazy way, I found myself in the sciences by chance!!"

KW: How did you end up doing a Doctor of Philosophy in Geological Sciences?
MM: When I was in first year, I was fortunate enough to get an internship with Professor Maartin De Wit (RIP), a lecturer in Geology at UCT. He put me on a project with his postgrad students (I was the only undergrad student), where we explored for shale gas in the Karoo. During my internship, Maartin encouraged me to study a PhD because he believed in transforming the landscape of South African academia and industry, where there were not many black South African PhD holders.

KW: Tell us about your research and how you followed this research path?
MM: In simple terms, my research was in sequence stratigraphy, which is a branch within the geosciences discipline, where I was re-interpreting geophysical data offshore in Port-Elizabeth in order to reconstruct how that part of the earth evolved from the Jurassic age until present-day. These reconstructions can help companies in their exploration for energy resources, and reservoirs where excess CO2 can be stored underground. I also explain how the landscape (and relative sea level) has changed as a function of climate change and tectonics.

After my Masters degree I went to work for Sasol in Johannesburg, and it was there that I decided to go back and do my PhD part-time. Although I thought I would only do my PhD when I was in my 30s or 40s, after talking to some colleagues about a certain model in sequence stratigraphy, I realised that there were inconsistencies in how most people in the industry approached sequence stratigraphy. After doing a bit of research and seeing how much of a problem these inconsistencies caused, I decided that the best way to address this formally was to do a PhD on the topic.

KW: What was most interesting and most challenging about your research and studies?
MM: As I was doing my PhD part-time, trying to balance my job, family and being a first-time dad was very challenging. Additionally, I had to relocate to the UK, all while trying to do my PhD—if I am honest, it was one the hardest thing I've ever had to do. The best part was seeing my ideas come to life and getting great peer review feedback on a paper I wrote based on my dissertation. I was so scared that my work was not good enough, however, after the peer review process I thought, "wow, maybe this work that I am doing is contributing positively to science". Getting positive feedback from experts in the field was one of the highlights of my research.

KW: What stands out for you on your journey as a student this far?
MM: This journey has showed me how everyone is capable of achieving even the things that are deemed impossible. It is hard, but with a willing mind and heart, it is possible. I also realised that there are so many people with my background, who never got the opportunity that I got, due to systematic oppression, which made me realise that we need to aggressively invest in students coming from disadvantaged backgrounds. How many more PhDs can we unlock if we invest in our youths? There is so much hidden talent in townships and rural South Africa that is never realised.

Marvel is currently working as an Exploration Geoscientist, with a focus in South America energy resource exploration—something he describes as his dream job! Also close to his heart is working with disadvantaged communities/ youth to unlock their potential and empower people within those communities.

Aune Angobe: Overcoming funding and foreigner challenges to get an MSc in Molecular & Cell Biology (cum laude)

I was born in a village called Ongongo in Elim constituency, Omusati region, Namibia and I was raised by my late grandparents. A privilege that I have and will always have is that my grandparents knew the value of education and took on the responsibility to send me to school with the little that they had. Throughout my schooling journey, I always enjoyed science subjects and I had no doubt that I was a Scientist from birth.

Despite my poor family background, I studied hard and matriculated with good grades and was granted admission to the University of Namibia for an Honours degree programme in Microbiology, funded by the government loan. After completing my undergraduate studies, I was employed and never had an intention to further my studies at all. However, I started developing a strong desire to further my studies and looked up for opportunities at universities in SA and Namibia. Excitingly, I got an admission news from A/Professor Inga Hitzeroth as a potential project supervisor for my MSc in Molecular and Cell Biology and eventually got admitted by the University.

My ultimate goal is to improve human/animal health using nature. For decades plants have been and continue to be the alternative to industrially produced expensive diagnostics/vaccine. I hope to help move our society to a future with faster and easier production of large quantities of diagnostic/vaccine proteins, with significantly lower production costs and safer to use.

What was most interesting and most challenging about your research and studies?
One of the biggest challenges that I faced (especially at the start of my degree) was funding. When I arrived in Cape Town for my studies, I did not have funds to cater for my accommodation and living expenses (I only had R 500.00). Upon arrival, I was illegally accommodated by a friend in a UCT residence, for about two weeks. During this period my supervisor, friend and I were constantly worried about how I was going to survive. I approached the university's student housing for possible accommodation, where I cried my eyes out. They asked me how I left Namibia without knowing where I was going to stay, and my response was: "I don't know but I just want to study." Fortunately they eventually found accommodation for me. Soon after that, my supervisor introduced me to Aunt Vivien, the owner of Sam Cohen Scholarship Trust, who went out of her way to made sure that my stay in Cape Town was fully funded.

In addition to funding, being in a foreign country was never an easy transition. I always felt like an outsider and struggled with overcoming the language barrier. Being far from my support system especially my family and friends, I really felt the gap. I also encountered several challenges in my research. The major one was that I struggled to secure sampling sites to obtain sera for my studies, but fortunately I managed to overcome this challenge. Also, just like most students, the Covid-19 pandemic was a major hurdle for my research. I had to leave Cape Town and go back to Namibia due to the lock down and I couldn't continue with the practical aspect of my research. However, I used this time to write my thesis on the work that I did prior to lockdown. And even though I never got a chance to continue with my experiments, the work that I did granted me a Cum Laude, surprisingly.

Tell us about your experience of having to finish your Masters in Namibia during lockdown?
Finishing my research in Namibia was a challenge for me. I needed a conducive environment to be able to write my thesis and continue to attend lab meetings, departmental seminars, chatties and journal club as part of my academic responsibilities. As I come from a village in the Northern part of Namibia where there's no electricity and lack of internet connection—it was not easy. As a result, I had to make a plan to look for accommodation in the city and pay for internet which was very costly for me but I made it a priority to ensure that I use what I have to push harder and finish my studies.

Currently Aune is looking employment and funding opportunities to further her studies….and her dream job would be that of a lecturer and researcher.

Amreesh Pokheer followed his childhood dream to be a scientist and make a difference in Africa...completing a PhD in Computer Science while working and having 3 children!

I am married and I have three kids: Abi (8), Malaika (7), and Keziah (2.5) - who all arrived during my PhD. Abi and Malaika are our two adopted children and Keziah is our biological child. during my PhD. (Abi in 2017, Malaika in 2018, and Keziah in 2019). I am currently working as an Internet Measurement and Data Expert at the Internet Society. I was born and raised in Mauritius where I did all my schooling before going to France for university studies in 2003. I initially received an offer to study Architecture at UCT but finally decided to go with computer science. And for a long time, I regretted turning down the offer at UCT because my dream back then was to become an architect. Architecture was a passion of mine as I was very good with art and design. I am, however, glad I'm still somehow continuing this passion, through my watercolour painting.

I decided to go with computer science because it was my other passion. In my childhood, I was very good at dismantling my toys and building new ones out of them. I was also good with computers: building them from scratch and configuring them. Notably, I always had this left and right brain dilemma! I also remember being fond of a series of books called the "Young Scientists", and I was always trying out the physics and electronic lab experiments from these books. My childhood dream was to become a scientist, indeed. And so this is how the computer science journey all started, all in sweat and tears, ploughing through maths and algorithms and on top of this all in French… with some regrets! I eventually made it through and developed a series of important skills and new passions/interests along the way .

After my 5-ish years in France, I got an amazing opportunity to work for NIST (National Institute of Standards and Technology) based in Maryland, USA between 2008 and 2009. This is a national research laboratory working on standards. I was working with a group of computational biologists, helping them with software instrumentation. The environment was really stimulating and this is where my interest in research actually started. Since then I always knew I had to do a PhD, but there was a big question mark, WHAT ABOUT? I could have somehow continued my career in the USA, but something was calling me back home, I felt the need to go back to the continent (Africa) because this is where I wanted to make the most impact.

And finally, an amazing opportunity popped up. I received an offer to work as Software Engineer in an African organisation (AFRINIC) based in Mauritius, my home country. AFRINIC is one of the 5 Regional Internet Registries (RIRs) responsible for managing Internet number resources (IP addresses and Autonomous Systems numbers) for the African continent. AFRINIC represents the "heart" of the African Internet, dealing with Internet Service Providers (ISPs), network operators, regulators, governments and other international bodies to coordinate that big network, which is the Internet. At AFRINIC, I had the opportunity to travel around Africa, attend and present at conferences, participate in capacity-building efforts and do a little bit of research. In 2015, AFRINIC decided to create an R&D Lab and I was asked to lead AFRINIC research activities. It is where the story began, I knew that to become a good research engineer I needed a solid research background, and this is the time (or never) I needed to embark on a PhD. And around the same time, I saw a call for PhD applications from the Department of Computer Science at UCT with HPI scholarships available. How timely! I applied and was accepted. UCT was the obvious choice: I was working in an African environment and UCT (with the ICT4D) lab has a strong African focus. I knew my research was going to be Africa-based as well. It was just the right mix. It was not very hard to convince the AFRINIC management and they allowed me to work part-time while studying part-time. I started my PhD in 2016 with an HPI scholarship. And here I stand, proud to have completed my PhD in Computer Science at UCT, more than 12 years after completing my Masters in Computer Science back in 2008.

Last words from Amreesh: “A PhD can be a long and painful journey (especially the writing part), but it was such a fulfilling one. If you are in the midst of your PhD and having doubts, it is very natural, do not let go. Everything is possible with patience and hard work. Good quality research requires dedication and a dose of passion.”

Sandile Ngacamphalala: a PhD to crown many years of study and multiple degrees and the value of support in these achievements

I was born in Swaziland and my father worked for the Royal Swazi Sugar Corporation, a company that produces and mills sugarcane. This developed my interest in agriculture. I did most of my schooling in Swaziland and completed my Matric in South Africa. I attained a degree in Agriculture (Agronomy) at Tshwane University of Technology and then completed a MSc degree in International Development specialising in Climate Change and Natural Resources Management from the Royal Agricultural University in the UK. My studies in the UK got me interested in the science and policy-interface.

I wanted to learn more about the utilisation of scientific evidence in natural resource policy planning and analysis, so I enrolled for a second Masters in Public Policy Analysis from the University of the Witwatersrand. To further strengthen my work in the science and policy space I completed a Post Graduate Diploma at the University of Stellenbosch, focusing on Monitoring and Evaluation Methods. At Stellenbosch, it became immediately obvious that the logic applied for policy planning, monitoring and evaluation gets more complicated for complex policies and is plagued by deep uncertainty and a great deal of interdependency with economic, social, and political systems. My learning path lead me to UCT. I had worked with **Dr Olivier Crespo** from the Climate Systems Analysis Group (CSAG) (in the Department of Environmental & Geographical Science) on a research project focusing on climate change vulnerability for farmers in Swaziland, Malawi and Lesotho. My boss at the time Dr Sepo Hanchigonta was a CSAG graduate, so it was a natural decision to apply for a PhD with UCT. I wanted to learn about policy planning and evaluation in a context of deep uncertainty and complexity using the case of climate change and water and there was no better place to engage in such a study than CSAG where I was accepted as a PhD student.

The Challenges: My research work has a limited number of scholars involved. I knew what I wanted to achieve but I was mostly working in the dark. My first two years of research were a total nightmare and it was a relief when I stumbled on a group affiliated with the Society for Decision-making Under Deep Uncertainty (DMDU) who invited me to their conference in Los Angelis, California. I met a couple of people there who decided to support my work in addition to my two supervisors at UCT. Dr Jessica Ruvinsky, in particular, gave me access to her systems mapping and analysis platform called the Elephant Builder and this changed my life and accelerated my work and efficiency. I remain forever grateful for her support.

Family, school and work balance: I started my PhD while working for the Agricultural Research Council as an Advisory Services Manager responsible for connecting research output with the users. At the time I was married with a two- year old son and then we were blessed with another boy! I had to be a full time father and husband, working fulltime with lots of national and international travelling and staying up late at night doing my research. I owe all the support and love to my wife Carol. It would have been impossible without her support! I also appreciate the great support I got from my boss Dr Yolisa Pakela who allowed me to travel to the Cape almost every other month and gave me space to do my research.

Support, support, support**:** One thing I learnt throughout my studying life is that without support either financially or emotionally and otherwise, it would be difficult, if not impossible to start and finish. Unfortunately most students do not enjoy such support. So as I reflect on my journey, the one thing that comes to mind is support, support & support! This for me included the support I got from my family, my superiors at work, my supervisors, experts who played a key role in informing my research and industry experts who attended my research workshops. This has made me fully committed to supporting other young students because I know and I have experienced the huge value of this support.

Supporting grain farmers in SA: In the last year of my PhD I was recruited by Grain South Africa to lead their Farmer Development programme. We support grain farmers in South Africa focusing on crops like, maize, wheat, dry beans, sorghum, sunflower, soy bean, canola and barley. I have done quite a number of jobs to support the agricultural development sector but working directly with farmers to transform their businesses and feed the nation is possibly the most exciting job I have done in a long while.

Value of my PhD: The value of my PhD at the moment is really the thinking capacity and problem solving skills it has afforded me. It makes my work even outside research a little more efficient and my effort effective.

Life after a PhD: I used to play golf a lot before enrolling for my PhD and with all the work, it all had to come to end. So now I am back playing again and look forward to more golf holidays.

Travels across the globe

Arctic Century – celebrating 100 years of the Arctic and Antarctic Research Institute by Peter Ryan

Cliffs on October Revolution Island seen across the Red Army Strait, Severnaya Zemlya

In August-September 2021 I was fortunate to be able to join the Arctic Century Expedition to the Russian Arctic. The expedition, organised by the Russian Arctic and Antarctic Research Institute, GEOMAR in Germany and the Swiss Polar Institute, left from Murmansk on the ice-breaker *Akademik Tryoshnikov* to conduct research in the Kara and Laptev Seas. For someone who has spent a fair amount of time in the Southern Ocean, it was a privilege to be able to visit the Arctic. Although there are many similarities, there are some striking differences – perhaps most notably the juxtaposition of land and ocean. The Arctic is an ocean surrounded by land, whereas the Antarctic is a continent surrounded by ocean.

Our cruise track took us across the Barents Sea, to the northern tip of Novaya Zemlya, and then across the St. Anna Trough, which is a major conduit for 'warm' Atlantic water to enter the Arctic Ocean. Its impact was apparent in the lack of ice in this area – we didn't encounter any sea-ice even when we steamed north of Frans Josef Land to 83 N. Fortunately, once we headed east towards Severnaya Zemlya we spent several days in quite thick sea-ice, and it was here that we had the most interesting wildlife, including Walrus, Bearded and Ringed Seals, and several Polar Bears. Whales, however, were surprisingly scarce, with only a few Bowhead and Minke Whales seen.

I recorded all seabirds and mammals while the ship was steaming. The diversity of birds is much lower than in the Southern Ocean, and it is strange to only see once species of petrel. However, my main task was to record the abundance and distribution of marine litter. Predictably, the Atlantic not only exports heat into the Arctic, but also large amounts of litter. What was particularly interesting, however, was the dominance of flexible packaging (bags and wrappers), which typically do not disperse far from land in warmer regions of the world. It seems that the low temperatures in the Arctic prevent the growth of sufficient epibionts to cause flexible packaging to sink.

I sampled beach litter at seven islands, including Graham Bell Island in Franz Josef Land, the three largest islands in Severnaya Zemlya, and at two small islands in the Kara Sea, Vize and Uyedineniya. This is not without its challenges, as you are not allowed to stray too far from a bear guard. Fortunately, we didn't encounter a bear on land, but we saw their tracks and every place we landed. Litter loads were highest on Vize Island, which lies just east of the St. Anna Trough, right in the path of the Atlantic water leaving the Barents Sea. The amount of litter there would not have looked out of place close to a major urban centre. Products from 19 countries were found, with most coming from Russia and Norway. The amount of litter was much greater than that reported from Svalbard, which also receives some Atlantic water through the Fram Strait.

Polar Bears make for interesting beach litter sampling. This fresh set of tracks was on Bolshevik Island in Severnaya Zemlya

The terrestrial research team on Uyendineniya (Solitude Island) in the central Kara Sea.
[Peter Ryan, third from right. Photo by Jón Björgvinsson]

Outreach in Faculty

Entomologist inspires girls with the motto: 'Just keep going'

Twenty-five girls between the ages of 15 and 17, part of the organisation, Brave, experienced a day of entomology and taxonomy as part of a collaborative workshop of the Cape Leopard Trust and the Iimbovane Project. Brave is an organisation that inspires and empowers girl leaders by supporting girl-led initiatives and building a network of girl leaders across the African continent. In line with the organisations' aims, the collaborative workshop focused on showcasing careers in conservation, especially entomology and taxonomy.
Kicking off the day with an icebreaker, the girls quickly got to the know Iimbovane project team and **Abusisiwe Ndaba**, an entomologist and UCT MSc student, working with the collections at the Iziko Museum. The rest of the day's programme involved hands-on fieldwork and the use of microscopes.

One of the day's highlights was the girls' interview with entomologist and UCT MSc student, **Abusisiwe Ndaba** from the Department of Biological Sciences. For her current project, Abusisiwe is revising the ant group *Anoplolepis* and her study will produce an updated species identification key to this group. Her study will also update the geographical distribution of species within this group and will confirm the presence or absence of the invasive species, *Anoplolepis gracilipes*, in Southern Africa.

The girls showered Abusisiwe with questions and were interested in why she decided to become an entomologist. She answered: *"I started out with my BSc in Biological Sciences which at first is very general. In my second year, that is when I started learning about ants and going to fieldwork with my lecturer. Since I started helping with fieldwork and looking at the ants through a microscope, I came to love ants and decided to specialize in them."*

When asked about her duties at the museum, Abusisiwe explains: *"There's a lot to do at the museum. It is home to several insect collections. Collections are drawers and cabinets full of pinned insects, some of which were already collected a long time ago. My duties were sorting of samples, mounting, identifying and databasing ants. Sometimes when I am unsure about my duties or the identification of species, I can also ask my mentor for help. I also helped in preparing for the museum exhibitions and management of the collection"*

Being an entomologist and MSc student has its moments of joy but also its challenges, so Abusisiwe shares her experiences with the group of girls: *"My moments of joy are each time I see the tiny and delicate features of ants when I examine them through the microscope. Looking at ants with the naked eye, they all look the same, but a whole new world opens up when the microscope magnifies them."*

"One of the challenges is the public speaking. I was at first very shy to speak in front of people but having to do presentations at conferences as part of being an entomologist, I am now much more confident and comfortable when speaking in front of people. Another challenge is the long hours behind the microscope. If one spends too much time staring non-stop through the microscope, you will start to make mistakes, so I make sure to take regular breaks."

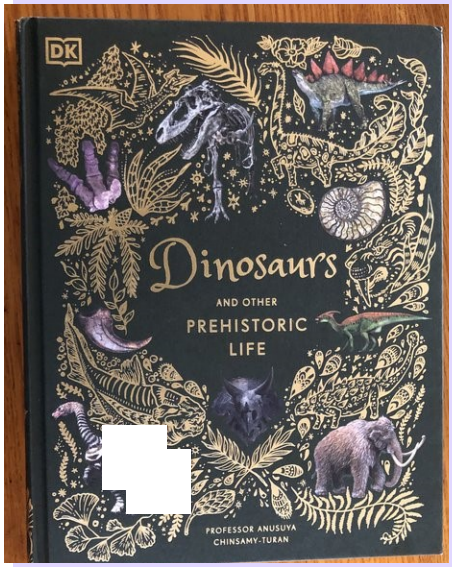
The girls also asked Abusisiwe about what personality a person needs to have to become an entomologist. "*One needs to have lots of patience and work very meticulously*," says Abusisiwe.
At the end of the workshop, Abusisiwe wished the girls all the best for their future studies and careers and encouraged them with her motto for success: '*Just keep going*!'

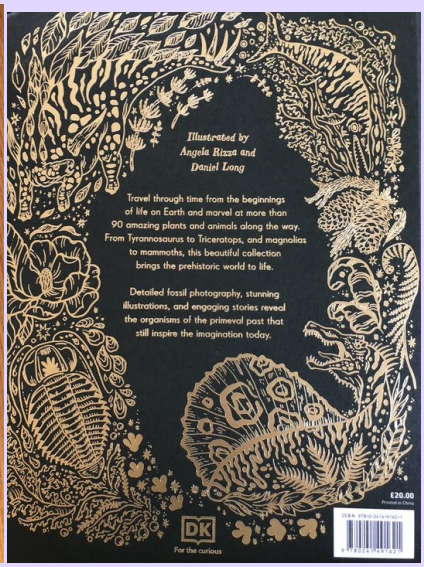
The group of girls mimicking ants for the group photo

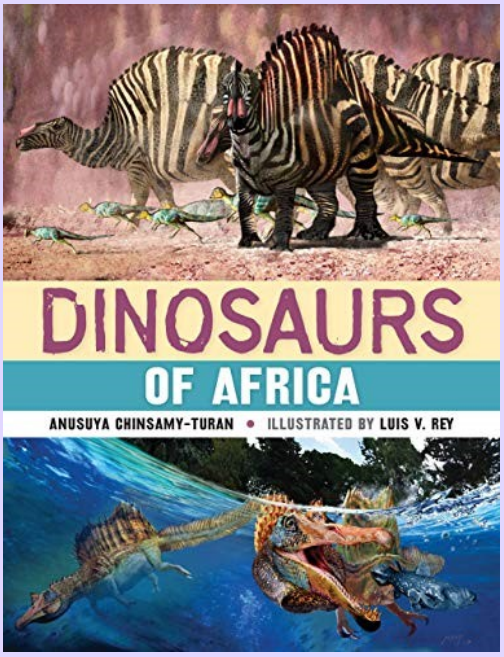
Books recently published

All things Dinosaur...

Professor Anusuya Chinsamy-Turan from the Department of Biological Sciences has recently published 2 new popular level books on dinosaurs. The newest one is entitled "Dinosaurs and other prehistoric life" and is published by Dorling Kindersley (DK). Her other book, "Dinosaurs of Africa" was released in May 2021.







LAST LAUGH....