December 2022 Faculty of Science University of Cape Town Vol. 11 Issue 2

Science Matters

Science Faculty Newsletter

Message from the Dean

The Dean's Dialogue that took place on 28 November 2022 captured our thinking about the science curriculum that not only deepens our understanding of the rapidly changing world but also our responsibilities as scientists. It challenged us to think about our teaching programmes and the relevance of our courses to pressing national, regional, and global issues. The dialogue inspired us to examine the science curriculum, and to imagine possibilities and opportunities for inter-and transdisciplinary teaching programmes across our departments, and with other faculties. Much of this is visible in the research space but less so in teaching and learning.

Our research continues to thrive despite funding challenges. We say halala! to our new NRF A-rated researchers Professors Tommie Meyer (Computer Science) and the late Timothy Egan (Chemistry) and all our science stars, including our postgraduate students.

We welcome our new appointed staff who chose to join our faculty at UCT and appreciate the contribution of the retirees to the faculty.

We congratulate our colleagues who have been promoted to rank of full professor: **Res Altwegg** (Statistical Sciences), **Emese Bordy** (Geological Sciences), **Michelle Kuttel** (Computer Science), **Greg Smith** (Chemistry), and **Tony Verboom** (Biological Sciences). We look forward to their various leadership roles in the faculty.

Best wishes for 2023!
Maano Ramutsindela

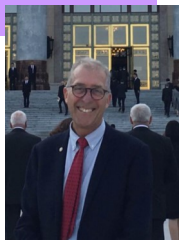
New A-Ratings in the Science Faculty

In recognition of their outstanding contribution to national and international research across a range of disciplines, four University of Cape Town researchers were added to the National Research Foundation's (NRF) list of A-rated scholars.

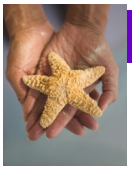
The NRF rating system is a key driver in the foundation's aim to build a globally competitive science system in South Africa. It is used as a tool for benchmarking the quality of researchers in the country against the best in the world. NRF ratings are allocated based on a scholar's recent research outputs and its impact as perceived by both national and international peer reviewers.

Congratulations go to Professors **Tommie Meyer** and the late **Timothy Egan** from the Faculty of Science, who recently received an A–rating. Several researchers retained their A ratings, including **Professor Anusuya Chinsamy-Turan** from the Faculty of Science. This brings the total number of A-rated researchers at UCT to 31, the highest of any university in South Africa.

Prof Michael Meadows election as fellow of International Science Council



Emeritus Professor Mike Meadows has been elected as a fellow of the International Science Council – the highest honour that is conferred on an individual by the ISC. The ISC Fellowship recognises individuals for their outstanding contributions to the promotion of science as a global public good. Conferment of a Fellowship recognises an individual who continues to make a unique contribution to the ISC's mission and to global science leadership.
Professor Meadows was also recently elected as Fellow of the Geographical Society of China, one of only five foreigners ever so elected!



Our Science Stars:

Researchers from UCT were recognised for their outstanding achievements and contributions to society at the 2022 National Research Foundation (NRF) Awards.

Research Excellence Award for Next Generation Researchers : This award recognises outstanding academic performance by final year doctoral students.

Athi Welsh, from the Department of Chemistry is one of six UCT researchers recognised at the 2022 NRF awards. While Welsh's research approach is reliant on training in basic science and scientific methods, it is firmly grounded in solving problems important to the pharmaceutical industry and addressing SDG 3 for good health and well-being. Welsh's work aims to provide a thorough understanding of the biology of cancer, which is of utmost importance for effective drug development.

His research interest is in the use of small molecule and macromolecular transition metal-based molecules as chemotherapeutic agents. This metal-based approach provides a novel, lesser-explored route to eradicating cancer and potentially provides new modes of action, a nascent field of research, targeting diseases not only endemic to sub-Saharan Africa but also globally.

Research Excellence Award for Emerging Researchers: This award recognises outstanding research excellence by current Thuthuka grant-holders. Thuthuka is central to the NRF's human capital development strategy and aims to redress historical imbalances among South African researchers.

Dr Wade Petersen, Department of Chemistry

Petersen's research looks at designing new molecules for drugs – a goal with growing importance given the increase in drug resistance. He is also interested in ensuring that the drugs he designs are produced in the most environmentally friendly and sustainable way possible.

Petersen's work and research group strive to pioneer a new era of chemistry expertise on the continent, contributing to the creation of new knowledge and keeping South Africa up to date with emerging trends and technologies.

Five UCT subjects in ShanghaiRanking's GRAS top 100

UCT has been ranked among the top 100 universities in five subject areas by ShanghaiRanking's Global Ranking of Academic Subjects (GRAS) 2022. The top-ranking subjects are environmental science and engineering, oceanography, clinical medicine, mining and mineral engineering, and public health.

More than 1 800 out of 5 000 universities across 96 countries and regions were ranked in 54 subjects across natural sciences, engineering, life sciences, medical sciences and social sciences. UCT was ranked in 21 of these subject areas. **Oceanography**, one of the top 100 was ranked between 51–75.

135 UCT researchers among world's top 2%. Four of these are from the Science Faculty

Researchers at UCT hold 135 positions on the University of Stanford's Top 2% Scientists in the World. That's according to the latest version of the list published in September. It features 195 605 researchers who make up the top 2% worldwide based on citations over their full careers.

The UCT researchers from the Faculty of Science, who are among the top 100 in their fields are:

- **Emeritus Professor William Bond** (Ecology)
- **Emeritus Professor John Parkington** (Archaeology)
- **Professor Judith Sealy** (Archaeology)
- **Emeritus Professor Gerd Gäde** (Entomology)

Royal Society of South Africa Awards Prof Nassimbeni the Marloth Medal

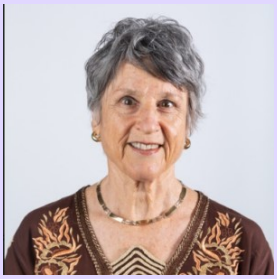
It was recently announced that **Emeritus Professor Luigi Nassimbeni** from the Department of Chemistry will be awarded the Royal Society of South Africa Marloth Medal. Their citation says that they recognise that he has made a major contribution to his field of research and to science in general. They comment that his contributions to the use of X-ray crystallography in chemistry and material science have made a massive impact in South Africa and beyond and that much of the current activities in this field in South Africa are a direct or indirect result of his work as a scientist and as an educator. Professor Stephanie Burton, president of the Royal Society commented, "Your long career and the various leadership positions that you have held make you a very worthy recipient of the Marloth Medal".

College of Fellows Young Researcher Awardees for 2022:

Dr Katye Altieri, from the Department of Oceanography was recently inducted as a College of Fellows Young Researcher awardee for 2022. Dr Altieri is the co-director of the UCT Marine Biogeochemistry Laboratory. Her current research interests include air pollution in coastal cities, the impact of human activities on surface ocean biogeochemistry, and studying the remote marine atmosphere of the Southern Ocean as a proxy to understand more about atmospheric chemistry and climate during the preindustrial.

Professor Jill Farrant and Emeritus Professor Jennifer Thomson invited to contribute to resolutions on how to save humanity in 21st century.

Professor Jill Farrant (pictured left) and **Emeritus Professor Jennifer Thomson** (pictured below right) were invited to a conference of Nobel Laureates and friends to deliberate on the final resolution of the 10 factors we need to undertake to save humanity in the 21st Century. They were the only South Africans invited to this conference to deliberate on and contribute to the 10 decisive actions required to save humanity in the 21st century. Prof Farrant was invited to comment on climate change and the urgent need to embrace alternative agricultural practices to save humanity from food insecurity and Prof Thomson on the role of women in science and their importance in carrying out this and other hugely imperative goals for humanity.

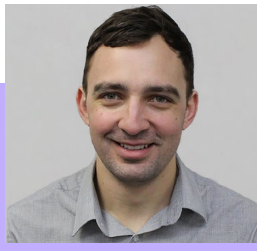


Emeritus Professor William Bond recognised as highly cited researcher

Three UCT Researchers are some of the world's most cited scholars, according to the Highly Cited Researchers 2022 list published by data analytics firm Clarivate. **Emeritus Professor William Bond,** from the Department of Biological Sciences is one of the three. This annual list identifies scientists and social scientists who have demonstrated significant influence through the publication of highly cited papers, which is defined as those ranked in the top 1% by citations for field and publication year, during the past decade (2011 to 2021).
This year, the list includes 7 225 researchers from 69 countries and regions.

Emeritus Professor Bond, who was elected as a Fellow of the Royal Society in 2021, is recognised as a global authority on open (non-forested) ecosystems, such as grasslands, savannas and shrublands. His research into the forces that shape global vegetation, including wildfire, CO2 levels and herbivores, has transformed understanding of how open ecosystems emerged.

STUDENTS IN THE NEWS:



Young UCT scientist selected as one of esteemed global Schmidt Science Fellows

Geomagnetic currents fundi and UCT National Astrophysics and Space Science Programme (NASSP) graduate **Dr Michael Heyn**s has been announced as one of the esteemed 2022 Schmidt Science Fellows by philanthropists Eric and Wendy Schmidt.

The 29 new fellows are a group of exceptional early-career scientists from around the world, each committed to transcending disciplines to advance discovery and driving innovation that improves the quality of life for all. Eric Schmidt, the co-founder of Schmidt Futures and former Google chairman and chief executive officer, said: "Our latest group of Schmidt Science Fellows embodies our vision for this programme at its inception five years ago. We find the most talented next-generation leaders from around the world and back these impressive young adults with the resources and networks they need to realise their full potential while addressing some of the big scientific questions facing the world. Congratulations to the 2022 Schmidt Science Fellows, I am excited to see where your science takes you and what you will achieve."

Dr Heyns' PhD involved research focused on improving the operational modelling of geomagnetic fields and geomagnetically induced currents (GIC) for utilities. He plans to harness computational physics to help us better understand the fundamental phenomena underlying space weather events, such as solar storms. He aims to increase the resilience of modern infrastructure in the face of extreme space weather events. His journey at UCT started with a BSc majoring in physics and applied mathematics in 2012. "I found a real passion for interdisciplinary research and really enjoyed the connectedness of the research community in astrophysics and space science in South Africa."

"Following on from this, I was fortunate enough to continue with an honours degree as part of NASSP. At that time NASSP was hosted at UCT and brought together students and research groups from around the country. In NASSP, I found a real passion for interdisciplinary research and really enjoyed the connectedness of the research community in astrophysics and space science in South Africa," he said. He then continued with a NASSP master's along an interdisciplinary trajectory, supplementing the core NASSP coursework with modules from SpaceLab in the Department of Electrical Engineering at UCT.

Building on this foundation, he then joined the South African National Space Agency (SANSA) and pivoted to electrical engineering to focus on modelling and understanding the ground impacts of solar storms on power systems as part of the UCT GIC research group. "In short, my specific focus has been on geomagnetically induced currents that arise from fluctuations in the earth's magnetic field due to perturbations of near-earth current systems, which may lead to direct damage and cascading failures or total blackouts in the context of power systems."

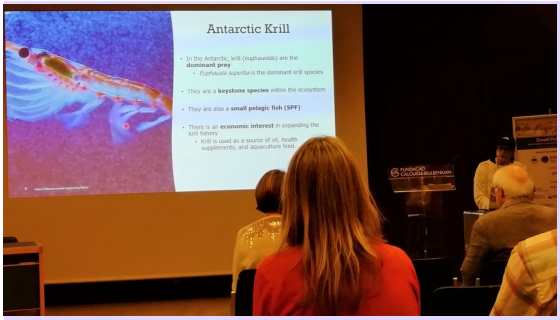
Research trajectory

This initial research inspired a follow-up PhD, still affiliated with SANSA and under the guidance of Professor Trevor Gaunt in the Department of Electrical Engineering at UCT. "During this research, probably the most rewarding and challenging aspect was being at the intersection of engineering and science and dealing with both operational application and theoretical underpinnings. It was truly fantastic to deal with both perspectives and work on an intensely interesting, multi-faceted problem that has real significance and impact in our daily lives", said Heyns. He said that after getting a taste of interdisciplinary research, the Schmidt Science Fellows opportunity truly resonated with him. This meant that there was a chance to switch disciplines entirely and define his own research trajectory. "For me this means moving up the modelling chain and focusing on the space physics precursors to space weather, with a hope of enabling increased resilience to space weather risks through operational forecasting for a South African and African context. Practically, this entails using physics-based modelling in the form of magnetohydrodynamic simulations and coupling them with interpretable machine learning approaches for the local context."

CAIR (Centre for Artificial Intelligence Research) student awarded Microsoft PhD Research Fellowship

Tezira Wanyana, a PhD candidate in the Adaptive and Cognitive Systems (ACS) Laboratory in the Department of Computer Science at UCT was recently awarded the Microsoft Research PhD Fellowship. 36 eligible students from universities globally, who are pursuing research that is aligned with the Microsoft areas of focus were awarded this prestigious fellowship and Tezira is one of them.

Tezira's interests lie in intelligent systems architectures. Her current research focuses on combining data driven and knowledge driven AI techniques in an architecture for designing intelligent agents for knowledge discovery and evolution (KDE) in different domains. The KDE architecture is applicable in dynamic physical sensor-based systems which acquire continuous observations that may contain new patterns which are worth following up. Machine learning is applied in perception and pattern detection while Bayesian networks and ontologies are used in theory construction to explain the situations detected in the patterns.



PhD candidate wins prize for best oral presentation at international conference

Naseera Moosa, PhD candidate in the Department of Mathematics & Applied Mathematics, was one of 5 people out of 120 early career researchers, to win a prize for best oral presentation at a major international conference the International Council for the Exploration of the Sea (ICES) recently. This was an outstanding achievement for Naseera, who was attending a major international symposium for the first time. Naseera's talk was entitled: "Investigating the influence of 'minor' krill-predators on the krill-predator dynamics of the Antarctic ecosystem". Naseera describes the Antarctic krill as being the star of the show: these small pelagic fish who are often overlooked despite their crucial role in the Antarctic food web and other marine ecosystems.

Women in Computer Science (WiCS) win DSA Leadership Award

The WiCS team receiving their award at the DSA Leadership Awards ceremony.

The Women in Computer Science (WiCS) Executive Team 2021/2022 had the honour of receiving an award of recognition at the UCT Department of Student Affairs (DSA) Leadership Awards. This award recognizes their efforts and contributions towards advancing the vision, mission and values of UCT. The highlights of their tenure include hosting the first ever MatHack Western Cape hackathon with three other societies, having a Womxn in Blockchain panel discussion with international panellists in collaboration with UCT FinHub & Algorand foundation, hosting a 4 week mentorship program for their members who were paired up with working professionals and having a basic computer skills workshop at Women in Tech's Philippi Centre.

They are delighted to have achieved the award and are very grateful for the nominations they received for the award; the members and sponsors who made all of this possible and the executive team for their hard work and commitment to making a difference.

The jubilant power team of women who made it all happen!

STAFF NEWS

WELCOME TO NEW STAFF

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

Biological Sciences:
- Ms Isabella Gongota—Departmental Assistant
- Dr Maggie Reddy—Lecturer

H3D Drug Discovery & Development
- Ms Melony Geldenhuys—Admin Officer
- Dr Omobolanle Jesumoroti—Investigator
- Dr Zaahida Sheik Ismail—Senior Research Scientist

Mathematics & Applied Mathematics
- Dr Yanga Bavuma—Lecturer
- Dr Harry Wiggins—Senior Lecturer

Statistical Sciences
- Ms Siphokazi Mngxunyeni—Programme Manager
- Mr Andrew Paskaramoorthy—Lecturer
- Ms Janine Saaiman—Admin Assistant

STAFF RETIRING

We say goodbye to staff retiring after many years of service to the Faculty of Science….

Biological Sciences
- Professor Peter Ryan
- Assoc Professor David Jacobs
- Assoc Professor Coleen Moloney
- Mr Aguilar Gonzalo

H3D Drug Discovery & Development
- Mrs Elaine Rutherford-Jones

Environmental & Geographical Science
- Professor Merle Sowman

Mathematics & Applied Mathematics
- Assoc Professor Peter Bruyns
- Dr Neill Robertson

Oceanography
- Ms Sharon Bosma

FAREWELL TO STAFF

The Faculty said goodbye to the following staff:

Archaeology
- Professor Shadreck Chirikure

Environmental & Geographical Science
- Ms Anna Steynor

H3D Drug Discovery & Development
- Ms Alacia Armstrong
- Dr Robin Klintworth
- Ms Tandokazi Ntsabo

Mathematics & Applied Mathematics

Congratulations to the following staff on their Ad Hominem Promotions

Name	Department	Promoted to
	Associate Professor to Professor:	
A/Prof. Res Altwegg	Statistical Sciences	Professor
A/Prof. Emese Bordy	Geological Sciences	Professor
A/Prof. Michelle Kuttel	Computer Science	Professor
A/Prof. Greg Smith	Chemistry	Professor
A/Prof. Tony Verboom	Biological Sciences	Professor
	Senior Lecturer to Associate Professor	
Dr Sarah Fawcett	Oceanography	Associate Professor
	Lecturer to Senior Lecturer	
Dr Josiah Chavula	Computer Science	Senior Lecturer
Dr Vincent Hare	Archaeology	Senior Lecturer
Dr Tamar Janelidze-Gray	Mathematics & Applied Mathematics	Senior Lecturer
Dr James Keaveney	Physics	Senior Lecturer
Dr Philile Mbatha	Environmental & Geographical Science	Senior Lecturer
Dr Wade Petersen	Chemistry	Senior Lecturer
Dr Rosalie Tostevin	Geological Sciences	Senior Lecturer
	Researcher Officer to Senior Research Officer	
Dr Jordan Collier	Astronomy	Senior Research Officer
	Other promotions	
Rene van der Merwe	Geological Sciences	Chief Technical Officer
Liesl Phigeland	Biological Sciences	Principal Scientific Officer
Andrea Plos	Biological Sciences	Principal Technical Officer
Kerwin Ontong	Physics	Principal Technical Officer
Dawood Hattas	Biological Sciences	Principal Scientific Officer

NEW IN THE FACULTY

UCT to build capacity for malaria modelling in Africa

UCT has received a major funding boost from the Bill & Melinda Gates Foundation to launch a three-year capacity-building programme for malaria modelling in sub-Saharan Africa.

The Malaria Modelling and Analytics: Leaders in Africa (MMALA) programme has received a grant of US$3 million over three years from the Gates Foundation to develop a critical mass of African malaria modellers to meet the need for tailored quantitative malaria decision support in a sustainable way. The programme is headed by **Associate Professor Sheetal Silal**, the director of the Modelling and Simulation Hub, Africa (MASHA) based in UCT's Department of Statistical Sciences. Associate Professor Silal's research focuses on using mathematics and statistics to model the transmission and control of malaria, COVID-19 and other diseases in South Africa, sub-Saharan Africa and globally.

MMALA is one of five projects that have received funding from the Gates Foundation to boost malaria modelling capacity in Africa. The funding opportunity forms part of the foundation's Grand Challenges Global Call-to-Action initiative and seeks to support the World Health Organization's goal of eliminating malaria by 2030.

Creating opportunities for postgraduates

"We're very excited to be producing a cohort of 12 PhD students and three postdoctoral researchers," said Silal. "We've sent a call for applications throughout the region, targeting the Elimination 8 (E8) countries of Angola, Botswana, Eswatini, Mozambique, Namibia, South Africa, Zambia and Zimbabwe, as well as Ghana, Cameroon and Benin. "Our previous research has shown that a regional approach is necessary to eliminate malaria," she said. "Each country working in isolation is not cost-effective, but a regional approach will bring mutual benefits and savings. And that is also the strength of this particular project." MMALA has already received 85 applications for the PhD positions and the interview process is already under way.

Silal emphasised the fact that the programme aims to produce malaria modellers who not only understand the science of malaria elimination, but are also able to translate this science into implementable policy and advise governments on the best way to achieve their health goals. The idea is to take a holistic approach to training by providing a proactive and reactive training programme that runs the gamut of malaria knowledge and offers students opportunities to revisit areas they struggle with. "We take a systemic approach to training, exploring the epidemiological, economic, social, demographic and other aspects in the world of malaria; not just modelling infection, but the system in which malaria transmits," she explained.

"We plan to engage the diverse community of malaria scientists – including policy makers, health economists, climate scientists and so on – to come together and contribute to a training programme for the students in the first eight months of the programme, before they start their research projects." Apart from the PhD training programme, MMALA will also be training a group of postdoctoral and early-career researchers who are employed at universities across Africa. "This grant is also a way for us to help our rising stars on the continent, [by] providing research opportunities and leadership training," said Silal.

Building capacity beyond campus

While the first year of the programme will be largely student focused, Silal said that the focus of the second year will be to increase the capacity for using malaria modelling in government. "During this phase, we'll be introducing policy makers to the benefits of modelling and how to critically engage with it," she said. "It will be important to work together to build a pipeline of decision-making from science to policy." To realise this capacity-building goal, MMALA will also be working closely with advocacy organisations such as SADC E8 and NGOs like the Clinton Health Access Initiative (CHAI). "So, between our training of students, engaging with governments and partnering with the likes of E8 and CHAI, we're able to create a triangulated programme, which will hopefully lead to impactful and implementable research over the next three years, bringing us one step closer to a malaria-free region."

Collaboration between Spain and South Africa

In his role as SKA Associate, UCT staff member **Dr Alvaro de la Cruz-Dombriz**, from the Department of Mathematics and Applied Mathematics, who is President of the Society of Spanish Researchers in Southern Africa (80 associates, 60 in South Africa), held a meeting with HE the President of the Government of Spain, Pedro Sánchez, on the occasion of his visit to South Africa.

During the visit, Spain and South Africa signed a Memorandum of Understanding between the two National Libraries, which will be beneficial for UCT libraries and departments specialised in bibliographic studies, such as, for example, the Tombouctou Manuscript project led by UCT (more information at http://www.tombouctoumanuscripts.uct.ac.za). Shortly, the two countries are expected to sign two more Memoranda of Understanding: a first one about Higher-Education cooperation and a second one on the facilitation of university degrees recognition issued by each country in the other one. Moreover, it is expected that the Spanish Research High Council (CSIC) and National Research Foundation will sign an agreement inspired by the bilateral agreements that South Africa has with the most scientifically developed countries (Belgium, France, Germany, Italy and Japan, amongst others). In all these four initiatives Dr de la Cruz-Dombriz has played both an advisory and instrumental role to both parties given his expertise and professional career in both countries.

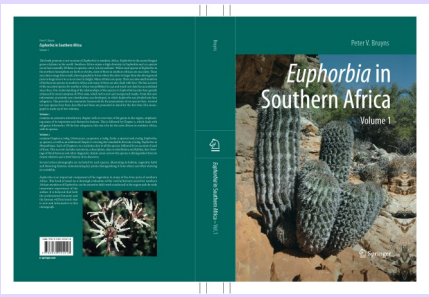
Also, later that same afternoon, Dr de la Cruz-Dombriz participated in the frame of the Spain - South Africa Business Forum, where the two presidents attended. This forum was also intended by both Spanish and South African R&D&I stakeholders. At this meeting, Alvaro had a productive conversation with Ibrahim Patel, Minister of Industry regarding opportunities for a project in companies in his role of Erasmus+ grants facilitator at UCT with top-ranked Spanish universities. It is exciting and encouraging that, as announced during this presidential visit, Spain would provide *funding of up to 2.1 billion euros to South Africa over the next five years, which would be invested in various sectors including renewable energy*.

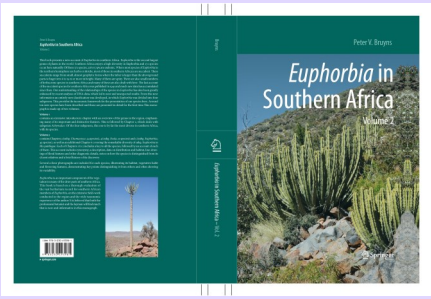
New book on Euphorbia published by Associate Professor Peter Bruyns

Associate Professor Peter Bruyns has just had a two-volume monographic work, *Euphorbia* in Southern Africa, published during 2022 by Springer. This is a large pair of books with just short of 1000 pages.

Euphorbia is the second largest genus of plants in the world and, with 170 species occurring here naturally (of which 128 or 74% are endemic), Southern Africa enjoys a high diversity in *Euphorbia*. Most species of *Euphorbia* in the northern hemisphere are herbs, but most of those in southern African are succulent and these range from small geophytes to huge trees to 15 m or more tall. The last account of the succulent species for southern Africa was published in 1941 and much new data has accumulated since then, including at least 20 new species. Our understanding of the relationships of the species in *Euphorbia* has been greatly enhanced by analyses of DNA-data and this led to an entirely new classification of *Euphorbia* into four subgenera.

This account provides detailed descriptions, data on distribution and habitat, line-drawings of floral features, how the species is distinguished from its closest relatives and a brief history of its discovery. Several colour photographs are included for each species, illustrating its habitat, habit and flowering features.





EVENTS IN FACULTY

Chemistry Women's Day Brunch

Delegates at the Chemistry Women's Day Brunch

The Department of Chemistry hosted an inspirational Women's Day brunch on Friday 26th of August - celebrating women in science and the department of Chemistry in particular. The Chemistry boardroom was transformed into a beautiful space with wonderful food, drinks, lucky draw prizes and even a photo booth! In addition to this inaugural brunch, the department also hosted a women's month charity drive where they collected toiletry items for *Ons Plek* – a child and youth care centre. This departmental initiative is aimed at connecting the department with the community and to have a positive impact on society.

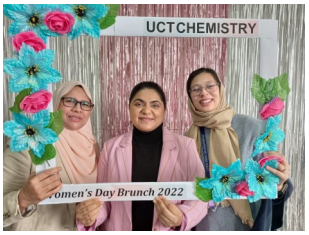
HOD **Professor Anwar Jardine** welcomed everyone to the event and commented that it was important to celebrate Women's month and women who across the ages have bravely marched against the government, who often bear the brunt of conflict in the world and go to great lengths to feed and educate their children. He said it is fitting that the UN recognised the importance of women and bringing attention to the plight of women globally. Bringing the issues of women close to home at UCT, Prof Jardine said that it is important to remove the bias in the world of science where only 28% of the workforce in STEM and science are women. He also challenged the participants to raise sons who are respectful towards women.

Guest speakers Megan Becker and Dr Chanell Marthinussen

Guest speakers from Unilever and a medical doctor were also invited to the event. **Dr Chanell Marthinussen**, a medical doctor and founder of The F-word – a company that sells silicone menstrual cups and aims to encourage women to become more comfortable with speaking about their period and reproductive health. Chanell captivated the audience with her story of the power of dreams and freedom and finding her niche in the world. Chanell highlighted the need to be free to dream – even the things that seem impossible; being free to stand out and to feel the freedom where she talked about the freedom cup she has designed for women with her business which aims to have conversations openly and not think it is taboo.

Megan Becker, a Research and Development manager at Unilever flew down from Durban specially for the event. Megan, a Chemical Engineer who completed her studies at UCT spoke about the theme of Fluid. She noted how life is constantly changing and shared 3 of her life hacks – adaptability, courage and curiosity. Megan shared her challenging journey at UCT and how despite being a top performer at school, in her second year at university she was barely passing and was on the brink of giving up, when she was approached by a complete stranger who told her that she needed to persevere with what she was struggling with. She realized she had to do things completely differently and ended up getting the highest mark in the class for a subject that most people failed – and this was a turning point for her. On completion of her engineering degree, Mega ventured off to Sasolburg, far from family and friends, where nothing quite went according to plan but she persevered through challenges and despite the predominantly male environment who initially judged her – they ended up respecting her. Megan's encouraged the audience to examine the things that hold them back, to forgive others, be generous in sharing information/ ideas; celebrate the success of others; share experiences with others and take others along on the journey.

Saaliha Essack, and **Barbara Lack** joined the conversation online from Unilever in Durban. Barbara, an R&D Director, shared about the importance of never giving up and what it truly means to be resilient. She spoke about finding your fit and striving forward with excellence. As a fellow chemist at heart, she inspired the audience by sharing her journey which helped her find new meaning and appreciation for learning through failure and advised the audience to learn to find a way to flow around problems. Saaliha who is the R&D for skin cleansers and works with differently abled customers asked how we co-create and serve the underserved consumer. As a chemist she has a passion for designing and developing products from scratch and says she really enjoyed lab work. However after the birth of her first child, who was born blind, she had to stay positive and she decided she would be the best Mom she could be to her daughter – and she described her courageous and determined journey of perseverance – to give her daughter an education, even though it came at a huge personal cost to herself, having to drive approximately 300km every day to get her daughter to school.



Congratulations to the organising team of **Dr Dalielah Jappie, Dr Roxanne Mohunlal** and **Ms Laa-iqa Rylands**. (pictured above far right). Sponsors of the event were the Department of Chemistry, Unilever, Mantelli's and Bloom by Meredith.

MCB hosts Research Day

The Molecular and Cell Biology Research Week invites postgraduate candidates from various labs to present their work thus far, as well as share valuable insight into the ongoings of different labs within the department. This year showcased presenters in the first face-to-face setting since 2019, an opportunity which granted them real-time interaction with both their peers as well as academics.

Speakers from various labs explored topics such as molecular mechanisms within plants, vaccine research in the context of biopharming, drug target discoveries using bacterial biofilm relationships, human immunodeficiency virus pathogenesis, human mitochondrial distress as well as signalling pathways during immunogenic responses.

The programme ran over two days with each presenter given 20 minutes for their talk as well as 10 minutes for questions. Honours Candidates were also asked to present posters on their current project progress. Special mention must be given to best presenter of the week: **Molopo Lipali**, a PhD candidate from Dr William's lab, as well as best honours poster: **Sarah McLeod** (Dr Colleen O'Ryan's student).

Sarah McLeod receiving her award from Dr O'Ryan

Molopo Lipali receiving her award from Dr O'Ryan

Nobel in Africa at UCT

UCT's High Energy Physics, Cosmology & Astrophysics Theory hosting world-renowned cosmologist Professor Viatcheslav Mukhanov for a public lecture .

During October, as part of the Nobel in Africa symposia series, UCT's Department of Mathematics and Applied Mathematics (MAM) hosted **Professor Viatcheslav Mukhanov** for a public lecture on his work in cosmology and theory of the quantum universe**.** The Nobel in Africa programme, is aimed at promoting areas of science in which breakthroughs are occurring or which have cultural or social significance.

Bringing together experts from Africa and the world

For the first time, Nobel in Africa is providing platforms for public lectures and critical engagements with universities around the Western Cape this year. "The Nobel in Africa symposium series is an initiative that will bring together experts in Africa and the world for discussions about science and the advancement of research in the areas of physics, chemistry, economic sciences and physiology and medicine," said **Professor Amanda Weltman** of the MAM. "The series aims to provide leading scientists in Africa with the opportunity to interact with the international community on our own soil. "The Nobel Foundation has been hosting symposia around the Nobel Prizes since 1965, but this is the first time that an external organisation is hosting, and the High Energy Physics, Cosmology & Astrophysics Theory Group at UCT are delighted to play a role as hosts." As part of this public outreach initiative, the group hosted the UCT Nobel in Africa Seminar given by the Russian-born Professor Mukhanov.

A full professor of physics and head of the Astroparticle Division at the Ludwig Maximilians Universität in Munich, Germany, Mukhanov is a leader in the field of cosmology. He is best known for his theory of the quantum origin of the universe structure, which was born out of research he completed with fellow cosmologist Gennady Chibisov (1946–2008). He discussed recent developments in cosmology that have arisen as a result of new cosmic microwave background fluctuation measurement techniques that enabled experiments to be carried out based on his theory.

Theorising the formation of the universe

When Mukhanov was completing his PhD at the Moscow Institute of Physics and Technology, cosmology theorists began to run into problems with the Big Bang Theory. Although compelling evidence had been found to support the theory in the mid-1960s, the consensus among scientists was that the homogeneity of the observed universe on a massive scale was extremely unlikely – if not impossible. Inspired by the work of Alexei Starobinsky, which focused on the origins of the Big Bang universe and found that it would have likely expanded exponentially in its first moments of existence, Mukhanov and Chibisov set about trying to understand why the universe is so uniform. They posited that exponential expansion would explain the homogeneity we observe across the universe. However, they also realised that this uniformity was at odds with Heisenberg's uncertainty principle. "The idea was that there had to be small inhomogeneities in the matter when the Big Bang occurred."

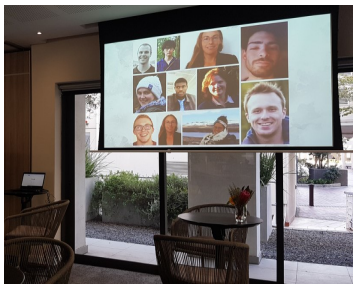
The idea was that there had to be small inhomogeneities in the matter when the Big Bang occurred. With the exponentially rapid expansion of the universe, these minute quantum fluctuations would be stretched to an extremely large size, grow in amplitude and become the basis for the formation of galaxies. Mukhanov and Chibisov concluded that these inhomogeneities – or primordial wiggles, as Mukhanov calls them – would themselves constitute the universe. They would be the structures that give the universe substance rather than simply being empty space. Several other scientists came up with similar theories, but it was Mukhanov who developed a hypothesis relating to these fluctuations that was applicable to a variety of cosmic inflation models.

Although calculations evidenced that such inhomogeneities would be detectable in the cosmic microwave background, it would be decades before technology would enable monitoring of this radiation. Finally, in the past 20 years, these observations became possible and there have been a number that have validated Mukhanov's theoretical predictions.

International Statistical Ecology Conference 2022

The International Statistical Ecology Conference (ISEC) is the most important international gathering of statistical ecologists, held every two years since 2008. ISEC2022 was the first iteration of the conference held in Africa. It was hosted by the centre for Statistics in Ecology, Environment and Conservation (SEEC) and held at UCT's Breakwater Lodge from 25 June to 1 July 2022. The conference was held as a hybrid event and attracted 516 delegates (152 in-person and 364 online) from 46 different countries.

Talks, posters and workshops at ISEC cover a broad range of themes within statistical ecology such as abundance estimation, animal movement, big data, biodiversity, capture-recapture, citizen science, community dynamics, disease ecology, distance sampling, epidemiology, evolutionary ecology, fisheries, individual-based models, integrated population models, metapopulation dynamics, multispecies models, occupancy models, population dynamics, spatial ecology, species distribution models, and survey design. ISEC also has a strong focus on capacity building through a series of pre-conference workshops and 'skill showcase' sessions, taught by world experts.



A few of our online delegates. We displayed photos of online delegates on a rotational basis in the poster hall to encourage interactions between in-person and online delegates.

On reflecting on the conference, **Res Altwegg** and **Greg Distiller** said that ISEC is a highlight where statistical ecologists exchange their latest research and discuss topics that are important to them. We had round-table discussions on specific methods but also broader topics like inclusivity, teaching statistics to ecologists and around publishing our research. ISEC2022 has been particularly important for African researchers as we used the event to promote statistical ecology in Africa. On the one hand, we used our role as hosts to showcase African case studies. We had a special plenary session on conservation in Africa with black scientists from Kenya, Morocco and South Africa. We also had a public lecture with two speakers presenting on data needs to address conservation questions in Africa. On the other hand, we used the opportunity to gather statistical ecologists with an interest in research conducted in Africa through a round-table discussion.

ISEC2022 was the first ISEC carried out in hybrid format. Our focus was on accessibility and inclusivity. We learned a lot about organising such hybrid events. Having enough resources (financial and human) to be able to use a state-of-the art online platform, a mobile app, and high-quality recording in the venue proved critical. Standard conference procedures had to be re-thought. For example, we felt that having a single person chairing a session was insufficient because of the need to monitor online questions in addition to the normal chairing duties. We used this opportunity to assign postgraduate students as co-chairs, thus giving them early experience in chairing international events and the benefits of the associated exposure to the community.

Group photo of the in-person delegates

The conference dinner at the Gold restaurant. We enjoyed a culinary tour around the African continent rounded off by drumming and dancing.

Research Bytes

Unveiling a new large-bodied sabretooth cat that roamed the West Coast of South Africa

Reconstruction of a sabretooth skeleton highlighting the bones that were examined in this study

New research has shed light on carnivoran diversity and diseases that afflicted sabretooth cats over five-million-years-ago. The fossils studied were from the Mio-Pliocene (5.2 million years ago) fossil site called Langebaanweg (West Coast Fossil Park) where at least three different types of sabretooth cats have been recovered. Sabretooth cats, with their distinctive, large sabre-like canines that project out of their upper jaws like steak knives, are charismatic carnivores known globally in the fossil record. The previously undescribed sabretooth cat (felid) fossil remains were discovered by **Dr Alberto Valenciano**, a former postdoctoral fellow at UCT and the Iziko South African Museum, now based at University of Zaragoza, while examining the collections at the Iziko South African Museum. Shortly after, UCT Palaeobiologist **Professor Anusuya Chinsamy-Turan** and her then honours student **Caitlin Rabe** began their work on the remains. They found that this sabretooth cat lies between two previously described genera and, that the large cat was afflicted with osteoarthritis. These and other findings have been published in the prestigious international journal *Papers in Palaeontology*.

Now a doctoral candidate at UCT, Rabe explained how the research process began: "We cast our net wide, by comparing our fossils to those of many sabretooth species from around the world, and we also included modern representatives in our analysis, like the African Lion (*Panthera leo*), to better understand what our cat looked like relative to the rest of the felid family." This comparative analysis revealed that the Langebaanweg sabretooth had similar limb bone proportions to two known African and European sabretooths – *Lokotunjailurus emageritus* from Kenya, and *Machairodus aphanistus* from Spain. Rabe continued: "These results were surprising because despite being a large-bodied cat, our specimen was different to the large-bodied genus at Langebaanweg *Amphimachairodus."*

While the genus *Machairodus* has been previously reported in Langebaanweg, the genus *Lokotunjailurus* is currently known only from the Lothagam fossil site in Kenya, and Toros-Menalla in Chad. Co-author Valenciano shared: "Our analyses showed that the fossils did not belong to the biggest known sabretooth cat from Langebaanweg, but that it was a new large-sized cat. This indicates that we had two large-bodied sabretooth cats that were living on the West Coast of South Africa about five-million-years-ago." "This is not the end of the fascinating story of the diversity of the sabretooth cats from Langebaanweg. There are still several other undescribed sabretooth fossils (including skulls and mandibles) that are crying out from some research attention," added Professor Chinsamy-Turan. In addition to identifying the sabretooth, Rabe also described the disfigured, diseased bones and was able to deduce the animal was afflicted with osteoarthritis. "The erosive pathological features visible in the sabretooth indicate that it suffered from severe osteoarthritis. Just looking at the bones it is obvious that something is seriously wrong. Up close, one can see that once the cartilage had worn away, the bones were in direct contact with one another," explained Rabe.

By studying the overall skeleton and the extent and severity of the disease, the researchers deduced that the Langebaanweg sabretooth would have been an old individual that had suffered with arthritis for a long time. The bony spurs in the lumbar vertebra and deformation of the ankle bone suggest that the animal must have endured considerable pain and that it may have been lame and most likely unable to hunt with great success. These findings suggest that the animal's long-term survival may have depended on it being part of a social group or at the very least that it changed to a scavenging lifestyle.

Professor Chinsamy-Turan said: "This palaeobiological research on this enigmatic 5.2-million-year-old sabretooth cat demonstrates how much we can learn about our prehistoric biodiversity by studying their fossilised remains." The Langebaanweg site provides a unique window into the Western Cape province as it was over five million years ago and offers many opportunities to understand the remarkable African biodiversity of the Neogene period.


Various Podocarpus species include Podocarpus latifolius (left) und Podocarpus elongatus (right). Photos: Patrick Schmidt

Early modern humans in Africa used high-tech adhesives extracted from a local plant

New research shows that early *Homo sapiens* in South Africa (during the Middle Stone Ages) used a glue made from local *Podocarpus* trees with excellent adhesive properties – that can only be produced in an elaborate process – to attach stone tools to wooden spears. The fact that early modern humans did not resort to more readily available adhesives 100 000 years ago is a testament to their innovative abilities and skills. This may even have been a turning point in human cultural evolution, concluded the research team of Dr Patrick Schmidt and Tabea J. Koch from the University of Tübingen, Germany and **Professor Edmund February** from UCT.

Yellowwoods, conifers of the genus *Podocarpus*, are tropical evergreen shrubs and trees. “Adhesives have been discovered at several Middle Stone Age sites in South Africa, mostly as residues on scrapers or stone blades that had been glued to handles or spears,” said Dr Schmidt. Chemical analysis had shown that such glue was often extracted from yellowwoods which, according to Dr Schmidt, was surprising as yellowwoods do not exude tree resins or any other sticky substance.

Professor February shared: “In the fynbos there are many species that exude resins and latex that could be used for hafting tools. It really came as a surprise to me when I realised that people 100 000 years ago where not using any of these but rather opting to use a complex distillation process to get the resin from tree leaves.”

The team investigated how the adhesive could be made when only Stone Age materials and tools were available. No small feat as the leaves of Yellowwood trees contain small amounts of resin, which need to be distilled out. They discovered two ways to manufacture the glue as explained by Dr Schmidt: “it’s quite simple to burn the leaves directly next to flat stones. This leads to the condensation of tar, which can be scraped off the stones. This is a process that people may have discovered by accident. The second option is more difficult and time consuming. In it, the leaves have to be heated in a kind of underground distillery for several hours so that the tar drips into a container. It is not known which method was used.


After tar has been extracted from Podocarpus leaves by the condensation method, it can be scraped from the surface of the stone with a stone tool (left). The finished product is a lump of tar (right). Photos: Tabea Koch

Schmidt shared that regardless of the method it was astonishing that early modern humans at that time did not use any plants other than yellowwoods as sources of glue. Koch elaborated: "People could have simply collected tree resin as, in several species that occurred in their environment, it flows visibly from the trunk. And some plants release sticky latex when the leaves break off.”

The study was possible using standard laboratory tests such as those used in the adhesives industry. “Our tar distilled from yellowwoods had particularly good mechanical properties and proved to be stronger than all other naturally occurring adhesive substances of the Stone Age in South Africa; it was able to hold significantly larger loads," said Schmidt. According to the team the fact that modern humans in southern Africa purposefully produced particularly good adhesives around 100 000 years ago was a turning point in the development of our direct ancestors. "People weren't selecting materials based on their properties, they were modifying the existing material. Such new engineering technology required higher cognitive abilities and innovative thinking,” shared Schmidt.

A second way to produce tar from Podocarpus is dry distillation of the leaves using an underground distillation apparatus like this one, which was opened here after the experiment. Photo: Tabea Koch

Karoo Keyhole

The recently minted Dr Zoe Woodgate with a 'keyhole on the Karoo' camera trap

Worldwide, scientists are scrambling to document our remaining wildlife so that politicians and land managers can be provided with the evidence they need to act and hopefully apply the brakes to the 6th great extinction bus.

In South Africa with only 10% of the land being formally protected, most wild animals are still living on private land, particularly in semi-arid regions like the Karoo where the natural habitat, although altered by domestic livestock, is still largely intact. This includes the elusive riverine rabbit, one of the most endangered mammals on earth that still has scientists scratching their heads on how to find it and provide a reliable population and distribution estimate.

The elusive riverine rabbit identifiable by the black line on the side of its face proved to be readily sampled using camera traps

According to **Professor Justin O' Riain**, the Karoo occupies about one third of the total land area of South Africa and is mostly used for commercial small livestock farming. More recently there has been interest in exploiting both natural gas and uranium resources below ground and both solar and wind farms above it. Understanding how these different land uses impact biodiversity is critical to mitigating further losses and this led to the inception of an ambitious project lead by SANBI to systematically record the existing fauna and flora of the Karoo under the banner of the BioGaps project.

The Institute for Communities and Wildlife in Africa (iCWild) was given the task of surveying the mammal taxon and PhD graduate **Zoe Woodgate** the formidable challenge of working out where the medium and large mammals were living in the vast expanse of the Karoo. Armed with a trusty 4x4, sturdy hiking boots, a GPS and trailer load of camera traps, Zoe set off on a journey of many thousands of kilometres, much of which was on foot—to remote camera trap locations selected to sample the varied topography and habitat types of the Karoo.

Remote sensor camera traps have revolutionised sampling for cryptic and elusive wildlife. Positioned in areas with animal sign (e.g., trails) camera traps photograph everything that passes their infrared sensors. They can stay in the field for months on end in all weather conditions capturing both rare and common species by day and night. Downloading the SD card from a camera trap after it has been in the field for months is both exhilarating because of photos of unusual animals or strange behaviours, and daunting when you have to sort through thousands of images of swaying grass that accidentally triggered the sensor.

Once she had compiled and analysed the results obtained, Zoe immediately challenged one of the most persistent misconceptions about the Karoo - that farmers are bad for biodiversity. Farmland supported similar levels of species richness to government protected areas. The data also revealed that privately protected areas can invest more in good fences resulting in the restocking of large predators and herbivores which had the most mammal species, including the rare riverine rabbit. Perhaps the two most important findings to emerge from Zoe's thesis is that camera traps placed in clusters proved to be an excellent method for detecting the elusive riverine rabbits and the resultant data allowed Zoe to be the first to explore key abiotic and biotic drivers of their presence.

The first surprise was that 'riverine' rabbit presence was not closely linked to riverine habitat while the second was that the absence of hares was the best predictor of rabbit presence. Together these findings which were recently published in the journal of *Endangered Species Research* suggest that not only is their name perhaps a misnomer, but their general rarity may be a function of the relative abundance of the competitively superior hare species.

Other important findings were that private protected areas, that have the money to fence and then rewild with large predators and herbivores had the most species but farmland was not far behind with some species clearly benefitting from increased access to water and the release from top predator pressure.

Reflecting upon her adventures in the Karoo Zoe was most struck by the hospitality of the farmers. It is a rare site being greeted by a woman stepping out of a tired looking 4x4 with a dusty smile, a hammer, some metal stakes and a request to pitch a tent. Karoo hospitality meant the tent was seldom required and the engagements 'on the stoep' proved important for bridging the gap between farmers and scientists with the former sharing their deep knowledge of the land the latter their new tools for spying on the elusive wildlife still roaming the plains of the Karoo.

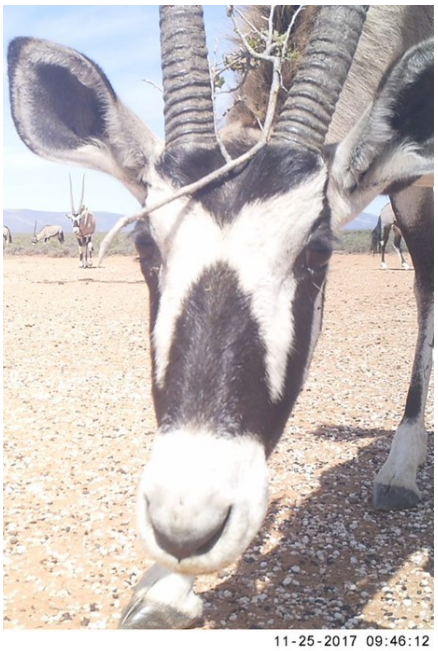
Zoe has no doubt that many farmers shook their head in disbelief at the effort she was going to in understanding what animals lived where in the Karoo. But these have now provided a robust baseline that can guide policy makers and developers as to which areas will be most impacted by current and future human activities.

For the most part the news is good. Farmers farm with wildlife and both public and private protected areas provide a haven for those species that farmers cannot easily farm with. Looking forward Zoe wants to pull the many disparate Karoo studies together to provide the definitive body of literature on wildlife in the semi-arid interior of South Africa.

The aardwolf, an historically misunderstood species that was historically heavily persecuted as a potential threat to livestock is now fairly common on farmland with farmers acknowledging their largely insectivorous diet.

Zoe with her trusty vehicle. Having extensive offroad driving experience was an essential skill for the immense fieldwork challenges of this project.

Leopard were only detected in protected areas during the study while Gemsbok were common across all land uses.



Remarkable PhD graduate who had never used a computer at school graduates with PhD in Computer Science and built a lifechanging mobile app for mothers of premature babies.

Wanjiru Mburu, who was born in a small village in rural Kenya and had never used a computer in her life, has just completed her PhD in Computer Science at UCT. Her Dad (a seasoned accountant) was an avid supporter of her education and used to coach her in maths and sciences from a young age. Unlike her siblings who studied in high end schools, Wanjiru went to a village school due to financial challenges and while at high school, she won a national award for a mathematics contest, for the best female student, two years in a row. After completion of her secondary national exams, she secured a position in Moi university where she pursued a degree in Computer Science. Initially she wanted to pursue a medical degree (specializing in Pharmacy) because she was good at sciences and Chemistry in particular. However, her high school physics teacher, Mr Gatere, had encouraged her to apply for a degree in computer science because she excelled in maths and science. And that is how she found herself in the field of computer science!

Not having ever owned or used a computer before joining the University, meant that her initial years on campus were frustrating. She initially struggled to grasp the coding concepts and battled for the first two years. In her third year, she teamed up with other students to practice coding. Despite the limited access to internet and computers while at school, she graduated in 2009 with an Honours degree in computer science. Thereafter she graduated with Masters' degree in 2013 from UCT and she wasn't keen on pursuing PhD. On completion of her Masters, she wanted to practice in ICT4D—the field that she was passionate about. Wanjiru describes, "I worked hard to be involved in areas designing and implementing maternal health solutions. I identified numerous challenges that mothers in low-income setting face. One opportunity that hadn't been greatly researched and addressed in the field of maternal health studies, was providing support to assist mothers of premature infants care optimally for their infants. This intrigued me and motivated me to do some research and apply for a PhD scholarship that would enable me research this under explored topic. Fortunately, I received the Hasso Plattner Institute (HPI) Scholarship in 2017 and an additional scholarship from NRF in 2018. I worked with awesome advisors Associate Professor Melissa Densmore and Dr Yassen Joolay, who were as passionate about the research topic as I was.

For her PhD Wanjiru worked on bridging the gap between staff and parents in the NICU. There is limited research work done in low-income settings that focus on investigating how digital innovation could bridge communication barriers between parents and health personnel in NICU setting, which is what compelled her to do research in this area. She explained, "Working in NICU requires emotional strength—it is an environment that is intimidating and emotionally distressing. The sight of beeping machines, tiny babies connected to numerous devices and tubes was frightening. The sad stories from mothers and NICU staff made me emotional, but with the support of my supervisors I became focussed on supporting these mothers in every way I could, in order to ease the stress related to premature birth. I did not only focus on the research aspect but also supported the mothers in cup feeding and cleaning their babies (under nurses' supervision), mediating conversations between mothers and NICU staff since many mothers were afraid of initiating conversations with the staff, seeking medical information on behalf of parents etc. This relationships with NICU stakeholders encouraged me to continue with the studies, since it was mutually beneficial.

What Wanjiru found most interesting and encouraging about her research was the positive uptake of the premicare digital solution that she built. She was also inspired when the digital intervention empowered parents to engage with NICU staff. Putting a smile on the face of mothers by offering them a helping hand and receiving positive feedback from NICU stakeholders during an evaluation of the premiecare system were the highlights of her PhD. The hardest part of her PhD journey was during her third year when she was configuring the raspberry pie as her system's local server, she got stuck for three months. She says, "My mental health was impacted during this period, but thankfully my colleague's encouragement and support during this challenging time, kept

me going. Looking at the result of the tool I built, I realise that it was worth all the struggles. Another challenge during my fourth year, when I was wrapping up my research, COVID happened. I was pregnant at the time and looking forward to submitting my thesis before welcoming my child. The closure of UCT disrupted my schedules and welcoming my bundle of joy in the process required me to delay my studies by two years. Anyway, I am not complaining – at least I managed to graduate in motherhood as well as a Doctor of Philosophy in computer science" 😊

Wanjiru's research findings uncovered the challenges of designing digital interventions for multilingual users in the health sector. This is a novel idea that echoes the communication barriers reported in most health research.

Now that Wanjiru has completed her PhD, she is currently a Human computer Interaction (HCI) researcher at Microsoft. She also work as a consultant for various organisations that focus on designing digital tools for Africans. She is passionate about co-designing tools that meet the cultural and economic needs of African people. Therefore, her dream is to be a seasoned user experience researcher (also referred as HCI researcher) in a renowned technology company.

Wanjiru at work in the NICU

And outside of work, her other passion is travelling…and she plans to do a trip from Cairo to Cape Town soon. She also loves playing chess and looks forward to beating her partner, who is exceptionally good at the game!

Her words of wisdom to other students: "PhD studies require resilience and tenacity. Don't focus more on the degree but ask yourself whether your research work is adding value to the people you are working with or your target users".

Training a mother to work with the app

UCT Soil expert hosts Save Soil Ambassador who is walking 10 000km to raise awareness about the importance of soil for survival

Dr Janion-Scheepers giving Tseke Nkadimeng a book on Soil Biodiversity

Dr Charlene Janion-Scheepers from the Department of Biological Sciences, hosted businessman, entrepreneur and Save Soil Ambassador **Tseke Nkadimeng** who visited her lab at UCT to learn about her research on soil biodiversity and soil health. In July this year, Save Soil ambassador Tseke embarked on a 10 000km walk across South Africa in 250 days to raise awareness about the Save Soil initiative. Save Soil is a global initiative, launched by Sadhguru, to address the soil crisis by bringing together people from around the world to stand up for Soil Health and supporting leaders of all nations to institute national policies and actions that increase the organic content in cultivable soil. Tseke started from Dullstroom and went to Durban, Bloemfontein, Middelburg, Queenstown, Gqerberha, Knysna and arrived in Cape Town after 108 days (and 4000km) of walking. From Cape Town they head North to Calvinia, Upington then to Venda, Tzaneen, Polokwane, Kempton Park, Johannesburg before ending in Pretoria.

The United Nations says we only have 60 years of soil left and already 52% of agricultural soil is degraded globally. This means that here in South Africa, we could begin experiencing the effects of food scarcity and soil extinction within the next 10 to 15 years. Soil – which is the basis of life on the planet, is globally in danger of desertification, which is characterized by soil having insufficient organic content (animal and plant matter). In Africa, the average organic content in agricultural lands is well under 3% which is the minimum percentage required to call agricultural soil healthy (enough to keep microbes in soil on a survival diet). Lack of organic content in soil results in lack of nutrition in food, thereby resulting in malnutrition.

Moreover, desertification means soil will produce less food over time, resulting in famines and forced migration. South Africa is also facing extreme weather effects from lack of water to floods. Soil rich in organic content and managed well can absorb rainfall better, preventing flood-causing runoff. Soil rich in organic content retains water and can slowly release these over time keeping plants hydrated where there is low rainfall and keeping rivers flowing for longer. Increasing organic content in soil reduces water required for irrigation significantly.

The aim of this initiative, which is part of the global SaveSoil movement, is to support citizens in finding out more about the impending soil crisis, and also supporting them in raising their voices and bringing to bear influence on government to stop this imminent soil extinction crisis and to protect our future by supporting and lobbying for environmentally-conscious governance decisions.

Charlene showing Tseke the springtails under the microscope

Dr Janion-Scheepers showed Tseke a collection of live springtails in the lab and described how these are useful indicators of soil health. She explained that springtails are some of the most abundant creatures in the soil. Springtails, or Collembola, are tiny, wingless arthropods that occur in the soil and leaf litter. They are important in nutrient cycling as they feed on decomposing material, but they are also prey to other animals such as spiders. She highlighted how other larger soil fauna such as termites, ants and earthworms are ecosystem engineers which contribute to nutrient recycling, generating biomass below the soil. She stressed the importance of thinking long-term, rather than short-term and bringing back natural predators to the soil so that farmers can use less pesticides. She explained that by practising conservation agriculture and increasing soil organic matter, farmers will have long-term benefits by not needing to use as much pesticides and fertilizers. Conservation agriculture is a method used in crop production where soil disturbance is reduced by reducing tillage, while crop rotation and the use of cover crops increase soil organic matter and increases the diversity of soil animals. Dr Janion-Scheepers said that although conservation agriculture is more widely practised the Western Cape than in other provinces, more needs to be done to increase awareness of soil conservation. Dr Janion-Scheepers and Mr Nkadimeng also met with collaborators at the Western Cape Government's Research Farm near Malmesbury (Langgewens) to see the positive benefits of practising conservation agriculture.

Collembola—aka Springtail

Tseke grew up on a farm in a rural area, where 66% of the food came from the yard – however now that figure has dropped to 10%. Having seen that lots was happening in Europe around the issues of soil degradation, Tseke was impatient for change to happen in South Africa, and taking inspiration from the culture of activism and the Freedom Charter in this country, he decided to become an activist in this critical issue and through making personal sacrifices in the 250 days of walking 10 000km, to be a catalyst of turning the tide for the wellbeing of our society and future generations.

His daily activities, together with his backup team, include waking up at 2am, practising yoga, starting walking at 5am to cover approximately 40 to 50km per day and then meeting with farmers, students in schools, community leaders, etc – thereby creating a community of leaders talking about soil and championing policy changes to save our soil.

Professor Farrant to send resurrection plants to the moon

Unique plants that can 'come back from the dead' and survive extreme weather conditions might be the key to growing crops in space.

Plants growing on the moon. Photo: The MediaLine

Known as resurrection plants, these rare organisms can survive without water for months or even years on end, depending on the species, and might prove to be ideal candidates for space travel. In 2019, the privately owned company SPACEIL launched Beresheet 1 lander to the moon. It could not land, but they decided to launch another one, Beresheet 2, by the end 2024/early 2025. They offered a free payload to any group who could suggest a meaningful and realistic project. **Professor Jill Farrant** is part of Lunaria One, a group of international biologists, space scientists and other experts who proposed a project to observe seed germination and resurrection plant "resurrection" on the surface of the moon. See ALEPH-1 (lunaria.one).

Prof Farrant is the only South African involved and has invited her team to play a role. The team, which includes scientists from Israel, Australia, and South Africa, is currently testing to know exactly which species of plants can not only survive but also thrive on the moon as part of SpaceIL's Beresheet2 mission The group was chosen not only because of the potential reality of their mission (desiccated organisms, that are alive, will best survive the extreme conditions in space) but because of their extensive education program to all on earth. All data will be immediately available to anyone interested and every person can view germination/resurrection on the moon live, through computers and other devices they will be handing out for free.

Professor Farrant has chosen the most iconic of all resurrection plants to be sent to the moon— *Myrothamnus flabellifolia* which is an ancient woody shrub, unique to Africa, that is desiccation tolerant. "It's the only woody resurrection plant on this planet and it's ancient," Farrant explained. "The reality is that they can lose 95% of their water and stay in their dry state for years. After a rain, 12 hours later they're green and growing again." It has powerful medicinal components and is the only plant they will send to the moon with agricultural value as a tea. The seeds being sent up are not crops, as these are not as hardy as some desert seeds they will be using instead. *Myrothamnus* is also the plant that Prof Farrant has done work on as the scientific consultant for the production of the luxury cosmetic skincare range *Crema nera extrema* by Giorgio Armani. The *Myrothamnus* is a rich anti-oxidant, thirty times more powerful than Vitamin C and in the cream, stimulates the skin, breaks down toxins and regenerates the good elements for continued cell division and growth.

If successful, Aleph will be the first experiment of its kind to test growing conditions on the moon. Many years ago China attempted to grow cotton seeds inside a controlled environment on the moon but all of them died due to the harsh conditions. The upcoming mission is aimed at both preparing for possible eventual human settlements on the moon, as well as helping farmers back on Earth cope with climate change.

Myrothamnus flabellifolius foliage during wet season, Hamerkop Kloof, Magaliesberg,

Out and About in the Faculty

HOD Prof Hussein Suleman cuts the cake

Computer Science turns 50! By Prof Hussein Suleman

The birthday cake.

The Department of Computer Science at UCT quietly turned 50 years old in 2020, while UCT and the rest of the world grappled with pandemic-related uncertainties. All ideas to celebrate this milestone were put on hold and, in 2022, as UCT went back to the classroom, a small celebration was held as part of the 2022 School of IT Showcase. Attendees enjoyed portions of an almost too realistic ceremonial cake in the shape of the original IBM PC computer from the 1980s. This computer was a turning point in the development of computing, when desktop computers became widely available to homes and businesses and when universities like UCT were first able to set up computer laboratories with individual computers at each desk.

The Department of Computer Science was established as a separate entity by Prof P G Parkyn in 1970, emerging from its roots in the Mathematical Sciences. In 1970, the first Computer Science 1 course was run and there were 14 student enrolments in total across all courses. This has grown over the years to approximately 1200 first year students in 2022, and approximately 250 students majoring in Computer Science in the 3rd year. Our flagship postgraduate programmes attract students from around the continent, growing from around 19 Honours students in 2000 to 62 in 2020, and from 4 PhD students in 2000 to 24 in 2020.

A modest staff complement of 1 (and a tutor) in 1970 grew to approximately 7 by the end of the 1980s. In the 1980s and 1990s, Computer Science exploded as a discipline around the world with the emergence of the Internet and substantial improvements in computer hardware, and a new generation of academics trained in various specializations in Computer Science arrived at UCT. In 2022, there are 15 academic staff in Computer Science, spanning a wide range of research areas, including AI and machine learning, visual computing, data- and human-centric systems, computer networks, computational science, CS education and ICT for Development. Given the trajectory and recent trends and interest, the discipline and department show no signs of slowing down for the 50 years ahead!

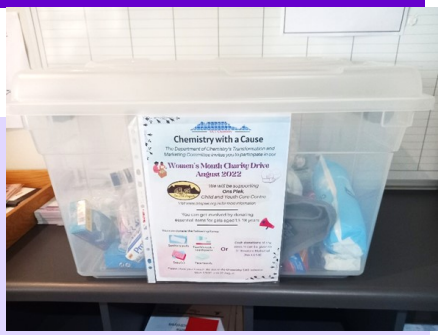
School of IT Showcase 2022

The School of IT held its annual Showcase of student research and student projects on 25 October 2022 in the Sarah Baartman Hall. This year the showcase returned to an in-person event after 2 years of it being online. Approximately 350 people attended and engaged with students and staff at the event. The event showcased the research and software development projects of third-year finalists (BCom & BSc), Honours (4th year), Masters and PhD students.

The demonstrations covered a diverse range of topics, including Artificial Intelligence, Machine Learning, Computer Games, Computer Graphics, Cyber Security, Digital Libraries, Distributed Computing, Forensics, Human-Computer Interaction, Information and Communication Technologies for Society, Blockchain, Content Management Systems as well as Applications that will add Business Value to various Organisations, specifically also NGOs, and many more.

Awards were presented to the top students at this event, and selected Honours students from Computer Science and Information Systems gave presentations on their recently-completed projects. The Showcase and awards were generously sponsored by industry partners, including: BSG, iOCO, SOLIDitech, Huawei Technologies Africa (Pty) Ltd, FNB, Electrum, Entelect, Thinkst, EY, GetSmarter, Inspired Consulting, Training and Research, KPMG and Open Box Software.

OUTREACH



Chemistry with a Cause: Ons Plek Charity Drive - September 2022

The Chemistry Transformation and Marketing Committee created **Chemistry with a Cause** - a departmental initiative that connects their department with the community and allows them the opportunity to have a positive impact on society. This initiative was launched in August 2022 and Ons Plek— the charity organisation of choice commemorated women's month. Ons Plek is a non-profit organisation based in Mowbray which provides a safe haven for girls who have lived or begged on the streets. This Child and Youth Care Centre currently houses 35 girls between the ages of 13-18 years old across two properties in Mowbray and Woodstock. They also have a one year-old baby and six year-old girl child. Their focus is to assist and help develop girls who have left home due to neglect, abuse and/or have been sent away by their families who are unable to adequately provide for them. Their programmes offer a holistic approach to help young girls cope with life events and work towards a better life.

An advert was circulated within the department inviting people to get involved by donating essential items such as toothbrushes, toothpaste, soap, face cloth and sanitary pads. A collection box was placed in the department and cash donations were also welcomed. The charity drive quickly gained momentum and was further advertised via various social media platforms through the Faculty of Science and various departmental members. Donations were collected throughout the month of August. The organisers commented, "We had initially requested for only the above-mentioned basic items to be donated and planned to box these and drop them off. However, the charity drive was exceptionally well received and everyone got involved. We were able to prepare 33 individual care packages for each of the teenage girls. Cash donations received were used to purchase any items missing from the care package to ensure that the contents of each was uniform as well as clothing for the 6 year old girl and a baby toiletry pack. First-aid supplies, pretty bracelets as well as chocolates and chips were kindly donated and the latter were added to each care pack as a snack. The chemistry department also very kindly sponsored the packaging, and additional items such as lotions, lip balms, deodorant, nappies for the baby and small bottles of juice".

During September, the initiative organisers dropped off all donated items at Ons Plek. This was very well received by the staff members on behalf of the recipients. During this visit we learnt a bit more about this organisation and how they impact the lives of others. The staff on duty, Nomandla and Elaina, shared about how fulfilling their roles are and even though there are many challenges, one of the most rewarding parts is witnessing these girls build their confidence, self-esteem and are ready to re-join society.

Dr Dalielah Jappie, Mrs Laa-iqa Rylands and Dr Roxanne Mohunlal with all the donations received for the Women's Month Charity Drive

Hand over of donated items from UCT Department of Chemistry to Ons Plek as part of Chemistry with a Cause.

The Climate Crisis: How is the UCT Science Faculty part of the solution?

Professor Maano Ramutsindela hosted a Climate Crisis panel discussion as part of the Science Faculty Dean's Dialogue talks. The dialogue brought together six expert panellists who addressed the question of how the Science Faculty at UCT is part of the solution to this problem. Some questions discussed were: What the role of a University Science Faculty is in addressing the climate crisis?; What the single most urgent scientific research question is with respect to the climate crisis?; What critical skill science undergraduates need, to be part of a solution?

Panellists (from left to right)
Dr Chris Jack, CSAG
Dr Romaric C. Odoulami, ACDI
Dr Christopher Trisos, ACDI
Prof Lesley J F Green, Director, Environmental Humanities South
Dr Sarah Fawcett, Department of Oceanography
Dr Celiwe Ngcamphalala, Department of Biological Sciences

Dr Sarah Fawcett spoke about the need for a better understanding of the ocean's role in the climate crisis and suggested that we should be teaching our undergraduate students a focus on understanding the ocean's role in climate change and what controls the productivity of the ocean. She commented that students are ill equipped to deal with the visual representation of data and suggested that lecturers enhance students capacity to interpret information. She highlighted how many of our students care and are anxious about climate change and said we should offer courses that integrate different components such as what changes mean for health, wellbeing, etc.

Professor Lesley Green asked how we build knowledge and stressed that we need to teach students to think expressively, not reductively. She commented that we have a crisis of relations, saying that our current relationship with the earth is based on extraction and deposition—evidenced in the volume of waste on our dumps. In order to focus on caring for our planet, she said we need to look at the undergraduate curriculum bringing together Bio, Geo and Social Science—focusing on habitability and partnering with earth/ planetary processes. She suggested a focus on local political earth Science, teaching students how to negotiate with local planetary processes.

Dr Chris Jack stressed the need for a strong interdisciplinary role, with the Science Faculty partnering across the university with philosophers, psychologists, economists, etc. He said we need to develop skills of engaging across disciplines, engaging with society and being humble in our knowledge, engaging with different types of knowledge and understanding problems. Critical to this is building trust and respect between disciplines. He said that we shouldn't always look to the North for solutions, but should tap into our creativity and passion to be world leaders in solving the climate crisis issues here in Africa.

Dr Celiwe Ngcamphalala asked how we have conversations with the general public, recognising that the climate crisis is everybody's business and stressed that we need to involve everyone. She highlighted how we need a large part of the population making changes and said they need to know why these changes are necessary. She said we need to talk to people on the ground, such as farmers about drought/ soil quality and recommended that at UCT we put this into practice on a smaller scale by looking at alternatives to plastic in the food courts on campus—utilising environmentally friendly packaging.

Dr Romaric Odoulami stressed the need to get out of our comfort zone and be a university that serves the community and builds community that serves **all** people. He said UCT needs to be part of the solution and answer some of the problems our society/ community faces. He commented that the university makes students specialists and doesn't always allow students to think in broad ways. He said we need to expose students to things outside the topic they chose to study—creating a space to be open-minded to see other perspectives.

Dr Christopher Trisos said that the Science Faculty needs to be a bridge building organisation, which produces trans-disciplinary research and builds relationship with different groups in our local communities. He stressed the need to be accessible to give answers. He said we need to research what effective adaptation looks like and said that it is a priority for undergraduates to be part of the solution—building climate change literacy and connecting what students are studying with climate change is critical.

Generous donations boost Biological Sciences' rebuilding efforts

After the devastating losses in the fire that swept across UCT's upper campus last year, the Department of Biological Sciences has received a donation of €1 million (approximately R17 million) from the Hasso Plattner Foundation to assist with its recovery efforts. When the Hasso Plattner Foundation committed to donating €500 000 to the department, Dr Kristina Plattner – a permanent member of the Foundation Council and a UCT alumnus – matched the amount with an additional €500 000 from her personal fund, making up the €1 million.
The donation came as a pleasant surprise to the head of the department, Professor Tony Verboom, and his colleagues, who had compiled and submitted the proposal for funding in July 2021. "Seeing the damage the fire caused to the university last year was devastating," said Dr Plattner. "As an alumnus myself, UCT is very close to my heart; especially the Biological [Sciences] department as I did my undergrad there."

The Biological Sciences department was quite badly affected by the fire on campus last year," explained Professor Verboom. "We've experienced a groundswell of sympathy from the outside with various generous donations." Starting in the vicinity of Rhodes Memorial on the morning of 18 April 2021, the fire rapidly spread towards UCT's upper campus. Airborne embers ignited various strands of vegetation, including a large palm tree neighbouring the HW Pearson building, which houses parts of the Department of Biological Sciences. Eight offices, the common room and the computer lab were gutted by the fire. Worst of all, however, was the destruction of irreplaceable historical photographic collections and other unique long-term data sets.

Putting the magnitude of this kind of loss in context, Verboom used the example of the partial destruction of the Berlin Herbarium during the Second World War. To this day, there is still uncertainty about which plants certain names refer to, since their anchor samples were destroyed during the Bombing of Berlin. "The fire on campus made us realise how important it is to get all our specimens digitised, imaged and databased," he said.

Rebuilding

The digitisation of the department's herbarium and various other collections is also aligned with what the Hasso Plattner Foundation hopes will be achieved with their donation. "We hope that our donation will [be] put towards securing the collection by digitisation and creation of a virtual herbarium, as well as towards the restoration/upgrading of the physical infrastructure," said Plattner. "It would mean a lot to the foundation if the funds help the [Department of Biological Sciences] move forward with their scientific research in the unique Cape Floral Kingdom as well as their teaching work."

LAST LAUGH....