

Science Matters

Science Faculty Newsletter



Message from the Deam



We all welcomed the lifting of the National State of Disaster in April 2022. This came after some uncertainties and the challenges of limits to venue capacity at the beginning of the first semester of 2022.

The return to face-to-face teaching rekindled our joy of teaching and research. I am pleased that the first semester was concluded smoothly.

We also had two graduation ceremonies in person. We conferred the degree of Master of Science, in Mathematical Sciences to 11 candidates. We also conferred Doctoral degrees at the graduation ceremony held on 22 July. The high-

light of this ceremony was the award of the honorary degree to Dr Robert Adam for his outstanding achievement in the advancement of science in South Africa. His contribution to science, policy, and management speaks volume to the role of science in society but also challenges us to provide service to our communities, the country, and the world beyond the time we spend in laboratories, field sites, and lecture theatres! What is the role and place of scientists in our dynamic world?

In this issue we recognize the outstanding work of our students and academic staff, who continue to hold the flag of our faculty high. Our postgraduate students are rising stars in their field, and thanks to the supervisors who guide them. Our academic staff continue to do cutting-edge and impactful research in their various disciplines. We celebrate our new NRF A-rated researchers Professors **Tommie Meyer** (Computer Science) and the late **Timothy Egan**

(Chemistry) and all those who have retained or improved their NRF rating in the Faculty of Science. Of course, excellence in research and the standing of scholars in their fields are also recognized through other awards that are reported in this newsletter.

I hope this newsletter will inform and also inspire us to do more for our faculty and UCT!

Best Wishes

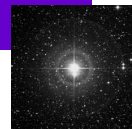
Maano Ramutsindela

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.

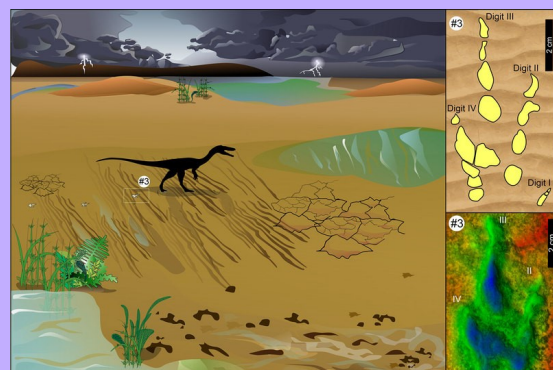


Our Science Stars:

Outstanding Article Award for research paper on African dinosaur footprints for Associate Prof Emese Bordy

A research paper authored by **Associate Professor Emese Bordy**, from the Department of Geological Sciences, which carefully studies a trackway made by a tiny, agile dinosaur almost 200 million years ago, offers an “evocative” reading of a time long ago.

“[Darting towards storm shelter: a minute dinosaur trackway from southern Africa](#)” makes for a captivating read. For her exceptional work on this paper, Associate Professor Bordy has received the 2021 Outstanding Article Award from the *South African Journal of Science* (SAJS).



The paper was originally published on the SAJS platform in May 2021, and in March this year Bordy was informed that she was named the recipient of the award. The award recognises outstanding work by African academics who seek to advance the SAJS’s mission: to publish high-quality research from the African continent or on African-relevant issues that are of interest to readers across disciplines, makes an important contribution to general knowledge and benefits academics, educators and the general public.

Bordy, a professor in sedimentology in the Department of Geological Sciences, said her research revealed that about 195 million years ago – during the Early Jurassic period, a tiny dinosaur raced across a muddy environment near Nqanqarhu in the Eastern Cape, at an estimated running speed of 12.5 km/h. “We don’t know whether this bipedal carnivore was avoiding being eaten, chasing its own meal or darting across the landscape for another reason. But we do know – based on the tracks themselves – that it was running very fast,” Bordy said.

Incredibly, millions of years later, several of the dinosaur’s footprints remain intact. They form a short trackway and provide an exciting snapshot into the animal’s behaviour and the ground on which it ran. Judging by the tracks’ characteristics, Bordy said the footprints are likely those of a coelophysoid dinosaur, which mirrored the size of a large rooster or a turkey. And when it dashed across the landscape, the carnivore ran through a pool of stagnant water. “Wrinkles in the rock around each fossil footprint provide evidence of microbial mats – a common feature of fossil footprints throughout southern Africa, and something that might have enhanced the tracks’ preservation,” she said. The dinosaur’s footprints were located on the surface of a sandstone and show four claw impressions. But when she inspected the tracks closely, Bordy said it was evident that the dinosaur put most of its weight on just three of its toes.



UCT’s Kelly Chibale listed among Africa’s top 25 public health leaders

Professor Kelly Chibale has been named among *Harvard Public Health Magazine’s* top 25 public health leaders in Africa. These “standout voices” include scientists, public health advocates and policy experts.

Chibale says “although it is a personal accolade for which I am grateful, it is a team accolade. The team comprises all H3D staff and postdoctoral research fellows as well as our various research and funding partners – past and present. I am blessed to be the ‘vuvuzela’ of this team; I am privileged to lead”.

Further to the antimalarial drug his team developed and which is in human clinical trials, in the pipeline, he is very excited about what they are doing in the use of artificial intelligence and machine learning tools towards improving treatment outcomes in African patients through a combination of optimising dosages of medicines and stratifying patients for designed clinical trials. Watch this space for news on this front soon!

Professor Kevin Naidoo elected to World Association for Computational and Theoretical Chemists board

Computational Chemistry is not only core to the research and development of new drugs and devices, but fundamental in the engineering and design of new materials.



The World Association for Computational and Theoretical Chemists (WATOC) is guided by a board of scientists elected from world research leaders in the field. Amongst the WATOC board's roles are the selection of outstanding theoretical and computational chemists for the award of the Dirac and Schrödinger Medals each year. The latter awards are the most prestigious in the field of Computational Chemistry. Our very own SARChi chair of Scientific Computing, **Prof Kevin Naidoo** in the Department of Chemistry was elected to the WATOC board at its triennial congress held on July 1st in Vancouver, Canada. The World Association of Theoretical and Computational Chemists is a scholarly association founded in 1982 to encourage the development and application of theoretical methods in chemistry, particularly theoretical chemistry, and computational chemistry. It is indeed a significant achievement to have the quality of one's work recognized by international peers playing a leading role in a field. We congratulate Prof. Naidoo on this honour and take this as a celebratory moment for the department of chemistry and for scientists working on the African continent.



Professor Jill Farrant receives Humboldt Foundation Georg Forster Award

Congratulations to **Professor Jill Farrant**, from the Department of Molecular & Cell Biology, who was recently awarded the Humboldt Foundation Georg Forster Award.

This award is given to internationally renowned academics from developing and transition countries in recognition of their entire academic record to date. It is awarded to

academics whose fundamental discoveries, new theories, or insights have had a significant impact on their own discipline and beyond and who are expected to continue developing research-based solutions to the specific challenges facing transition and developing countries. Late last year Prof Farrant was approached by Prof Ute Vorthknecht, chair of Plant Cell Biology at the University of Bonn, Germany, who had heard about her research and wanted to nominate her for the award and in so doing, develop a collaboration of benefit to both of their research aims. Her current research portfolio includes projects on 'Water use efficiency and drought stress responses – from *Arabidopsis* to Barley', a DAAD funded project on 'JAR1-mediated JA-Ile accumulation: a mechanism towards drought stress resistance in *Arabidopsis thaliana*' and she is part of a large EU consortium, ADAPT - *Accelerated Development of multiple-stress tolerAnt PoTato*, funded under the call H2020-SFS-2018-2020 -Sustainable Food Security. As part of the nomination process, they had to develop a project to be funded if she won the award. The synergies between their research interests meant they focused on hormonal signalling and associated genetic responses of a range plants (select crops, orphan crops and resurrection plants) to various drought intensities, which they hope will ultimately inform ways to better prime crops for survival of extreme and prolonged drought.

The award comes with funding to not only do this work, but send a South African PhD student to Europe for 6 month of training at Bonn University under the supervision of Prof Vothknecht. In turn, Prof Farrant will host her students to experience work on resurrection plants in Africa. Farrant explains, "To me personally, this is the greatest thing about this award. I have always strived to send my students abroad for training on equipment and from experts in their respective disciplines (5 PhD students date). In turn, I have opened my lab to any brave soul who wants to spend time with my group at part of their higher degrees (4 PhD, 6 MSc and numerous graduate students trained). Embedded within this initiative is not only to train students, but to expose them to different research cultures and ethos and to encourage collaboration across the world".

In addition to student training, Prof Farrant's responsibilities will be to visit University of Bonn in early 2023 to initiate research and go on a lecture tour to several places in Germany to meet with other colleagues to discuss potential collaborations. In December 2023 she will speak a joint conference of the two Horizon2020 Sustainable Food Security projects, ADAPT and CAPITALIZE (Working with Nature to improve Crops).

Biopharming Unit— Innovation Award finalists for this year's 'Science Oscars'

In recognition of their outstanding research and innovative contributions to science, engineering and technology, the Biopharming Research Unit was selected as finalists for the 2021/2022 NSTF-South32 Awards, for their work on developing cost-effective vaccines



The Biopharming Research Unit (BRU), led by **Professor Edward Rybicki** in the Department of Molecular and Cell Biology, was established in 2013. Its research themes cover areas related to social well-being, such as agriculture, human health and vaccine production with a special focus on preventing outbreaks of zoonotic diseases. One of its objectives is to produce high-value proteins from plants for use in human and animal vaccine production. They have a notable portfolio of 13 patent families in the international biomedical space. This brings considerable income to the country through licencing and was the basis of the creation of Cape Bio Pharms Ltd. The future of BRU innovation is promising with advancements in vaccines for cervical cancer, HIV, SARS-CoV-2 and other viruses on the horizon.



Local astronomers celebrated for their contribution to the field by African Network of Women in Astronomy.

In what often reflects as a male-dominated space, two women were earlier this year recognised for their contributions towards astronomy in Africa. The award celebrated the women for their contribution to society through the promotion

of women in science and their contributions to the global community of astronomy through their research. The inaugural awards of the African Network of Women in Astronomy (AfNWA) aimed to highlight and celebrate the scientific achievements of **Professor Renée Kraan-Korteweg**, from the Department of Astronomy at UCT, and **Dr Marie Korsaga**, who studied at UCT is considered Burkina Faso's first woman astronomer.

Prof Kraan-Korteweg, who held the chair of astronomy at UCT, and was head of department for 10 years, said that her love for astronomy was nurtured through her father. "As a child I was always interested in science, I in particular loved mathematics and chemistry, and as a young girl they rather wanted my to learn about cooking, housekeeping, but I insisted that I could also take the algebra classes that were only offered to boys. My love for astronomy came later and was nurtured through my father. He was a navigator on airplanes. When I was about 16, he took undergraduate courses in astronomy in between his long flights. When I joined him in one of the lectures, that is when I knew that I wanted to study astronomy," said Korteweg

Along with her extensive experience and knowledge, Korteweg remains active in research and continues dedicated her time to nurture female students in the astronomy department. "Despite all these activities in building up astronomy over the last years, I have remained active in research, dedicated to the large-scale distribution of galaxies, the Zone of Avoidance, HI-surveys, cosmic flow fields, and galaxy evolution. I have involved many students in these varied research projects. I attract a lot of female students to my research, as well as to the astronomy department. This may have been influenced by the fact that I was the only female head of department in the STEM fields of the UCT science faculty, and had an open-door policy. I have kept mentoring many of my former students, in particular women and students from disadvantaged backgrounds who generally do not have the support structures they need," said Korteweg.

Vanessa McBride from AfNWA said that in the last decade, there had been tremendous growth in astronomy across Africa, with investments in astronomy research infrastructure, as well as in the people needed to perform and support astronomy research. "Prof Kraan-Korteweg has contributed to this by training local researchers, bringing international expertise to South Africa and promoting women in astronomy. Dr Korsaga is an embodiment of this growth of astronomy on the continent. She is the first Burkinabe woman to obtain a PhD in astronomy, and she is using her position to inspire and pave the way for women in Africa in astronomy. From our point of view in the AfNWA, this year's awards celebrate the fact that women from Africa have been using state-of-the-art research infrastructures, based in Africa, to do cutting-edge research on the global astronomy stage. Not only that, but the nominees are using their influence grow a stronger, and more equal, astronomy research community on the African continent," said McBride.

Prestigious award for lifetime contribution to ornithology in southern Africa awarded to Professor Peter Ryan

Professor Peter Ryan, Director of FitzPatrick Institute, in the Department of Biological Sciences was recently awarded the Gill Memorial Medal. This is BirdLife South Africa's most prestigious award for outstanding lifetime contributions to ornithology in southern Africa. This is a fitting and well deserved recognition of the fine work Peter has done throughout his career in avian biology and conservation. The citation mentions important contributions he has made to the fields of seabird ecology, marine plastic pollution and its impacts on seabirds, mitigation of seabird bycatch by fisheries, and evolution in oceanic island birds. It further highlights among many valuable contributions to African ornithology and conservation being his founding leadership of the FitzPatrick Institute's MSc course in Conservation Biology, which he ran for 22 years and which helped to train and launch the careers of hundreds of African scientists, alongside hundreds from elsewhere in the world.



STUDENTS IN THE NEWS:



Mbithe Nzomo awarded Generation Google Scholarship for women in Computer Science

Mbithe Nzomo, a second-year PhD student in the Adaptive and Cognitive Systems Lab, was recently awarded the Generation Google Scholarship for women in Computer Science. She is one of 36 students from Europe, Middle East, and Africa to receive the scholarship this year, and joins a community of over 2,800 Google scholarship recipients. The prestigious and competitive scholarship recognizes students who have demonstrated a passion for technology, academic excellence, and have proven themselves as exceptional leaders and role models. Mbithe's research is in the field of Artificial Intelligence (AI) explores the integration of data-based (e.g. machine learning) and knowledge-based (e.g. ontologies) AI in an intelligent agent for health monitoring using sensors.

Mbithe was born and raised in Nairobi, Kenya and spent the first few years of her career working as a software engineer and also had a brief stint in technology consulting. Prior to her PhD, she earned an MSc in Advanced Computer Science (with distinction) from the University of Manchester, where she was a Chevening Scholar. Mbithe is also a member of the Hasso Plattner Institute (HPI) Research School at UCT.

The editor asked Mbithe some questions about her journey so far and how this scholarship will impact her.

- What does winning this scholarship mean to you and how it will impact your path ahead?

MN: I was incredibly honoured and excited to win this scholarship. It is validating to be recognized as a potential leader in my field by a renowned technology company. As a PhD student, additional funding is always a good thing as I now have the means to travel to attend more research events like conferences and summer schools, and buy more research tools, both software and hardware, than I otherwise would have..

- What excites/ interests you about your field of study?

MN: AI is a very dynamic and fast-paced field. For example, state-of-the-art machine learning models from only a couple of years ago, are significantly outperformed by what is being built today. There's also a huge opportunity for impact across many different domains, from healthcare to agriculture to music and art.

- What are the highlights and challenges of your PhD?

MN: My supervisor, Prof. Deshen Moodley, is fantastic, and I have wonderful colleagues in the Adaptive and Cognitive Systems Lab. I enjoy the fact that I'm constantly learning and improving both my technical skills and soft skills. A challenge that I'm still getting used to is the unstructured and unpredictable nature of research. Doing a PhD can sometimes feel like being in uncharted territory, which is both exciting and nerve-racking. I came across a quote some time ago that made me laugh out loud because of how relatable it was: "no research plan survives first contact with reality!"

PhD candidate among rising stars to attend 71st Lindau Nobel Laureate Meeting

Athi Welsh's research is at the interface of bioorganometallic chemistry and cell biology and his work aids bridging the gap between medical chemists and biologists. Athi is pursuing the third year of his PhD in UCT's Department of Chemistry. His research, which focuses primarily on organometallic chemistry – the study of compounds that contain a covalent bond between a carbon atom and a metal – is in a class of its own. At the heart of his work in the chemistry research lab, located in the PD Hahn building on UCT's upper campus, are the platinum group metals (platinum, palladium, rhodium, ruthenium, iridium and osmium). His research, he explained, focuses on studying how to incorporate these platinum group metals onto organic scaffolds (the structure or framework of a molecule) and exploring how its subsequent organometallic complexes can be used to treat cancer.



In recognition of this work, Welsh was selected to attend the 71st Lindau Nobel Laureate Meeting in Germany during July. The event provides a globally recognised forum for exchange between Nobel Prize laureates and young up-and-coming scientists around the world, with the aim of building an international exchange of knowledge between nations, cultures and disciplines. Owing to his unparalleled research, the African Academy of Sciences nominated Welsh to attend the Lindau Nobel Laureate Meeting. After a long, thorough selection process, he received word that he was selected as one of 600 up-and-coming scientists from around the world to attend the prestigious event. .

Young achiever and MSc candidate Kialan Pillay heads for Oxford

Science Faculty graduate **Kialan Pillay** broke some records when he graduated in computer science and mathematical statistics at 19 and got his honours degree in computer science (cum laude) at just 20, both first-class. With invitations to pursue a master's in computer science degree at Imperial College London, Oxford and Cambridge universities, Kialan was spoilt for choice. But it's Oxford he's opted for.



UCT graduate awarded prestigious Gates Cambridge scholarship for 2022

UCT Science faculty graduate, **Sanjiv Ranchod** has been awarded the 2022 Gates Cambridge scholarship – considered one of the world's most prestigious scholarships. The scholarship focuses on academic excellence and is highly competitive. Applicants need to show leadership capacity and a commitment to improving the lives of others.

The Gates Cambridge Class of 2022 is made up of 79 outstanding new scholars. The scholarship programme is the University of Cambridge's flagship international postgraduate scholarship programme. In addition to generous funding to do their research, with no age limit on candidates, scholars will benefit from the strong sense of community and identity that has been forged by their predecessors and an absolute commitment to improving the lives of others. Ranchod who is currently pursuing his masters in the Department of Mathematics and Applied Mathematics at UCT before joining the Gates Cambridge Class for his PhD shared: "I am incredibly excited for the chance to continue my academic journey at the University of Cambridge. As a member of the Gates Cambridge class of 2022, I hope to engage with an international cohort of academically and educationally interested students with diverse backgrounds and am grateful to the Gates Cambridge for this opportunity. I am greatly in debt to UCT, which has provided the necessary support throughout my mathematical studies, with particular mention to my supervisor, Professor George Janelidze."

STAFF NEWS

WELCOME TO NEW STAFF



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

Astronomy

- **Dr Jacinta Delhaize** - Lecturer
- Professor Daniel Pisano—SARCHI Chair

Biological Sciences:

- Mr Frederick Stellenboom—Departmental Assistant

Chemistry

- **Associate Professor Clinton Veale**
- **Dr Samatha Douman**—Lecturer
- Mr Earl Delport—Laboratory Assistant
- Dr Mashikoane Mogodi—Lecturer
- Mrs Joey Paulse—Laboratory Assistant
- Dr Roxanne Mohunlal—Chief Scientific Officer
- Mr Molefi Makuebu—Senior Technical Officer

Environmental & Geographical Science

- **Mrs Sarika Govender**—Training Coordinator
- Ms Mathilda van Niekerk—Junior Research Fellow

H3D Drug Discovery & Development

- **Dr Robin Klintworth**—Research Scientist
- **Dr Mziyanda Mbaba**—Research Scientist
- **Dr Mwila Mulubwa**—Investigator
- **Dr Ayanda Zulu**—Research Scientist
- **Dr Keabetswe Masike**—Investigator
- **Dr Rudy Cozett**—Investigator
- **Mrs Takalani Raphala**—Research Scientist
- **Mr Ronewa Tshinavhe**—Research Scientist
- **Mrs Raygaana Jacobs**—Senior Research Scientist
- **Ms Kim Jackson**—Research Scientist

Molecular & Cell Biology:

- **Mr Nksoxolo Tobi**—Departmental Assistant
- **Ms Imaan Shaik**—Departmental Assistant
- **Mr Uthmaan Zardad**—Senior Technical Officer

Physics

- **Dr Mawande Lushozi** - Lecturer

FAREWELL TO STAFF

The Faculty said goodbye to the following staff:

Astronomy

- Dr Joseph Bochenek

Biological Science

- Boitumelo Marope

Chemistry

- Dr Ncamiso Khanyile

Environmental & Geographical Science

- Ms Kate Kloppers

Physics

- Dr Katie Cole

H3D Drug Discovery & Development

- Dr Andani Mulelu
- Dr Gregory Basarab
- Mrs Elaine Rutherford-Jones
- Mrs Sumaya Salie



NEW IN THE FACULTY

Attom set to revolutionise geochemistry research

A R7.9 million mass spectrometer, funded by the national Department of Science and Innovation (DSI), has recently been installed in a Geological Sciences laboratory and will serve as a national facility for researchers in South Africa and Africa. This machine specialises in measuring variants of individual elements with great speed and precision and is the first of its kind in Africa.



More compact and significantly faster than its older, larger predecessors, the aptly named Attom can measure concentrations of elements with amazing speed and precision, according to **Dr Robyn Pickering**, who oversaw its installation at the beginning of June. A specialist piece of scientific equipment, a mass spectrometer can identify tiny differences between various types of elements. “Not all the atoms of a particular element have the same mass and we can tell a lot about how a rock formed, how old it is, or even say what an extinct fossil animal was eating by counting up the number of normal and different atoms (known as isotopes) of an element,” said Dr Pickering.

While the most well-known example of a mass spectrometer’s use is radiocarbon dating, Pickering said the new machine will focus on uranium lead dating. This is a similar concept but facilitates the dating of much older things, mainly rocks and minerals, that are millions of years old. Pickering explained that while the new machine does similar analyses to the existing mass spectrometers, it does so at a higher resolution and is able to precisely identify more elements in less time. As a bonus, the newer machine is also easier to run. Comparing the technologies, she used the analogy of smart phones versus older cell phones. “Both can make calls, but a smart phone can do a great deal more in less time,” she said.

New biogeochemistry lab: Shift ‘centre of gravity’ to Africa



Principal investigators Dr Katye Altieri (left) and Dr Sarah Fawcett with the new denitrifier-isotope ratio mass spectrometer (IRMS), housed in the recently built biogeochemistry laboratory in the Department of Oceanography.

UCT’s new [Marine Biogeochemistry Laboratory \(UCT-MBL\)](#) is set to escalate high-impact Earth science research that maximises South Africa’s geographical advantage. The lab uses a unique method to study nitrogen cycles, critical to understanding how the oceans, land and the atmosphere work. This is also essential to climate change studies.

Biogeochemistry is an interdisciplinary field that studies how biological, geological, chemical and physical processes interact to shape natural environments over time and space. But it needs high-precision data and measurements of a huge range of inorganic and organic chemical components, capacity South Africa has not always had – at least not in the marine sciences.

The lab’s unique method involves lowly bacteria as a route to characterising nitrogen cycles. This relies on the lab’s crown jewel: the new denitrifier-isotope ratio mass spectrometer (IRMS). It’s housed among a suite of high-tech, cutting-edge equipment in a vibration-proof, climate-controlled room in the Department of Oceanography. “It’s the global standard for high-resolution nitrogen-cycle studies, and the UCT-MBL is the only African lab that has the denitrifier-IRMS. It’s good news for the continent,” said principal investigator (PI) **Dr Sarah Fawcett**. Dr Fawcett’s co-PI is **Dr Katye Altieri**.

The lab will underpin large- and small-scale research questions in Earth science. It is founded on the philosophy that increasingly innovative techniques are needed to address local and global research questions. This underscores UCT’s Vision 2030 with its pillars of excellence, transformation and sustainability. The facility will also create future wealth for the university and continent, training the next generation of South African Earth scientists and boosting African expertise, collaboration and teaching. The lab has a big training agenda, said Fawcett.

Satellite centre to fast-track new antibiotics discovery as drug resistance rises



H3D scientists take their J&J counterparts on a tour of their Cape Town laboratory.

Our world needs new antibiotics and the newly launched **Johnson & Johnson Satellite Centre for Global Health Discovery at the UCT Holistic Drug Development Centre (H3D)** hopes to fast track the discovery and development of new antibiotics to curb rising antimicrobial resistance (AMR), which has rendered once effective drugs useless. Bacterial AMR caused an estimated 1.5 million deaths in 2020, and if not addressed is likely to precipitate future pandemics potentially worse than COVID-19. The new centre is the first of its kind in Africa and the centre aims to advance discovery research and development in South Africa. The time to act is now, said the UCT's **Professor Kelly Chibale**, who leads the new centre.

The UCT-based facility was launched on 25 April 2022 and is Johnson & Johnson's (J&J) second satellite centre. The first was launched in 2021 at the [London School of Hygiene & Tropical Medicine](#). The new development harnesses the resources of J&J, the world's largest healthcare company and the technical expertise and talent of the H3D, Africa's first drug discovery and development institution. The J&J satellite centre at H3D will now focus on developing precision antibiotics to treat multidrug-resistant Gram-negative bacteria (MDR-GNB).

"It is a no-brainer that we build capabilities in discovery and development in close proximity to where the patient is; it is critical because we know that there is a relationship between the genetics of a population, the socioeconomic environment and the physical environment in which patients live, and effective treatment outcomes," said Chibale at the launch.

J&J's Dr Ruxandra Draghia-Akli said that "investing to increase the capacity of the innovation ecosystem in Africa is critical to strengthening the research and development (R&D) pipeline for entrenched and emerging global health challenges. By leveraging the unique strengths of H3D and the J&J Centers, we can cultivate the talent and capacity needed to drive innovation in the global fight against AMR". Draghia-Akli is head of Global Public Health R&D at J&J's Janssen Research & Development.



H3D and J&J scientists meet at H3D facilities at UCT to discuss project goals

New 'Humanity' exhibition reframing 'origins' story set up by Human Evolution Research Institute

The Human Evolution Research Institute (HERI) at the University of Cape Town (UCT) and Iziko Museums of South Africa are creating a new permanent exhibition, *Humanity*, which retells the story of evolution and human origins – without the colonial paleoanthropological lens. UCT's **Professor Rebecca Ackermann** from the Department of Archaeology and member of HERI, spoke with UCT News ahead of International Museum Day on 18 May.



How does an exhibition tell the story of human origins in Africa in an inclusive and non-racialised way? "The new *Humanity* exhibition, scheduled to open at Iziko Museums in 2023, will start with the word 'diversity'. It will showcase South Africa's rich archaeological and palaeoanthropological record of human evolution, but not in the way it has historically been told: as a series of remarkable discoveries by largely white men, said Professor Ackermann. "The decision with this exhibit was to side-line this telling," said Ackermann. "*Humanity* will take a very different approach, one focused on telling the story of how we came to be so diverse."

EVENTS IN FACULTY

UCT staff and students join 'successful' Liesbeek River clean-up

A massive clean-up operation along the Liesbeek River drew dozens of eager UCT staff and students, and local residents who took out their gardening tools and used a sunny Saturday morning to do their bit for the environment.

The clean-up operation is an initiative of Friends of the Liesbeek – a community-based non-profit organisation, established in 1991 and dedicated to rehabilitating, conserving and enhancing the Liesbeek River and its surrounds. The clean-up initiative, underway in the Rosebank canal section of the river, was carried out in partnership with **UCT's Future Water Institute**, the Dutch Consulate in Cape Town, the City of Cape Town and Rosebank residents.



"The Liesbeek River provides a remarkable blue-green corridor that enhances the urban environment, cools soaring urban temperatures by as much as 5°C, and improves the natural habitat that attracts nature back into the city," said **Dr Kevin Winter**, from the Department of Environmental and Geographical Science. He explained how Cape Town's water crisis a few years ago was a stark reminder that water scarcity is a real concern and that the city is highly dependent on rainfall for its water resources. "As we continue to pick up the pieces after that devastating drought, we now need to focus on how to diversify our future water supply and how best to ensure that water quality is not compromised. In the process, we are learning to value water not only for its uses, but also to appreciate the value of surface- and groundwater" he said. He described how initially, the Friends of the Liesbeek's maintenance project team started this clean-up by removing weeds and grass along the 100 m stretch of the canal. Then, residents of Rosebank and UCT staff and students volunteered their time to landscape the sediment mounds, which were left exposed by the initial weeding. He commented, "This is a perfect example of what happens when people come together to do their bit for the environment."



Volunteers also helped to set up rocky weirs to slow the water flow and to shift the water toward the edges of the canal. (see image left) This process will ensure that the soil is kept moist to plant about 1 500 palmiet reeds and other riverine species. These plants will play an important role in stabilising the riverbed and will encourage macroinvertebrates and aquatic species to develop even further.



World Water Day Paddle: a commitment to a water-sensitive city

Battling strong winds and sandbanks near its mouth, a colourful flotilla of kayaks set off to explore Zandvlei lagoon on World Water Day, 22 March. Organised by **Dr Kevin Winter** of the University of Cape Town's (UCT) Future Water Institute and co-hosts the City of Cape Town, the World Water Day Paddle highlighted pollution in the city's rivers and estuaries. It also underscored a shared commitment to address this.

The joint event was modelled on Dr Winter's annual Peninsula Paddle along the Liesbeek River. It both strengthened the Future Water Institute's research partnership with the metropole and shared a vision for a water-sensitive city. The UCT group included Winter's fellow water researchers as well as his third- and fourth-year students in the Department of Environmental and Geographical Science, all toggled out in the university's new Vision 2030-branded T-shirts and caps. Members of the City's executive included Executive Mayor Geordin Hill-Lewis, Councillor Zahid Badroodien of the Mayoral Committee for Water and Sanitation, and executive director for Water and Sanitation, Michael Webster. Among the paddling party were the Khayelitsha Canoe Club, Friends of the Liesbeek and a small group of Dutch academics with links to the City.

Like other peninsula waterways, Zandvlei carries the burden of socio-economic and environmental stressors: urbanisation, burgeoning informal settlements, land invasions, and sewage infrastructure failures and blockages. The situation must change, said Winter. If we can paddle, and even swim in our waterways, then we can safely say that Cape Town is becoming a healthy city – we are assured of its safety." "Failure to address these challenges is an unacceptable outcome. It is going to demand much better water management; improved behaviour, education and support to curtail from discharging pollutants into waterways; and a firm commitment to restore the blue and green corridors that surround our lakes and rivers.



Retreat on San Code of Ethics at !Khwatsha Ttu

Staff and students from the departments of Computer Science, Geography and Anthropology at UCT, UWC, Stellenbosch, CPUT and UNISA, attended a retreat on the San Code of Ethics at !Khwatsha Ttu.

Associate Professor Melissa Densmore from the Department of Computer Science at UCT says, "It was a unique gathering to bring together disciplines and the four Cape Town universities in the same place to discuss ethics in research – I think it was a valuable learning experience for all, and I hope we're able to continue such retreats in the future".

The workshop featured some of the authors of the San Code of Ethics (Doris Schroeder, Roger Chennells, Chris Low) and the Global Code of Conduct (of which UCT was the first university to adopt into our research code), as well as a lot of discussion on how what we learn from the San Code can be applied to research in other communities.

Research Bytes

Lockdown 2020: Birds bask on barren Muizenberg beach

Research conducted during lockdown in 2020 indicates that a large number of birds descended on Muizenberg beach to enjoy this natural habitat without any human disturbances. As humans were ordered to stay indoors to curtail the spread of COVID-19 during the early days of the pandemic in 2020, it appears that our feathery friends came out in their numbers to get their dose of vitamin sea.



A research paper titled [“Effects of COVID-19 lockdowns on shorebird assemblages in an urban South African sandy beach ecosystem”](#) has confirmed this. Authored by a team of researchers in the Department of Biological Sciences, the paper revealed that a striking number of birds descended on Muizenberg beach during lockdown Level 5 to enjoy this natural habitat without any human disturbances. The paper was published in *Scientific Reports*, a leading peer-reviewed scientific journal, last month.

According to lead author **Associate Professor Deena Pillay**, the team set off to understand how birds would respond to the sudden changes in the number of beachgoers permitted on the beach during the various stages of lockdown. “We used standardised photos of Muizenberg beach between 2019 (pre-COVID-19) and 2020 (during COVID-19 lockdowns) to quantify the relationship between human and bird numbers on the beach,” Associate Professor Pillay said. Because beaches are one of earth’s most utilised ecosystems for recreation, Pillay said that conducting this type of research would ordinarily have been quite tricky. But lockdown offered researchers a unique opportunity to get to work and answer timely and relevant questions. A barren beach was just what researchers needed and meant that Pillay and his team, which included MSc student **Jemma Lewis** and BSc honours student **Jayden Collison** (co-authors on the paper) could begin to measure just how much increasing human numbers impacted bird numbers on this urban beach.

“Without graded lockdowns it would’ve been almost impossible to generate human-free spaces and times at the scales needed to detect ecological responses. Our work sheds new light on how increasing human numbers on beaches for recreation can affect these sensitive ecosystems and key organism groups,” he said.

The outcome

The team’s findings indicated a six-fold increase in the number of birds on Muizenberg beach during lockdown Level 5 in 2020 when compared with the same period in 2019. Subsequently, as lockdown measures eased, and about 34% of beachgoers returned to their happy place on the sand and in the sea, bird numbers declined by almost 80%. With these findings, Pillay said the team achieved their goal, which was to demonstrate just how sensitive beach ecosystems are to increasing human numbers. “The potential effects of humans on beach ecosystems should not be underestimated, and neither should the value of using data.

Pillay said he hoped that the team’s findings would help people understand just how sensitive birds are to high levels of human activity on beaches. The research team hopes to use their findings in public education initiatives to help people make more informed decisions when interacting with beach ecosystems.

Communities tell their stories about water, gather valuable data

World Water Day earlier this year underscored the urgent need to add community experiences of water to the data used to manage this fragile resource in an era of climate change. A multi-sectoral project using the *SenseMaker* tool and methodology does just that, said UCT geographer and climate change adaptation researcher **Associate Professor Gina Ziervogel** from the Department of Environmental & Geographical Science.



Winner of UCT's 2020 Social Responsiveness Award, A\Prof 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. Her work on urban water resilience and social justice involves working with community activist groups such as the Western Cape Water Caucus, Environmental Management Group, and the City of Cape Town. All are key players in this multi-sectoral project to "make sense" of water. In the aftermath of [Day Zero](#) in 2018, Ziervogel's research has provided a lens on why metropolises must engage with residents to understand their water issues – data that is vital to shaping policy. This has not happened in marginalised communities, which is where most of the city's 4.2 million people live. Information on water leaks, failing infrastructure, sewage and billing problems is not being sufficiently harnessed.

But data from the web-based *SenseMaker* tool is changing this. The proprietary tool was adapted by a team of researchers including Stellenbosch University's John van Breda and Rhodes University's Luke Metelerkamp, who had both used the tool before. In the hands of citizen scientists who are community activists in the Western Cape Water Caucus, the phone-based tool uses a unique methodology to collect and collate water data from areas across the Cape Flats. This data will help to build water resilience in these communities, said Ziervogel. The second part of the *Intergovernmental Panel of Climate Change's Sixth Assessment Report (AR6): Impacts, Adaptation and Vulnerability* was released in February and Ziervogel is a lead author. "In this report, we stress that we must pay more attention to low-income areas and informal settlements. Yet so few cities have a good way of doing this, because they've tried to sideline low-income residents; because as soon as they acknowledge them, they've got to address the problem, which is really hard for cities to do. But ignore them at your peril. We must have more spaces for conversation around these tough issues across scaled levels, from neighbourhood to city level," she said.

The project is gathering momentum across communities where the communities' citizen scientists have been putting the *SenseMaker* tool to work. Community members such as the Western Cape Water Caucus's Ann October have been going door to door to do this. They ask simply framed questions: Can you tell us a story about water? What are your problems? How did you go about resolving these? Many stories were around bills and billing – a challenge because many households have water management devices that restrict the flow of water. "And these households are still getting water bills, which is confusing," said Ziervogel. Other stories concerned leaks, poorly built houses, taps that were leaking and poor sanitation – the latter clearly in evidence during a community feedback meeting in Dunoon, where sewage was running in the road outside the hall, she said.

Community responses are charted in a predictive matrix, which helps respondents analyse their own story – and their own data – at a glance. The information is then fed into the broader water project. As such, these stories are key to understanding water usage and water issues. October has excelled in her story collection; but it's hard, too, she said. "Many people come door knocking, and they come with stories promising people are going to help; so to me, it was a learning process. And it was also painful, because you go out to do the research, and ... we see the problems of people." **Dr Johan Enqvist**, a postdoc from UCT, coordinated the *SenseMaker* component of the project. He said, "Three hundred stories have been collected and analysed from these communities, and *this* is the story that those stories tell; *this* is the message that those stories communicate."

Ziervogel added, "But it's amazing for me, as a researcher, that there is this engagement and this kind of working towards listening to different perspectives – both the community listening to the city and the city listening to the community voices."

Teaching people why oceans are important

The ocean is everyone's concern—especially with sea level rise predicted to grow one foot by 2050—which will have devastating effects according to National Geographic scientists. They say this poses a threat to coastal life around the world. As these are areas where typically large populations reside, mass displacement will ensue. **Dr Moagabo Ragoasha** had never heard of oceanography before she came to UCT. The Limpopo matriculant had been set to study astrophysics. But a small error on her registration form changed the course of her life. Now a PhD in oceanography, the scientist talked about the significance of her work and its links to her second calling – a traditional diviner-healer, or sangoma. Public engagement is vital to understanding the complex web of life that is dependent on the oceans. And teachers must be taught how to teach ocean literacy at schools across the country. She says that the best starting point in addressing some of these concerns is teaching ocean literacy. She comments, “we must teach people why oceans are important, even if they live inland, far from the seas. We must explain the connections to climate, drought and rain and how that affects them—wherever they are”



In 2020, the same year she defended her PhD, she was called to continue a family cultural and spiritual responsibility as a traditional healer. This calling is passed on through the ancestral lineage to keep these traditions alive. Her family remembered that her great grandfather had been a sangoma. Accepting this calling, Ragoasha began training as an apprentice. She first became aware of her calling through revelations in dreams, one of the signs she had been chosen. “I would dream things and they would happen,” Ragoasha explained. She also discovered a significant link between her scientific work and her traditional healing work. Water spirits call the sangoma to the water, physically or in dreams, giving knowledge and gifts of healing.

To manage the twin responsibilities of her training and work as a lecturer, Ragoasha approached the head of the department, **Professor Isabelle Ansorge**. Although the first part of her sangoma training would be in Cape Town, she would have to travel to Mpumalanga for the second part. This would involve learning divination, how to use traditional healing herbs, dream interpretation, cleansing with *iyeza*, the art of beadwork, and spiritual diagnosis. She would also need to wear her traditional sangoma clothing on campus for a time after graduating.

With the department's full support, she began what at times was a bewildering journey, she said. It was often difficult to reconcile the duality of her experiences while training: the unexplained, mysterious aspects of ancestral communication and divination and her rigorous training as a hard scientist. “It was mind blowing at times,” she said. But she sees these as complementary wisdoms. In her scientific world she studies the oceans' energy, bound up in the movement of currents around the globe. And as a traditional healer, Ragoasha recognises the deep spirituality and energy embodied in the oceans, the oneness, natural systems and the need to preserve this balance.

“When we gather the traditional healing herbs, roots and barks, these are collected in ways that don't destroy the natural systems but preserve them for future generations.” With that spiritual connection to the ocean and Earth's water systems, comes a responsibility to keep water bodies healthy and alive. “That's because of the energy we get from natural resources: the sea, the rivers, mountains and caves and forests. And because that's where our ancestors were.” Ocean literacy also helps the public understand why scientists raise the roof when a multinational oil company announces plans to conduct seismic testing along the seabed off the country's southern coastline. “It's important they know the implications of the damage of seismic testing can do. And it can't be contained to the area surveyed. The ocean has no barriers.”

Climate change could wipe out southern yellow-billed hornbills in the Kalahari Desert by 2027

A UCT study set out to investigate the effect of climate change on the breeding success of southern yellow-billed hornbills in the Kalahari Desert found that they could be wiped out by 2027.



The study found that the breeding success of the hornbills collapsed over a decade-long monitoring period (2008 – 2019), corresponding with rapid warming due to climate change. During the monitoring period, sub-lethal effects of high temperatures, including compromised foraging, provisioning, and body mass maintenance, reduced the chance of hornbills breeding successfully or even breeding at all. “These temperature effects occurred even in good rainfall years,” said **Nicholas Pattinson**, a researcher at UCT’s FitzPatrick Institute of African Ornithology. “While drought did negatively affect breeding success, our findings suggested that the rapid warming in the region was responsible for the collapse in breeding success: temperatures have been rising but drought return rates have remained stable in this area.”

The hornbills have an incredible breeding strategy, whereby the female actually seals herself inside the nest and moults all of her flight feathers. This strategy helps them avoid predation, and while it is common to many hornbills, it is a truly remarkable method of breeding. Writing in the *Frontiers in Ecology and Evolution* journal, Pattinson said the study supports the proposition that even in the absence of large-scale mortality events associated with heat waves, cumulative sub-lethal consequences of increasing temperatures can and will likely cause population declines and even local extinctions.

Pattinson and his colleagues were surprised by how rapid climate warming acted so quickly on the breeding success of the hornbills. “Within just a single decade we see a collapse in breeding success, correlating to the warming in the region and related to the inability of the hornbills to breed successfully at high temperatures. The most surprising thing is the finding that the hornbills, as we were monitoring, were fighting extirpation,” he said. Commenting on the findings, Pattinson said there is rapidly growing evidence for the negative effects of high temperatures on the behaviour, physiology, breeding and survival of various bird, mammal, and reptile species around the world. “Heat-related mass die-off events over the period of a few days are increasingly being recorded, which no doubt pose a threat to population persistence and ecosystem function,” he said.

A team of researchers monitored the breeding of a population of the hornbills breeding in nest boxes at a study site in the Kalahari Desert from 2008 to 2019. They analysed the breeding success at the scale of entire breeding seasons and individual breeding attempts within seasons and correlated those with weather variables. The team also analysed South African Weather Service data for the Kalahari region to look at long term temperature and rainfall patterns to determine the onset and rate of warming due to climate change.

Out of the 118 breeding attempts the team monitored over the decade period, not a single attempt succeeded where the average air temperature during the attempt was equal to or greater than 35.7 °C. According to Pattinson, this shows a clear, dramatic negative effect of high temperatures on the breeding success of the hornbills. “Current climate change predictions make it very unlikely that hornbills will persist across the hottest parts of their range even over the next decade. However, if they are going to occur anywhere across their current distribution in the future, the temperatures will have to remain below this threshold of 35.7 °C during their breeding,” he said.

This study may be about the hornbills in the Kalahari Desert, but it is relevant to people and systems worldwide, said Pattinson.

ParentCoach: An interactive chatbot for first-time parents

Associate Professor Melissa Densmore, from the Department of Computer Science has received a grant to codesign chatbots for maternal health in South Africa and Portugal. Aiming to support first-time parents who otherwise lack the experience or support for this daring time, the ParentCoach project consists of an interactive chatbot that will provide accurate - easy-to-understand - information, giving the necessary support in postnatal healthcare. The goal is to avoid bigger health problems or complications in the future.



The ParentCoach project kicked-off in the beginning of the year and aims to democratize access to neonatal information. Starting from a previous chatbot – Aurora - designed for Portuguese parents with a focus on sleeping issues and breastfeeding, the project wants to further develop the technology, to support parents based on the previously most asked questions, while also adapting it to the South African context. This means that besides including a new range of neonatal issues, the chatbot will also have relevant information about common health risks in the South African context, such as mother-to-baby HIV transmission, poor nutrition, among others.

To adjust the chatbot to the target audience, the team will be responsible for the development of user research activities that will rely on interviews, observation sessions and participatory design sessions on both countries. The input and perspective of parents, families and healthcare professionals will help to create a digital solution that accurately answers – in the right moment – the most pressing questions from parents. Two Master's students from UCT, namely **Leina Meoli** and **Lusanda Vilane** we will be working on the project.

With a budget of over 242.000€, the project counts on the experience of Fraunhofer Portugal AICOS, Aurora Tech AI, UCT and the Wits Health Consortium to develop a decentralised digital health solution and to promote, through exchange activities and two “summer schools”, the importance of user research when developing projects of this nature.



Father and son team produce 'Explore the shore' free educational video series

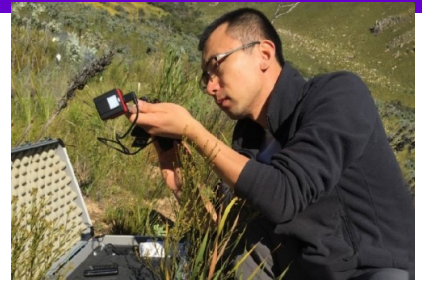
UCT marine biologist **Emeritus Professor Charles Griffiths** and his filmmaker son, Matthew, have drawn on their scientific and artistic talents to produce a series of short educational videos on the organisms and features modern-day *strandlopers* and rock poolers will commonly encounter while exploring our coastlines.

Most coastal residents have little idea of just how magical these creatures and their habitats are, said Emeritus Professor Griffiths. The [Explore the Shore YouTube series](#) features Griffiths introducing Matthew to the idiosyncrasies of the animals and seaweeds that occur along our coastline, and the wonders of their diverse habitats. Each video is a short inspirational journey of discovery for viewers, designed both to inform and to instil a love of these fascinating natural treasures that lie right on the doorsteps of many South Africans.

Each short three- to 10-minute episode provides close-up footage of and describes the unique habits of either an animal group, or some aspect of this hidden world that most of us have never realised was available on our doorsteps,” Griffiths said. The duo plan to release a new episode every second Thursday and have a list of 50 different topics to film. The resource is free to anyone who subscribes. That includes biology teachers at all levels. It’s a useful marine biology resource, especially for schools far from the coast, said Griffiths. “We are fortunate to have a sponsor who has been assisting us in covering the costs of producing the first 20 episodes, but we welcome sponsors for the next tranche of *Explore the Shore*, said Griffiths.

Fynbos puts the squeeze on trees via the thinnest roots known

Fynbos and Afrotropical Forest biomes live side by side in the Western Cape, sharing an underlying geology and climatic patterns. Each survives in very different soil, produced by the vegetation. However, the fynbos biome relies on a unique adaptation to keep trees off its turf. Scientists call the phenomenon “alternative stable states”, which underpins a new international study by the Santa Fe Institute (SFI) in the United States with UCT. The results appeared in a new paper, “Biome boundary maintained by intense belowground resource competition in world’s thinnest-rooted plant community”, published earlier this year in *Proceedings of the National Academy of Science*.



Dr Mingzhen Lu at work during his four-year manipulated experiment in the Jonkershoek valley. Photo Adam West

The lead author is SFI Omidyar Fellow Dr Mingzhen Lu. The corresponding author is Princeton University’s Professor Lars Hedin (Ecology and Evolutionary Biology Department), with UCT’s **Emeritus Professor William Bond** (Department of Biological Sciences) and several other UCT authors. The paper describes how fynbos plants are able to maintain the poor soil conditions that they are adapted to thrive in – and how the abutting forest biome ends up being so different, contributing to biodiversity, despite the same starting geology and environmental conditions. The study relied on another network, the support, technical and research team of UCT botanists and plant physiologists who were also co-authors of the paper: **Emeritus Associate Professor Ed February, Professor Michael Cramer and Professor Adam West, Associate Professor Samson Chimphango and Dr Jasper Slingsby**. “Measurements of responses required some technology: a drone with a multispectral camera and a scanner for the measurement of underground root traits,” said Bond. “These primary roots are very small – the very first produced.” “Across the world’s ecosystems, these [fynbos] roots are the thinnest of all,” Zu said. “For every 1 g of carbon – the weight of a paperclip – these plants produce roots 15 football fields longer than forest species.” Or, as Bond commented, “Imagine drilling for gold nuggets (nutrients), 15 times faster than the competition – it’s no contest!”

The study showed how alternative stable states contrast with the standard idea of plant succession, said Bond. “We now see that it is not the intrinsic soil properties, but plant feedbacks to the soil, that create misery for forest saplings.” “[Succession is] where a disturbance opens up a forest, say, pioneer species arrive and gradually re-build the forest. With alternative stable states, the disturbance opens up the forest, fynbos invades, changes the environmental conditions to suit itself at the expense of the trees, and, with repeated disturbances (such as by fire), persists where forest once grew. “The thin roots of fynbos are the belowground weapon creating miserable conditions for nutrient-demanding forest plants. We now see that it is not the intrinsic soil properties, but plant feedbacks to the soil that create nutritional misery for forest saplings.”

Compounding this, the fynbos biome is prone to frequent, hot fires that cause the destruction of accumulated nutrients in the soil, said Bond. “The nutrient-mining belowground strategy combined with very slow litter decomposition and a collective fire-adaptation allows the fynbos plant community to favour its own persistence by modifying its environment. On the other side of the biome divide, the forest is doing the converse thing.” The findings suggest that alternative stable states can be maintained through biotic mechanisms, such as root traits, in addition to the commonly understood abiotic factors like climate. This insight is critical to conserving threatened ecosystems around the world. “Roots are the foundation of biodiversity,” said Lu. This makes them especially interesting as models for dramatic change because they can switch from one state to another, said Hedin. “This is especially urgent in a world being stressed by climate change.”

Trees could invade those soils, enrich them and oust fynbos for generations to come by making them more fertile,” Bond noted. “Then again, the warmer climates could promote more extreme fires which might reverse the trend we have seen of forest expansion over the last several decades.” “The idea that plants create their own environmental conditions, rather than adapt to existing conditions, has emerged gradually from studies of open and closed (forest) ecosystems around the world. In this case, two distinct ways of living have evolved, forest and fynbos, competing with each other for the same living space.”



PhD candidate Cecilia Cerrilla (Department of Biological Sciences) measures a sandfish.

Conserving endangered Clanwilliam sandfish pool by pool by Cecilia Cerrilla, PhD Student in the Department of Biological Sciences

When I decided to take on a fully field-based PhD on the sandfish, a critically rare endangered species of freshwater fish, found only in one catchment area of the country, I knew I was taking a big risk. Six months prior to embarking on this project was the first time in recent memory that scientists had seen Clanwilliam sandfish undertaking a spawning migration. They had their suspicions that it might be an annual event, but with their distribution now whittled away to less than half what it was a century ago, there were no guarantees of witnessing the spectacle again any time soon.

There were so many unknowns. But the draws of working on a poorly known species (namely – anything we learned would almost certainly be a new discovery to science), and an endangered one at that, outweighed any risk in my book. And for my supervisor Dr Jeremy Shelton, a conservationist, photographer and storyteller eager to bring attention to sub-aquatic life in South Africa, there was no better candidate than the charismatic Clanwilliam sandfish: a large cyprinid that can grow to half a meter in length, and which sports a prominent 'onderbek' or 'under-mouth' that supports its benthic feeding habit.



Plump adult Clanwilliam sandfish migrating up the Biedouw River to spawn at the end of the winter high-flow season. Photograph by Dr Jeremy Shelton.



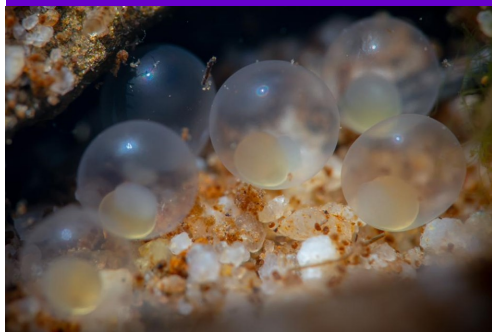
A school of adult sandfish resting in a Biedouw River pool during the spawning migration of 2021. Photograph by Dr Jeremy Shelton.



A spawning aggregation of adult sandfish at dusk in the Biedouw River. Photograph by Dr Jeremy Shelton.

I arrived in the Biedouw Valley for my first field trip in early August 2021 at the start of the kaleidoscopic flower season. Just under 70km from Clanwilliam, the Biedouw Valley sits in the middle of mountain fynbos and succulent karoo, becoming drier and sparser the further you travel downstream. Farmworkers in the valley spoke of the great sandfish migrations of years past... How long ago, thousands of plump fish would travel from the Doring River and up tributaries like the Biedouw each spring, creating waves as they propelled themselves upstream to spawn. On arrival at the valley, it was hard to believe that this unassuming reach of river played host to such a spectacular sub-aquatic phenomenon. My objective: find the sandfish, follow their migration, discover and characterise their spawning grounds, then follow the trajectory of their offspring as they evolve from eggs to larvae to fry to fingerlings and finally to energetic juveniles.

For nearly two weeks I walked the banks and shallows of the lower 15 km of the Biedouw River hoping to catch a glimpse of the large, torpedo-shaped bodies making their way upstream. By week two I was beginning to doubt it would ever happen, considering shifting the focus of my research. But when a big cold front swept through the valley and the Biedouw came pumping down from the mountains, turning the pools chocolatey brown, the more experienced members of the Saving Sandfish team were convinced that sandfish would soon appear in the murky depths. And finally, it happened. On day 12, I was walking the banks with my field assistant when I saw them: eight grown sandfish, each easily larger than the length of my forearm, swaying with the gentle flow, their dark silhouettes standing out against the sandy bottom of the pool. All thoughts of data collection flew swiftly out the window and I stood there mesmerised, drinking in the moment and sending silent prayers to the PhD gods for finally delivering my study subjects.



Sandfish eggs in the Biedouw River. Photograph: Dr Jeremy Shelton.



Juvenile sandfish in the shallows of the Biedouw River. Photograph: Dr Jeremy Shelton



Remains of Biedouw River—March 2022. Pictured here are the 2022/23 class of MSc students assisting with a late-season sandfish rescue. Photograph: Dr Jeremy Shelton.

For the next seven months I practically lived at the Biedouw: commuting to my field site to carry out a week or two of fieldwork, driving back to Cape Town to swap out field assistants, do laundry, and greet my friends briefly before jetting off to the Cederberg again. So much changed so quickly, I felt I couldn't miss a second of it. We knew next to nothing about sandfish. We now know that sandfish carry out peculiar 'chasing' staging behaviours in pools and runs before the main event of spawning. That come dusk, they move en masse from the stillness of pools, past swiftly flowing runs and into the excitement of the riffles. That they aggregate in groups of two to up to 30 when they spawn, vibrating their dorsal fins violently before darting forward in a mess of spray, milt and eggs. That they abandon all thought of danger come nightfall, when the action is at its peak, so much so that Jeremy had sandfish writhing over his submerged feet as he documented the frenzy from within the milieu. That not even a week later, no trace of them remained in the Biedouw, having migrated back downstream and into the mighty Doring River before the subsiding flows turned the shallow riffles into impassable barriers.

Over the next six months I saw tiny embryos squirming inside translucent eggs, miniscule larvae in every nook and cranny of the lower Biedouw, occupying only the margins where the water was a centimetre or two deep. I witnessed them turn into tiny fry, saw them venturing out into the depths as fingerlings and start schooling in the dozens. And then I saw the water levels start dropping... slowly at first, then – it seemed – all at once. The once-permanent isolated pools that were meant to hold them through the summer, acting as nurseries until the winter rains returned, were now death traps, shrinking by the day into shallow pools, then puddles, then nothing. A disastrous combination of thirsty alien plants, climate change and water abstraction meant these nurseries barely lasted into mid-summer, let alone winter. Add to that a host of invasive species – highly predatory North American bass and omnivorous bluegill sunfish – and these young sandfish didn't stand a chance.

It became crystal clear why no subadult sandfish were ever sampled in the Doring River. The dwindling population had become one of ageing elders who would continue to spawn year after year, but whose offspring had a close to zero chance of survival. If the alien predatory fish didn't get them first, the disappearing waters certainly would. At this rate, it would take only decades for this species to be relegated to history books and photographs. The beauty of my PhD project is that it is not an ecological study standing in isolation. It is part of a larger conservation project hoping to bring this charismatic ambassador species back from the brink of extinction. We're pioneering a rescue-rear-release programme where we take months-old sandfish from the Biedouw and place them into off-stream farm dams that act as alien-free nurseries, where they grow to bass-proof size before they are released back into the wild. With the use of Passive Integrated Transponder tags and underwater cameras we'll determine if our sanctuary-reared sandfish survive long enough to migrate with their parents and grandparents (and perhaps even spawn!) in the years following their release.

While witnessing the spawning migration in 2021 was indescribably special, it consisted of less than 200 individuals – a mere fraction of the thousands witnessed by those whose families have been in the valley for generations. We hope our efforts to increase the current population of sandfish reproducing each year will lay the foundation for the ultimate restoration of this charismatic species to its former glory.

Out and About in the Faculty



Tara Cruise: UCT Scientists at sea...on Mission Microbiomes

The 36m French schooner Tara, arrived earlier this year as part of a two year expedition up the West African coast to study how pollution, particularly microplastic pollution in Africa's main rivers and climate change are impacting the marine microbiome of the Atlantic ocean. 3 UCT women scientists were on board the Tara for a month, from Cape town to Walvis Bay. **Dr Emma Rocke**, a research fellow with MARIS, was the Chief Scientist onboard for the leg from Cape Town to Walvis Bay. This is the first time someone from an African institution has been chief scientist on Tara. **Dr Nicole Dames**, a MARIS postdoc working under Emma was on board, together with **Ms Ndamononghenda Mateus** who has just registered for a PhD when she returned from the trip. (see picture right: Emma, Nicole and Ndamononghenda)



Dr Rocke explained, "The primary goal of this leg was to look at the very powerful Benguela upwelling system - one of the strongest upwelling regions in the world and which produces a huge percentage of life in the ocean. The high nutrients at the surface create phytoplankton blooms that create the base of the food chain". They zig-zagged their way up the coast from St Helena Bay—where lots of red tides that happen and where there was low oxygen, attempting to understand how the microbiome is responding to that. On board, they collected 21 700 samples of plankton and micro-organisms from the water, to take back to the labs to be processed and analysed.



What were some of the highlights of the trip? Being on night watch under a canopy of stars; seeing bioluminescence, having a pod of hundreds of pilot whales play near the boat; forming a new family on board for a month, eating gourmet food cooked by the chef; listening to the captain playing his accordion and sing sea shanties in the evening; the very real science and being able to see everything from viruses to bacteria and jellyfish—which are all connected and "pieces of a puzzle which give a picture of what is going on in the ecosystem" says Dr Rocke.

Environmental & Geographical Science students use video to capture vulnerability of Capetonians to COVID and climate risk.

As part of the EGS3021F course, Environment and Sustainability, the students are required to use video to capture what they have learned in class about the concept of vulnerability. Although the class material, taught by **Assoc Prof Gina Ziervogel**, focuses on climate change vulnerability and adaptation, there is a strong emphasis on the root causes of vulnerability and their social nature.



3 of the 4 winners collecting their prize

Students were encouraged to get into groups of 4, with people they don't usually work with. The rationale of this being that it is useful to draw on different perspectives when trying to understand vulnerability. They then needed to go out and find someone or a group to film around how they are vulnerable to a climate risk or how they were vulnerable and adapted to COVID. In the final prac session, a vulnerability video festival was held, with popcorn for the groups as they watched all 20 videos. The students were "the people's jury" and the demonstrators and lecturer were "the expert panel", with all the marks contributing to the final grade.

The winning video was about flooding in Khayelitsha - <https://youtu.be/viLdxuMdmDc> shot by the team **Khwezi Mgobo, Guymond Mogale, Ayanda Mhlabeni and Vuyelwa Zwane**. Reflecting on their choice of topic, one of the group members said, "We chose Khayelitsha because it was the best way to convey vulnerability in real life situations." They also linked it to their class learning, saying, "This task allowed us to apply the knowledge we learnt in class to real life situations. Although it was challenging, I am grateful for this experience. I am definitely interested in engaging with communities in my future career." The runners up looked at "Sustainable Bokaap", a project that came out of lockdown to help residents grow and access food.

Honours students on Four Month expedition on Norwegian Tall Sailing Ship

Six Honours students (four from Biological Sciences, two from Oceanography) started a four-month expedition on board a Norwegian tall sailing ship, *Statsraad Lehmkuhl* in the Pacific Ocean, travelling from Valparaíso (Chile) to Palau. They are part of an international group of 90 students who are doing a course on board the ship (on "Ocean-Climate-Society: Sustainability"), run by the University of Bergen.



The UCT students are: **Aimee Cloete, Michael Geldart, Ben Heather-Clark, Amanda Masilela, Lerusha Naidoo and Stephan Roos.** In addition to their academic activities, the students are also part of the crew, helping to sail the ship, working shifts of eight hours on, 16 hours off each day. The participation of the UCT students is being funded through a grant from the Norwegian Research Council, linked to a project between the Universities of Bergen, Oslo and Cape Town.

Statsraad Lehmkuhl is filled with students, researchers, trainees and crew, all working together to sail the ship and gather knowledge about the ocean. Throughout the expedition, they regularly share our experiences from the life on board. With two thousand square meters of sail, *Statsraad Lehmkuhl* is one of the world's largest tall ships in year-round operation. The more than two thousand square meters of sails and two kilometres of ropes are handled with raw hand power. The trainees become an important part of the crew on board - without their effort, it's actually impossible to sail this enormous ship!

SKIES Training and Mentorship Programme

During April, the Astronomy department, in collaboration with SARAO and UWC organized and hosted an EU-funded SKIES training workshop at the Graduate School of Business. The SKIES (SKilled, Innovative and Entrepreneurial Scientists) project offers training for Astronomy and Physics researchers (MSc, PhD candidates and young postdoctoral researchers) in developing new skills, integrating Open Science, innovation and entrepreneurship.

During the workshop, the participants had the opportunity to reflect on the skills they have acquired during their academic training and to learn how to effectively apply these skills both in academia and in the private sector. The dynamic week long program started off with a self-reflection session and a Design Thinking workshop offered by the UCT D-School, where the participants had the opportunity to work in groups and unlock their imagination by using some simple tools and toys to present an original solution to an everyday problem.

There were sessions on entrepreneurship, innovation and business creation with experts from the UCT and UWC Research Offices and invited speakers from local and international businesses. The workshop not only provided the participants with theoretical concepts but also challenged them to apply what they had learned by working in groups to create a business idea and pitching it to a panel of experts.

Dr Lucia Marchetti from UCT astronomy and coordinator of the SA SKIES node says: "I am very pleased with the workshop outcome. From the evaluation forms that we ran before and after the workshop, it is clear that this workshop was needed and very much appreciated in preparing our students and postdocs for their next steps in life, whether they will take them in academia or in the private sector. I hope we will be able to continue with this program even after the end of the current program." After the workshop, the participants were paired with a mentor to continue with the discussion started during the workshop. The mentorship programme will run until the end of the current SKIES project in August 2022.



SKIES workshop participants—both in-person and online, with trainers



In Memoriam:

A true gentleman, a first-rate scientist, and a mensch – these were some of the superlatives describing **Professor Timothy Egan** (1962-2022), the late Jamison Professor of Inorganic Chemistry at the University of Cape Town, at a memorial event on Upper Campus on Saturday 14 May. Not even an early afternoon occasional shower of rain could hinder family and friends from congregating at the New Lecture Theatre, to celebrate the life of their kinsman, friend and colleague who passed away on 1 May 2022.

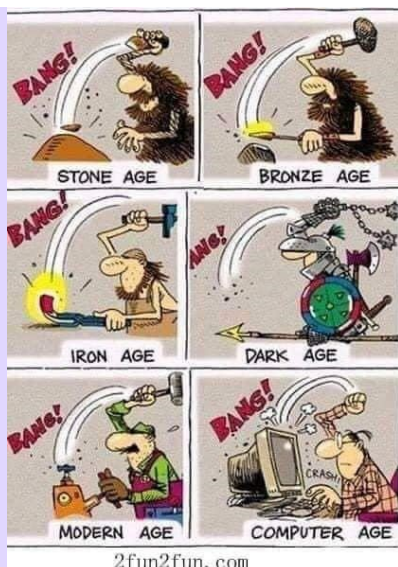
The memorial was bookended by a collage of photographs of Tim's life, depicting the nature-loving man, the global traveller, and the proud supervisor smiling with his academic "children" at their graduation ceremonies. .

Emeritus Associate Professor David Gammon, on behalf of the family, welcomed the guests. This was followed by two tributes from UCT Department of Chemistry – words by Associate Professor Anwar Jardine (HOD) and then a soulful rendition of *More Than Wonderful* by Deirdre Brooks, the Chemistry Departmental Manager. She was accompanied by Alexios Vicatos, a postgraduate student in the department.

Professor Valerie Mizrahi, herself an alumnus of the UCT Department of Chemistry and currently Director of the Institute of Infectious Disease and Molecular Medicine (IDM) – and representing UCT Fellows at the occasion (Tim was inducted as a Fellow in 2010) – spoke highly of the courage and stoicism with which Tim faced his final months, while also lauding his international standing as a leader in research related to the mechanisms of drug action against *Plasmodium falciparum*, the causative agent of malaria.

This was followed by reminiscences from three graduates of Tim's research group, Dr Catherine Kaschula and Dr Katherine de Villiers (both of the Department of Chemistry and Polymer Science at Stellenbosch University) and Dr Kathryn Wicht, a research officer in the UCT Department of Chemistry and at the H3D Centre. The "Three Catherines/Katherines/Kathryns", as they are affectionately known and whose tenure in Tim's research group spanned two-and-a-half decades, shared stories from their respective academic journeys with Tim, culminating in the prestigious A-rating from South Africa's National Research Foundation that their mentor had recently received and that coincided with his 60th birthday.

Alexios Vicatos provided a short piano recital, allowing for some moments of quiet reflection, before A/Prof David Gammon shared a selection of moving tributes written by members of Tim's family. Dr Joanne Egan, Tim's wife, conveyed her thanks. Afterwards, guests mingled, shared stories and reminisced about their very special colleague – and reflected on an indomitable spirit whose legacy will endure in their hearts, at the university and beyond.



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LAST LAUGH....

