

Science Matters

Science Faculty Newsletter



Message from the Deam



Welcome to the 2018 edition of Science Matters, the newsletter which gives a view into the lives and achievements of staff and students in the Science Faculty.

In this edition you will find accounts of an inaugural lecture, the discovery of a previously unknown ocean current, and the opening of a new optical telescope, linked to the MeerKAT radio telescope array. There are

also stories of a new generation of undergraduate digital storytellers, and numerous awards (including for sporting achievements) to members of the Faculty. We are proud of a new NRF A-rating awarded to Prof Kelly Chibale, and of the renewal of his A-rating to Prof Ed Rybicki. Congratulations are also due to those who graduated with the PhD at a shorter ceremony on 22 June. Research in the Science Faculty continues to thrive, with a number of short highlights captured in this newsletter.

Also in this newsletter you will see an account of the New Science Learning Centre, to be housed in the renamed Chris Hani building, for which fundraising has begun.

The Learning Centre will provide an on-campus “home” to Science students, and all donations are welcome!

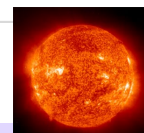
As I write, we are approaching to the start of the second semester. Thanks to the efforts of academics, PASS staff, and students, the first semester of 2018 ran smoothly. I wish all a refreshing break, and look forward to another productive and stimulating semester.

Finally, I would like to express my thanks to all members of the Faculty for your support to me as incoming Interim Dean in 2018.

Susan Bourne



Our Science Stars



Gold Medal for Astronomer



Professor Patricia Whitelock, Department of Astronomy, (pictured left) was awarded the 2018 South African Institute of Physics (SAIP) Gold Medal for her outstanding research career in astronomy and astrophysics and for her distinguished and extensive contributions to leadership, education and human capacity development of the Physics and Astronomy community.

By awarding the 2018 SAIP Gold Medal to Professor Whitelock, the SAIP bestows on her the greatest distinction that is conferred in South Africa for achievements in Physics. Her research is focused on understanding the late stages of stellar evolution and mass-loss of evolved stars, the structure of the Milk Way galaxy, and the stellar content of the local group galaxies. Her scientific work has been cited over 8000 times. Prof Whitelock’s contributions to the development of the astronomical community in South Africa are extensive: she helped establish the National Astrophysics and Space Science Programme and was one of the key drivers behind the successful bid by SA to host the International Office of Astronomy for Development of the IAU.

President of International Science Council

Professor Daya Reddy has been elected as the first President of the newly-formed International Science Council (ISC). The ISC was formed following the merger of the International Social Science Council and the International Council for Science. Congratulations to Prof Reddy for this prestigious honour.



Congratulations on NRF A-Ratings

Congratulations to **Professor Kelly Chibale** for receiving a new A-rating from the NRF, and to **Professor Ed Rybicki** for the renewal of his A-rating.

Distinguished Teacher Awards



Gregor Leigh, a Physics lecturer, was one of four new Distinguished Teacher Award winners. He teaches first-year physics to all engineering students and describes his teaching style as relaxed, irreverent, interactive and engaging. He says that working with first-years has helped him keep in touch with the younger generation and commented that he learns things about them as well as from them—which he likes to think has kept him young at heart and malleable. At his final lecture, students paid tribute to him and his unique style of teaching and working alongside students, inspiring and encouraging them.

Professor Kelly Chibale named as one of World's Greatest Leaders by *Fortune*

Professor Kelly Chibale, founder and director of Africa's first integrated drug discovery centre H3D, was recently named as one of *Fortune's* Top 50 World's Greatest Leaders. *Fortune* said that Professor Chibale was selected for this accolade because of his pioneering work in developing infrastructure to support scientific research and the manner in which he is using his power and influence to make the world a better place.



His citation says, "In much of Africa, the infrastructure to support scientific research is sorely lacking. But Chibale is working to change that. The Zambian-born chemist has built H3D, Africa's first integrated drug discovery centre at UCT. His team includes more than 90 researchers and they work out of state-of-the-art facilities, thanks to partnerships with the Gates Foundation, Novartis and the SA government. H3D already has a potential drug for malaria in human trials. Chibale has grown H3D into a world-class centre and he comments, "We need to demonstrate that Africa has more to offer than the mere opportunity for human clinical trials. Africa has largely been a recipient of Western research. It is time for Africa to contribute research so that people from other continents can also benefit. Research is not a luxury—it provides solutions, creates jobs and infrastructure, builds capacity as well as expertise, attracts foreign investment, can seed an industry and contributes to reversing the brain drain."

Royal Society of Chemistry Award for Inspiration



Dr John Woodland, a postdoctoral fellow in the Department of MCB received the *Inspirational Award* by the Royal Society of Chemistry (RSC), which recognises those who have gone the extra mile to support their work. John received this award for his 'positive impact through his plays promoting the chemical sciences and ensuring that the performances were accessible to children from all parts of the local community.' John has been the driving force behind revitalizing the annual RSC Jack Elsworth lecture, through his creative scripts and marshalling the talents of post-graduate students. The shows have educated and entertained young and old and have been a brilliant advertisement for the fascination that Chemistry holds and its broad applications.

John has also received many other awards for communication of Science to the community and this RSC accolade is well deserved recognition of his sustained commitment to Science communication. He will receive the award in London—Congratulations John!

Environmental Science at UCT ranked in top 50 in world

Environmental & Geographical Science at UCT has been ranked among the top 50 universities in the world in the 2018 QS World University Rankings by Subject.



Climate Scientist Professor Mark New wins prize for world-leading contributions to solution-focused climate research

Professor Mark New, Director of African Climate and Development Initiative (ACDI) was named the 2018 recipient of the Piers Sellers Prize for world-leading contributions to solution-focused climate research. The award is one of the two bestowed annually in the former astronaut and climate scientist's name by the Priestley International Centre for Climate. In 2018 the award reflects a lifelong contribution, based on interdisciplinary research outputs and evidence of resulting impacts on climate solutions.



Professor Mark New (right) received the award at the University of Leeds.

Professor New is a global leader in the interdisciplinary integrations of climate and development research. He is at the forefront of cutting edge research on the twin issues of low carbon and climate resilient development from a strongly African perspective. The ACDI that he directs reflects the largest concentration of expertise in climate and development in Africa.

Two solutions-oriented research projects that New is involved in, are the GreenSkills project which strives to facilitate a more proactive approach to green planning in South Africa, using a systems-based perspective for capacity building. It has also developed training materials and programmes, including a toolkit for organisational development and the greening of jobs along the value chain of an organisation or sector. The other project SmartAgri, provides a road map for actionable and prioritised initiatives to get the agricultural sector moving towards greater climate resilience, as well as the production of a Climate Change Response Implementation Plan.

At a special event at the University of Leeds, honouring his leading contribution to climate research, Professor New delivered a keynote address on the Cape Town water crisis, entitled "Anatomy of a water crisis: climate, demographics, communication, behaviour and politics in Cape Town".

UCT-edited volume wins Humanities & Social Sciences Award



Hanging on a Wire: Photographs by Sophia Klaase, a volume containing photographs by the late Sophia Klaase, won the 2018 Humanities & Social Sciences (HSS) Award for Best Non-Fiction edited volume. The judges commented that "the visual language of the photographs presented in the book is a powerful account of what it means to be young, rural and poor in South Africa".

Sophia Klaase was a photographer from Paulshoek in the Leliefontein communal area in Namaqualand and was well known to the UCT Plant Conservation Unit (PCU). Under the leadership and guidance of Dr Rick Rohde (a PCU honorary research associate) and PCU director **Professor Timm Hoffman**, Klaase produced a body of work of over 1 500 photographs which documented village life in Paulshoek, over nearly two decades. She collaborated with researchers, students and colleagues from the PCU since the mid-1990s when Hoffman first started working in the village. In 1999 Rohde joined a long-term research project in the village, the aim of which was to understand and record the socio-economic and environmental history of the area. He organised for cameras to be distributed to document everyday events or interesting aspects of daily life in the village. Klaase's work stood out from the rest for her intense and idiosyncratic representation of life in a materially impoverished community and her frank exploration of her own relationship to her environment.

AWARD FOR BOTANIST

Dunja MacAlister, a PhD student in the Department of Biological Sciences participated in the South African Association of Botanists conference and presented part of her PhD work based on thermotolerance in Rooibos. She won the award for the best PhD student presentation at the conference.

Dunja with her supervisor Dr Samson Chimphango.



Congratulations!



Claude Leon Award for Early Career Researchers

Dr Alvaro de la Cruz Dombriz, Department of Mathematics, has been awarded a Claude Leon Merit Award for Early-Career Researchers.

Science Faculty Engaged Scholarship and Social Responsiveness Research Award

Zarina Patel, Department of Environmental & Geographical Science, received the Science Faculty Engaged Scholarship and Social Responsiveness Research Award.



Best Paper Award at K-Cap Conference

Dr Maria Keet, Department of Computer Science and her co-author Oliver Kutz from the Free University of Bozen-Bolzano, Italy, were awarded with the Best Paper Award for their paper entitled "Orchestrating a Network of Mereo(topo) logical Theories" at the conference, which took place late last year in Austin, Texas, USA.

Keswick Prize for Lucidity 2017

Alexes Mes, Department of Physics, received the Keswick Prize for Lucidity—which is awarded to a fourth-year or Honours student in any field at UCT who is adjudged to have written the most lucid essay during 2017, on a technical subject, without recourse to jargon. Alexes' essay was entitled "Physics and Art - The Tale of Strange Bedfellows." What an excellent topic, who would have thought ...

The 2017 academic year ZSSA (Zoological Society of Southern Africa) student awardees for the best Zoology 3rd year and Honours students were, **Sejal Pramlall** for 3rd year and **Michaela Martins** for Honours.

Inaugural Lecture

Professor Maano Ramutsindela: Peace parks: the future of South Africa's natural resources.



Peace parks have a long history in Africa, bound up in colonialism, border politics and currently, land claims in South Africa. But the parks also have implications for the ownership and control of natural resources, said **Professor Maano Ramutsindela**, Department of Environmental & Geographical Science, in his recent inaugural lecture, entitled. "Remapping African through peace parks: What future for the continent?"

The establishment of peace parks—also known as transfrontier conservation areas—along African countries' borders were more than an approach to jointly manage natural resources across political boundaries. They were cartographic devices used by colonial powers to control resources in Africa. And the use of these devices in post-independence Africa has implications for the ownership of resources among communities who live in these regions, particularly concerning the land.

Most peace parks between South Africa and its neighbouring countries have illustrated that they redefined national borders for wildlife, which becomes the common property of the participating countries. But the shared implications for ownership of the resources for the communities that live in these regions poses a different challenge. Historically, these communities were groups with shared ethnicity, language and heritage, who were not bound by the colonially drawn map. For real decolonisation to happen now, the short-term goal should be to create a fluid movement of people within transfrontier parks and to give these communities access to trans-border natural resources, said Ramutsindela.

From early on in his career as a human geographer, Ramutsindela was interested in the idea of the map and how it organises society. "As we know, conservation was part of the partitioning of Africa and we often forget about this because we're interested in saving the rhinos and other big animals. But what is important to understand is the relationship between Africa and colonial conservation" he said.

UCT Scientists shine in annual *Mail & Guardian* 200 Young South African's list



Science Faculty staff and students made their presence felt in the 2018 *Mail & Guardian* 200 Young South Africans list, which features notable South Africans under the age of 35 who have made a mark for themselves. The following Science Faculty students, staff and alumni featured on the list:



Lillian Maboya, EGS, is an environmental change enthusiast who holds an honours degree in Environmental & Geographical Science from UCT. She has always been passionate about environmental conservation and involving young people in combating climate change. At just 14, she founded a robust environmental club in her home province of Limpopo called GENC, pioneering the innovation of green technology that addresses the impact of climate change in rural areas, and doing door-to-door workshops on climate change awareness.

Pablo Chauke, EGS, works as the training and outreach coordinator at H3ABioNet. He obtained an honours degree Environmental & Geographical Science at UCT. He says that he “grew up in conditions of squalor that made me hungry for success and opportunities to change my life and those around me.” Chauke now works in bioinformatics and is passionate about climate change and development in Africa.



Kimon de Greef, Biological Sciences, is a freelance journalist who writes stories that situate conservation challenges in their wider social and economic context. He was drawn to journalism while studying conservation biology at UCT. His approach to stories is often from the perspective of those who are burdened by the legacies of economic exclusion and are trying to make a living on the fringes of society, including illicit diamond dealers, donkey skin smugglers, marijuana farmers and mountain muggers. “I believe that preserving the environment is impossible without social and environmental justice, and I hope that through storytelling it is possible to shift and widen people’s perspectives,” he says.

Dr Thulwaneng Mashifane, Oceanography, was the first black South African to obtain a PhD in Ocean and Atmosphere Science and is currently a postdoctoral research fellow at the South African Environmental Observatory (SARAO). Mashifane’s PhD research used biogeochemical models to understand ocean biogeochemistry and the production of the greenhouse gas nitrous oxide, which has a global warming potential 265 to 310 times higher than that of carbon dioxide. He is one of the few experts in South Africa who has skills in biogeochemical modelling and has transferred these skills to students as a tutor and teaching assistant at UCT.



Ntsako Mgiba, Computer Science, is the co-founder and CEO of Jonga, a security system for low-income areas. Following a personal encounter with burglary, Mgiba fused his training in mechatronic engineering and interest in entrepreneurship to “restore dignity, security and peace of mind to communities that are often seen as perpetrators of violence in South Africa.” Currently pursuing a Master’s degree in Computer Science as a Mandela Rhodes scholar, Mgiba clinched the first prize in numerous entrepreneurship challenges on- and off-campus.



Zoleka Filander, Biological Sciences, is an offshore benthic ecologist, who holds a Master’s in Marine Biology from UCT. Filander, in her work as a benthic ecologist, plays an integral role in ensuring the conservation and management of ocean resources and believes that marine conservation is crucial. “The ecological health of the environment is of paramount importance to our existence and survival,” she says. As the only black female diver in her research unit and one of three black female scientists at the Department of Environmental Affairs who have led a scientific expedition, Filander is a pioneer in her field.



STAFF NEWS

WELCOME TO NEW STAFF

Archaeology:

- **Dr Catherine Luyt**—Chief Scientific Officer

Chemistry:

- **Martina Mayiya**—Admin Assistant
- **Fundiswa Mpetsheni**—Admin Assistant
- **Thamier Kamaldien**—Workshop Assistant
- **Adrian Jooste**—Departmental Assistant

Computer Science:

- **Phelisa Bikani**—Admin Assistant

MCB:

- **Ghakiema Salie**—Senior Secretary
- **Mario Pause**—Departmental Assistant
- **Dolly Marubelela**—Departmental Assistant

Physics:

- **Dieter Geduld**—Lecturer
- **Kutullo Freedom Maibane**—Scientific Officer

FAREWELL TO STAFF

Biological Sciences (ADU)

- **Dr Hans-Dieter Oschadleus**

Computer Science

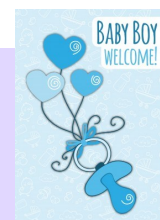
- **Dr Brian DeRenzi**

Geological Science

- **Dr Lynnette Greyling**

Congratulations

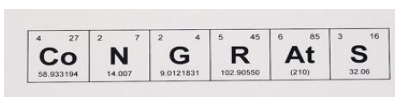
Ghakiema Salie, an Admin Officer from the Department of MCB, gave birth to a healthy baby boy, on the 15th May 2018.



MCB on the run



MCB Scientific Officer **Madhu Chauhan** completed her 50th Discovery ParkRun in May this year. She is very enthusiastic about this new sporting activity which she started last year as an integral part of a healthy lifestyle program. Her next goal? To achieve the century run next year!



Promotions in the Faculty:

Congratulations to the following staff for their *ad hominem* promotions, effective in 2018.

Department	Title	Name	Promoted to
Archaeology	Assoc/ Prof	Rebecca Ackerman	Professor
Archaeology	Assoc/ Prof	Shadreck Chirikure	Professor
Biological Sciences	Dr	Arjun Amar	Associate Professor
Biological Sciences	Mr	Desmond Barnes	Chief Technical Officer
Chemistry	Dr	Eileen Murray	Principal Scientific Officer
Chemistry	Dr	Clive Oliver	Senior Lecturer
Computer Science	Assoc/ Prof	James Gain	Professor
EGS	Dr	Babatunde Abiodun	Associate Professor
Geological Sciences	Dr	Philip Janney	Associate Professor
MCB	Dr	Robert Ingle	Associate Professor
MCB	Ms	Shakiera Sattar	Chief Scientific Officer
Physics	Dr	Sahal Yacoob	Senior Lecturer

Long Trek for double family graduation

Professor Chris Harris, Department of Geological Sciences, had to travel 650km from his third year student's field trip in the Northern Cape, to attend the joint graduation of his wife, Chandra, who graduated with Honours in Education and his daughter, Katherine, who graduated with a BA in English, Business French and Philosophy.

Positioning graduation in the middle of mid-semester vac was challenging for Professor Harris, who had to travel the long distance from the Northern Cape to Cape Town for graduation and then journey all the way back the Northern Cape a few days later to re-join his students for the rest of their field trip!



Chandra, Katherine and Chris Harris



3rd year Geology students in the Northern Cape on their field trip.



MCB Hosts Pub Quiz

On the 24th May, the Molecular and Cell Biology (MCB) Department hosted its annual quiz night, organized by the Postgraduate Research Committee (PRC). This quiz night is one of the most anticipated social events on MCB's agenda as it brings together the MCB community for a fun evening of trivia, food, drink and prizes.

The date was specially chosen to ensure that the Honours students had already chosen the lab where they want to work, so that quiz night is a chance for them to integrate with their lab

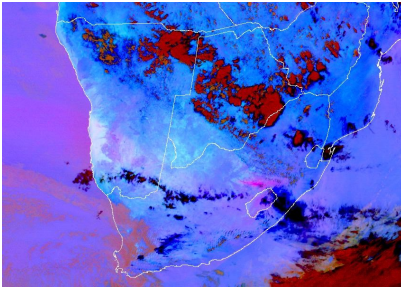
mates. This year, 8 groups competed to answer science, sports, geography, history, arts and general knowledge questions. Also in attendance were two special guests, Vicus van der Merwe and Bret Wurde- man, from WhiteSci, MCB's main lab supplier. They brought an awesome vibe to the night, and contributed the main prizes of the night.

The winning team was "Salty and Defensive", composed of members of the Donaldson and Ingle Labs. The Donaldson Lab focuses on how plants discriminate between salinity and drought stress and how stress tolerance can be engineered both in model plants and locally relevant crops. They are especially interested in how plants co-opt the auxin signaling pathway to grow out of stressful conditions. The Ingle Lab focuses on molecular mechanisms evolved by plants to cope with biotic and abiotic stresses, such as attack by bacterial and fungal pathogens and nickel and salinity stress. Outside the plant world, the Ingle Lab also researches the genetic basis of plumage polymorphism in black sparrowhawks.



Research Bytes

New study suggests that much of the major dust in SA is produced in a small area of South Africa : The South African Cropland Dust Emission Risk Project (SACDER) by Associate Professor Frank Eckardt



Meteosat satellite image detects dust plume (in pink) originating from the Free State. More than 300,000 images were analysed.

An eleven-year satellite observation record suggests that much of the major atmospheric dust in the South Africa is produced in the Southern Central Free State, an area of less than 3% of South Africa's surface area. Here, the land cover is comprised of grassland and dryland cultivation (maize, sorghum, sunflower, ground nuts). Dust emission peaks in the August to September period but may be triggered by both winter and summer weather systems. Given the prevailing drought, these dust outbreaks have been on the increase. At its peak in 2016, up to a dozen events could be tracked, reaching neighboring provinces and even countries.

A preliminary assessment of the management practices of several land parcels suggests that the source of dust plumes may be associated with unusually long (> 2 year) fallow periods brought about by late rains, and a need to recharge groundwater in sandy soils. Current studies focus on the formation and development of protective soil crusts, their resistance to wind erosion, dust emissions, and dust composition. Laboratory and wind tunnel observations will be complemented by field measurements and experiments that consider surface cover and farming practices.



Agricultural field in the Free State after the harvest. Residual stubble aims to reduce wind erosion.

A team from UCT (**Associate Professor Frank Eckardt**, Department of Environmental & Geographical Science), Basel (Professor Nicholas Kuhn), Pretoria (Professor Don Cowen) and the South African Agricultural Research Council (Dr Anthony Palmer) is currently conducting the South African cropland dust emission risks (SACDER) project, a bilateral Swiss/South African funded effort aimed at identifying the major South African dust sources, establishing boundary conditions of dust emission in relation to land management practices, and determining dust dispersal patterns, compositions and impact. The dust microbiome will be analysed for the first time using DNA sequencing. Several PhD students, including Nolusindiso Ndara, who is funded by a UCT Science Faculty Equity fellowship, are involved.



Despite best efforts, dust storms do occur and pose a hazard to people living in the area and beyond.

South African joins upgrade of the ALICE Experiment at CERN by Dr Thomas Dietel

The South African groups in the ALICE Collaboration have joined the effort to prepare the ALICE Experiment for the next decade, to analyse 100 times more collisions of lead nuclei and to deepen our understanding of the Quark-Gluon Plasma that is created in these collisions. The European Organisation for Nuclear Research (CERN) and the South African Department of Science and Technology have signed a memorandum of understanding that marks the official start of the South African contribution to the upgrade of the Muon Tracker, Muon Identifier and the Transition Radiation Detector.

The ALICE Experiment is one of four detectors at the Large Hadron Collider (LHC), the flagship particle accelerator of CERN in Geneva, Switzerland. ALICE is dedicated to the study of the Quark-Gluon Plasma, an extremely hot and dense state of matter that has filled the entire early universe until a few microseconds after the Big Bang and that can be recreated in collisions of lead nuclei in the LHC.

The upgrade of the ALICE Detector prepares it for the next decade by enabling it to record 100 times more collisions after the upcoming two-year maintenance shutdown of the LHC in 2019/20. IThemba LABS and the Department of Electrical Engineering at UCT will focus on the development of electronics for the Muon Tracker and the Muon Identifier, while **Dr Thomas Dietel**, in the Physics Department, will lead the software development for the Transition Radiation Detector, required for the analysis of 100 times more data from this detector.

UCT Astronomers play pivotal role in opening a new window on the universe.



The new telescope, MeerLICHT, will provide an optical view of the southern sky from its position at the SAAO facilities in Sutherland.

UCT is part of a consortium that is taking astronomy to greater heights with the launch of the new optical telescope, **MeerLICHT**, which took place on 25 May 2018. MeerLICHT, meaning ‘more light’, is distinct for a number of reasons. Firstly, the telescope has an enormous field of view at 10 500 by 10 500 pixels, matching that of MeerKAT. This means that it is able to focus on, and capture data from a larger portion of the southern sky. The telescope also outputs this data faster than ever before. Each 60-second exposure is processed in just seven seconds. Not only is this essential to maximise productivity and efficiency, it allows researchers to produce a rapid time sequence of the night sky. The telescope is fully robotic and will be paired with the MeerKAT radio array to provide a new and improved window on the universe.

Six years ago, after a workshop in Oxford, **Professor Patrick Woudt**, Department of Astronomy at UCT, and a colleague discussed how best they could follow up on discoveries picked up in data from radio telescopes. “And the answer to that question, over a pint at the pub, was: ‘Well, we must build our own [optical] telescope that is actually fully dedicated to doing that.’” A dedicated optical telescope being paired to a radio array was an entirely novel concept. “This telescope is quite unique in its design. It was designed to always co-stare with the MeerKAT radio telescope.” The project kicked off in earnest after Professor Woudt applied to purchase the core piece of technology, the detector, through UCT. The purchase was approved, prompting Woudt’s partners from Radboud University Nijmegen in the Netherlands to respond in kind. The partner university committed itself to funding the design and construction of the telescope, with support from the Netherlands Organisation for Scientific Research (NWO).

“We are in an era of astronomy where we are dealing with very large data volumes,” explained Woudt. “About five or six years from now, there will be an optical telescope that will map the entire southern sky every two days, and every night it will find a million transients – a million new objects. So, how do you deal with that information flow? What are the important objects in there? What do you select for follow-ups? This project, although on a much smaller scale, will start to address some of those answers.” Given UCT’s expertise in dealing with data flow, the institution’s key role in MeerLICHT is in managing its influx. The MeerLICHT data pipeline was formulated by PhD student **Kerry Paterson**, and is now ready for injection. Data will stream into the Inter-university Institute for Data Intensive Astronomy (IDIA), at UCT, for analysis. The team is investigating the possibility of making use of algorithms and machine learning to help sift through this deluge of information.

But MeerLICHT forms part of a greater context. The new telescope is linked to MeerKAT, which is South Africa’s pathfinder toward the Square Kilometre Array (SKA). “MeerKAT will eventually be incorporated into the mid-frequency component of the SKA,” said Woudt. Although MeerLICHT does not affect the timeline of MeerKAT and SKA, “it enhances the science we can do with them, by adding an extra dimension. Certainly, if we can overlay radio with optical, we can start to do some source association and really try to understand the correlations between these two different windows on the universe. If it turns out to be extremely valuable ... If it turns out we are finding many fast radio bursts and can identify the host galaxy, and report that to SALT [South African Large Telescope], and get a distance for these objects, and so on, then we should of course continue this into the SKA era.”



Prof Patrick Woudt shares one of the composite images captured by the MeerLICHT telescope in the data visualisation facility of IDIA.



Discovery of New Ocean Current

It's not often that PhD research makes world news. Department of Oceanography Doctoral candidate **Juliano Ramanantsoa's** (pictured left) discovery of a new current off south-west Madagascar has rounded off his doctoral research – and brought him and his co-authors international commendation. The Southwest Madagascar Coastal Current (SMACC) was described in Ramanantsoa's recent journal article in *Geophysical Research Letters*.

According to the observational-system and computer-modelling data, this wind-driven, poleward- flowing surface current is relatively narrow and shallow – some 300 metres deep and 100 kilometres wide – and salty. It flows more intensely in summer, and its physical impact on the ocean is particularly noticeable in a rich upwelling of nutrient-dense waters at the southern end of Madagascar. This has implications for the commercial and subsistence fisheries in the region as well as for the Agulhas Current along South Africa's eastern shores. The current transports an average of 1.3 million cubic metres of water a second, and is comparable to the poleward-flowing Leeuwin Current off western Australia.

Initially it was the mysterious variability in the ocean upwelling off the south-western part of the island that puzzled Ramanantsoa, a Madagascan national. He was unable to ignore it as his PhD needed to account for the phenomenon. "The only explanation was a poleward, warm surface current moving to the southern tip of Madagascar, which influences the upwelling." The researchers analysed a battery of data: shipboard observations (water speed and direction, salinity, depth and temperature), satellite observations of sea surface temperatures, surface drifter trajectories from Global Drifter data, and a computational model of ocean dynamics in the region. The analysis proved their hunch: they were dealing with a previously unknown, warm surface current heading south towards the pole. The water wasn't emanating directly from the East Madagascar Current but from the Mozambique Channel.

Ramanantsoa plans to sign up for a postdoc at UCT once his PhD is handed in and he will work with his supervisors to develop physical oceanography in the region around his "marginalised island". In the long term he's hoping to build a physical oceanography laboratory in his home town on Madagascar and further develop links between the two countries. "We can't work alone. We need to support each other. Science doesn't have any borders."

UCT Scientists to join unprecedented international Scientific Expedition

During January/ February 2019, a major international scientific expedition will explore one of the coldest, harshest and most remote locations in the world: the Weddell Sea, off Antarctica. **Professor Isabelle Ansoerge** and **Dr Sarah Fawcett**, from the Department of Oceanography, together with some of their students will be embarking on this unprecedented expedition to the Weddell Sea. There they will survey the underside of the Larsen C Ice Shelf, documenting the rich and little-studied marine life of the western Weddell Sea ecosystem and attempting to locate the wreck of Sir Ernest Shackleton's ship which sank in 1915.



South African research organisations and scientists will play a vital role in the Weddell Sea Expedition 2019. The 45-day voyage will be conducted from the South African polar research and logistics vessel the *S.A. Agulhas II*, owned by the Department of Environmental Affairs (DEA).

Professor Isabelle Ansoerge said: "Participating in the Weddell Sea Expedition 2019 will give South African researchers an unprecedented opportunity to investigate and explore one of the most remote, and least-studied place on our planet, and to collaborate with international research colleagues across different disciplines."

Scientists stunned by decline of birds in Botswana

A two year project to repeat a famous bird survey project across 20 000km of Botswana has confirmed researchers' fears: many birds of prey are fast disappearing. Reported sightings of iconic eagle and vulture species have declined by as much as 80%, compared with the previous survey, while some migrant species recorded last time have vanished, according to the study published this week in *Biological Conservation*. **Associate Professor Arjun Amar** from the Fitzpatrick Institute of African Ornithology at UCT supervised the research, and PhD student **Beckie Garbett** led the study.



Lappet-faced vulture & Yellow Billed Kite: Photos Beckie Garbett

The resurvey focussed on 29 raptor species and compared their encounter rate records with those of the previous study by Herremans, which they replicated. “The main motivation for doing the work was to explore whether vultures and other raptor numbers had declined in Botswana like they have in many other areas of Africa” says Associate Professor Arjun Amar, who conducted the study in collaboration with conservation NGO Raptors Botswana and supervised the research. He says the sharp decline in sightings is unexpected: “Although declines in raptor populations have been seen elsewhere in Africa, particularly across West Africa, we were not expecting these declines to be quite so dramatic in Botswana which has a relatively low human population size and where nearly 40% of the land is under some form of protection.” Species declines were detected for 14 out of 29 species monitored. Eleven of these species declined by over half in the last 20 years. Some of the species showing the greatest declines are the White-headed and Lappet Faced vultures, African Hawk Eagle, Secretary Bird, Bateleur Eagle, and Red-necked Falcon. Only three species showed an increase in their abundance: the Brown and Black Chested Snake-eagles and the Tawny Eagle.

The study does not pinpoint the cause of the declines. However, conservationists say vultures in particular are vulnerable to poisoning by poachers for whom the birds’ habit of circling carrion is a threat – because it might draw attention of game rangers inside protected areas. Garbett says: “We found declines occurring across species with varying diet and habitat use, which make it hard to pinpoint the main drivers of decline. Climate change is one candidate for these declines, but urgent research is needed to better understand the drivers of these declines.”

SEAmester continues to grow... by Isabelle Ansoorge

During July, the floating university SEAmester takes to the seas again for the third time. SEAmester introduces marine science as an applied and cross-disciplinary field to students who have shown an affinity for these core science disciplines. It combines traditional class-room lectures with hands-on-ship-based deck activities for the students, while providing them with opportunities to network with and support specialist scientists in recognised marine research activities.



“It seems almost yesterday that I approached the DST and the NRF to consider funding a Floating University that would be open to all University postgraduate students”, says **Associate Professor Isabelle Ansoorge**, “and here we are planning our third trip.” The programme strives to gain greater awareness of the ocean’s physical and ecological response to climate change. “It has been incredibly successful—since our first cruise in 2016 we have taken over 120 students from 23 universities around South Africa to sea, and each year we have over 24 lecturers participating.”

The lectures range from space weather to ocean plastics, to marine microbiology and ocean instrumentation. Hand-in-hand with the lectures are specially designed experiments, linked to the classroom lectures: for example: towing a net over the side to see what comes up from over 400m deep, counting seabirds, studying and forecasting weather patterns and calibrating oceanographic data. Associate Professor Isabelle Ansoorge, organiser of SEAmester says, “This year we are fortunate to have **Professor Patrick Woudt**, Head of Astronomy at UCT on board, teaching SEAmester students the Sky at Night—300 miles from land and far from any light source—we are bound to see the most amazing star shows!”



Out and About in the Faculty

Developing Digital Storytellers in Environmental & Geographical Science

Associate Professor Gina Ziervogel's 3rd year EGS students had been learning about vulnerability and adaptation to climate stress. For their practicals, they were required to make a 2 minute video of how people in Cape Town have been vulnerable to the drought and reflecting what they have been doing to adapt to drought conditions. Students were encouraged to work with others whom they don't normally work with. They had to go out and find a person or group they thought might be vulnerable or have adapted well to drought. Some of the people they filmed included: car washers, flower sellers, guesthouse owners, those relying on spring water and traditional healers. All videos were all filmed on cell phones and at the end of the process they had a film festival (with popcorn) to watch the documentaries.



The winning group with Gina Ziervogel

There was a "people's prize" awarded once the students had completed online evaluations of each video and this prize was awarded to the group who filmed the SPCA. The judge's prize went to the group who filmed a woman living in Gugulethu who makes ginger beer, but has been struggling to secure water for her ginger beer during the drought. To view the film click here: <https://youtu.be/OznNo0pGAQg>

The students appreciated the opportunity to get out and about and make a film as their practical submission. This is captured in some of their reflection comments: "I gained skills in presenting my vulnerability knowledge in a different way rather than in an essay. From creating a video and watching other videos I saw a wide range of people and communities who are vulnerable in different ways. Lastly, I also gained friends from being in a group with people I hadn't spoken to before." ; "I learned that its important to let those that are vulnerable take charge in how they want their story to be told." ; "Learning about a real life vulnerability issue from relevant people who experienced its effects allowed me to have a deeper understanding of the concept of vulnerability as compared to just learning it through lectures." Another movie can be viewed here: <https://youtu.be/T4xjJ0eKG34>



The Film Festival audience

Messengers from the Mantle

Messengers from the Mantle Exhibition is an exhibition developed two years ago by **Associate Professor Phil Janney's** Kimberlite Research Group, in the Department of Geological Sciences, and first displayed at the International Geological Congress in Cape Town in 2016. It has now travelled to the University of Johannesburg for an installation coinciding with the GeoCongress, a biennial interdisciplinary conference in the Earth Sciences.



The exhibition was developed to highlight scientific advances in the study of the Earth's interior and to showcase a selection of the roughly 14 000 unique rock specimens from the Earth's upper mantle currently held at UCT. Key to the story behind Messengers from the Mantle are the diamonds brought to the surface in kimberlites. This mineral acts as a time capsule uniquely preserving evidence of ancient and ultra-deep Earth processes, as well as providing information on the timing and nature of diamond formation itself. The exhibition contains ten exhibit cases, each containing backlit large format sections of specimens on display, allowing the unusual colours and textures of these unique rock specimens to be shown clearly.



Kimberlite

Tribute to Stephen Hawking by Emeritus Professor George Ellis

Stephen Hawking, (pictured right) who passed away on 14 March, was remembered by his long-time friend and collaborator, **Emeritus Distinguished Professor George Ellis**, in a moving tribute held in the RW James lecture theatre.



“Stephen Hawking was a great spirit and a wonderful mind,” said Ellis in his recent tribute to the renowned theoretical physicist, a collaborator and friend. Hawking died on 14 March, aged 76, having been severely debilitated by motor neuron disease for almost all his adult life.

Speaking to a packed lecture theatre in the Department of Physics, Ellis recalled how he and Hawking had been research students and then postdocs together in the Department of Applied Mathematics and Theoretical Physics (DAMTP) at Cambridge University with Dennis Sciama as their research supervisor.

It was soon after arriving at Cambridge from Oxford that Hawking, aged 21, began to show signs of the disease that would soon confine him to a wheelchair and later diminish his ability to speak. But his brilliant mind was not affected by his declining physical abilities. Hawking publicly challenged the legendary Fred Hoyle about the validity of the Hoyle–Narlikar action at a distance theory of gravitation at an “extremely prestigious” Royal Society meeting. Said Ellis: “Hawking, just a grad student, stood up and said, ‘Professor Hoyle you are wrong.’ Hoyle said, ‘How do you know it’s wrong?’ To which Hawking replied, ‘I have calculated it.’ This already showed the kind of initiative and the power of Stephen’s thinking, that as a graduate research student he was willing to stand up to one of the most famous research professors in astrophysics at that time.”

He said Hawking had been a beacon of hope for disabled people through his achievements. “On stage at the London Paralympics, he told the world, ‘Look up at the stars, not at your feet.’ He had huge courage and humour and I think ... really enjoyed adventure. He’d say, ‘So, the sun is going to go out in about 14 billion years and you sit there as if everything is fine.’ His birthday parties were celebrated with a disco and fireworks; he enjoyed the good things in life.” Part of his great resilience was his irrepressible humour. Often, when people gawked at him he’d joke, “Sometimes people mistake me for Stephen Hawking.”

Of his longevity Ellis remarked, “How did Stephen manage to live to the age he did when we all expected him to die before 25? I think it was pure determination, pure will to do what he wanted to do. And I believe that is what kept him alive, and so he was a great spirit and a wonderful mind ... not letting being in that wheelchair prevent him from letting his mind roam through all these possibilities – the future of black holes, the start to the universe, the nature of space-time ...”

“He has made a major contribution by what he did and by the way he lived his life. He will be very much missed,” said Ellis.

To watch the tribute click here: <https://youtu.be/NaEzdZ0fVLo>



George Ellis (pictured left) and Stephen Hawking were postdocs together at Cambridge University as well as long-time friends.



Part of Stephen Hawking’s great resilience was his irrepressible humour. In this picture he is experiencing zero gravity. Photo NASA.

Launch of New Science Learning Centre Project



In recognition of Chris Hani's contribution to South Africa's democracy, and in commemoration of his life and legacy, UCT has renamed the New Science Lecture Theatre, the Chris Hani Building. The ceremony was attended by Chris Hani's daughter Lindiwe Hani and Deputy Minister of Public Works Jeremy Cronin, who spoke on behalf of the Hani family, together with special guest Justice Albie Sachs, members of the university and student leadership, representatives from the South African Communist Party (SACP), and UCT students and staff. At the renaming ceremony, the project to redevelop the Chris Hani Lecture Theatre as a contemporary space, enabling innovative teaching and learning in the sciences, was launched.



**Be part of the Future of Science
at UCT – Contribute to the
New Science Learning Centre**

The New Science Learning Centre, located in the Chris Hani Building, will be a home to Science students at UCT and will provide innovative learning areas to enable students to engage with their studies outside of the formal classroom.

The centre will provide:

- Informal and social learning areas
- Communication hubs
- Venues for teaching and tutor/mentor-based cooperative learning activities
- A 'think tank' with a digital virtual wall.
- Access for students to learning and general support services

UCT is commencing fundraising for this important project. For more information on how to donate to this empowering new Science Learning Centre, contact the Dean of Science at sci-dean@uct.ac.za

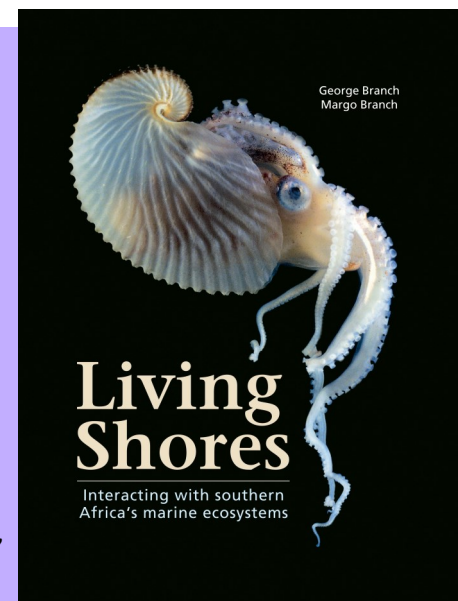
Revision of *Living Shores* 37 years later...

Emeritus Professor George Branch and his wife Margo Branch's well known book *Living Shores* was revised and republished this year—thirty seven years after they wrote the first edition.

Living Shores was for many years the standard reference guide for marine science students but was also embraced by the popular market for its fascinating insights into marine and coastal habitats and the life they support. This best selling classic has been completely revised and reworked to incorporate the many spectacular discoveries about our changing oceans and coasts that have emerged over the last four decades. It looks at the dynamics of the oceans and continents and explores the ecology of coastal systems, including rocky shores, beaches, dunes, estuaries, islands, kelp forests, coral reefs and the open ocean.

The book unpacks the relationship between humans and the marine environment, from ancient archaeology to modern times and the consequences of harvesting, alien species, development and mining. It also addresses the impact of climate change and motivates people to love and protect our marine heritage.

Professor Branch is world renowned for his research on marine ecology and Margo Branch is an award-winning biologist and illustrator with wide interests in research, interpretation and education.



Pint of Science Festival



Pint of Science is a science festival that takes place simultaneously across the world in 19 countries, over three days, every May. The festival brings interesting, fun, relevant talks on the latest science research to the public – all in the pub! The aim is to provide a platform which allows people to hear first hand from researchers about the work they are doing and have the opportunity to discuss the research with the people who carry it out.



The Science faculty participated in the event this year and the UCT Club was abuzz on a Monday, Tuesday and Wednesday evening as UCT Postgraduate students and staff presented their research and engaged with the public and students, highlighting their discoveries and developments. The audience was provided with a whistle-stop tour of a range of topics, from neurons, atoms and galaxies, to phytoplankton that is saving the earth, to birds that weigh themselves on UCT campus, to the pros and cons of carbohydrates; the impact of dust emissions; to toxins in maize; to how increased DNA changes the way plants use water; the effects of mindset on academic achievement and how plants can take on viruses....

The talks were highly informative, as well as being entertaining and the speakers used humour and everyday examples that people could relate to, to create understanding of complex issues. The Pint of Science festival was well attended and the participants learned a great deal in this window into the world of Science.

The Faculty of Science acknowledges that it has a responsibility as a community of scientists, to engage with the public and inform them about our scientific discoveries and developments and it is hoped that this will become an annual event in the UCT calendar. Our thanks go to all of the speakers for preparing such interesting, informative and entertaining presentations and for engaging with the audience so wholeheartedly.



The engaging audience



Kolisa Sinyanya with MC Isabelle Ansorge



Speakers from L to R: Naadirah Moola, Jessleena Suri, Mashudu Mokhithi, Tanya Hutton, David Gammon, Jore von Holdt, Ruan van Mazijk, Inge Pietersen

Outreach in the Faculty

Turning "So near, yet so far" into "Close & getting closer": Thandokhulu Science Initiative



Thandokhulu High School with the mountain and UCT in its sights

An exciting new initiative was recently started up by **Drs Barnett, Ngubane** and **Sunassee** within the Chemistry Department, and supported by keen postgraduate students within the Science faculty. Thandokhulu High School is just over the road from Dr Ngubane's Forest Hill room in Mowbray, at the doorstep of UCT. It is an historically under-resourced school, and the Thandokhulu Science Initiative (ThaScl) aims to try and make the chances of university admission more attainable for the scholars there.

The Thandokhulu Science Initiative (ThaScl) provides extra help to learners at Thandokhulu High School (THS) in their Science Curricula. Every Saturday morning Mr Slamang, the Grade 12 Life Sciences teacher at Thandokhulu, together with Science Faculty postgraduate students and staff volunteer to help the learners with hands-on activities related to their Life Sciences and Physical Science curricula - including assistance with homework and assignments. Initially, this outreach initiative is targetting learners from Grade 12, but the hope is that this will ultimately extend to younger grades.

The first session was held on Saturday 5 May. Over 50 learners showed up, brimming with enthusiasm and curiosity as to what it takes to be a student at UCT, especially in the Science Faculty. The call for tutors was well received by postgraduates in the faculty, who were happy to pitch in and lend a hand to tutor and assist the keen scholars.

In addition to the tutoring sessions our Health and Safety Officer **Ms Monique Muller**, together with PhD student **Shakeela Sayed** and Postdoc **Dr Malkeet Kumar**, took time out to come and help take stock and organise the school's life sciences store. This gave it a spruce up for the newly enthused learners - and hopefully future university scholars and scientists.....?



*Thandokhulu High School students with UCT staff members
Drs Sunassee, Ngubane and Barnett*



*The UCT Team: Back: Dr Sunny Sunassee, Dr Siyabonga Ngubane, Mr Faizel Slamang (Life Sciences teacher at THS), Mpho Kganyago, Pargeant Ntshalintshali, Rebeng Maine, Athi Welsh, Shepherd Siangwata, Nadia Baartzes, Dr Chris Barnett
In front: Stephanie Achieng*

Physics entertains learners at Lucy and Stephen Hawking book launch in Khayelitsha



Molo Mhlaba learners grapple with a Cartesian diver

Molo Mhlaba Primary School in the far-flung part of Khayelitsha is so new that even local residents and other schools in the area weren't able to guide the UCT Physics contingent through the last 500 m of their journey on Wednesday 13 June – but after driving around for some time, asking directions in rusty Xhosa, the team was eventually spotted by one of the organisers and ushered into the school.

Dr Trisha Salagaram, Gregor Leigh and MSc student **Lizelle Niit** (and, most importantly, a car load of demonstration equipment!)

had been invited by The Project for the Study of Alternative Education in South Africa (PRAESA) to lay on a mini science show as part of the launch of the children's book written by Lucy Hawking and her famous father, *George's Secret Key to the Universe*, which has been translated into several South African languages.



Gregor demonstrates the effects of atmospheric pressure



Molo Mhlaba performing their welcome song and dance

The event was attended by several hundred pupils from surrounding schools, each one of whom left with a copy of the book after having had passages from it read to them by the very woman who translated it into isiXhosa, UCT School of Education's Xolisa Guzula. According to the organisers, however, the highlight of the afternoon was the series of interactive science shows. Students ranging from 4 to 14 years old were treated to a variety of demonstrations and hands-on experiences – a ball "floating" in an air stream, cans being crushed by nothing more than the atmosphere, home-made

divers in water bottles which sank or rose apparently in response to commands in isiXhosa, and liquid nitrogen and water propelled rockets which went WHOOSH!! and disappeared high over the roof tops, never to be seen again.

Molo Mhlaba in Khayelitsha is one of a "network of Pan-African low-fee independent private schools for girls, providing quality STEAM education through innovative teaching and learning strategies" (<https://www.facebook.com/molomhlaba/>). Given the school's strong emphasis on science and mathematics, Director Rethabile Sonibare was very happy to have established a link with UCT Physics and is keen to maintain the contact.



Khayelitsha learners watch in amazement as Lizelle uses Bernoulli's principle to "float" a ball in the air stream



Liquid nitrogen rocket launch—the instant before take-off.



Xolisa Guzula, UCT School of Education, who translated George's Secret Key to the Universe, introduces learners to the book.

Last Laugh

