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DECEMBER
2018

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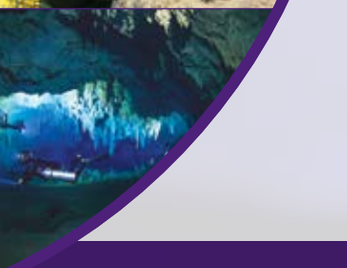
CONTACT

Newsletter for Faculty of Science









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DISCOVER A WORLD OF OPPORTUNITIES

Message from the Dean

Welcome to the 2018 edition of "Contact", the Science Faculty newsletter that aims to keep alumni and other friends of the Faculty informed about news and activities over the year.

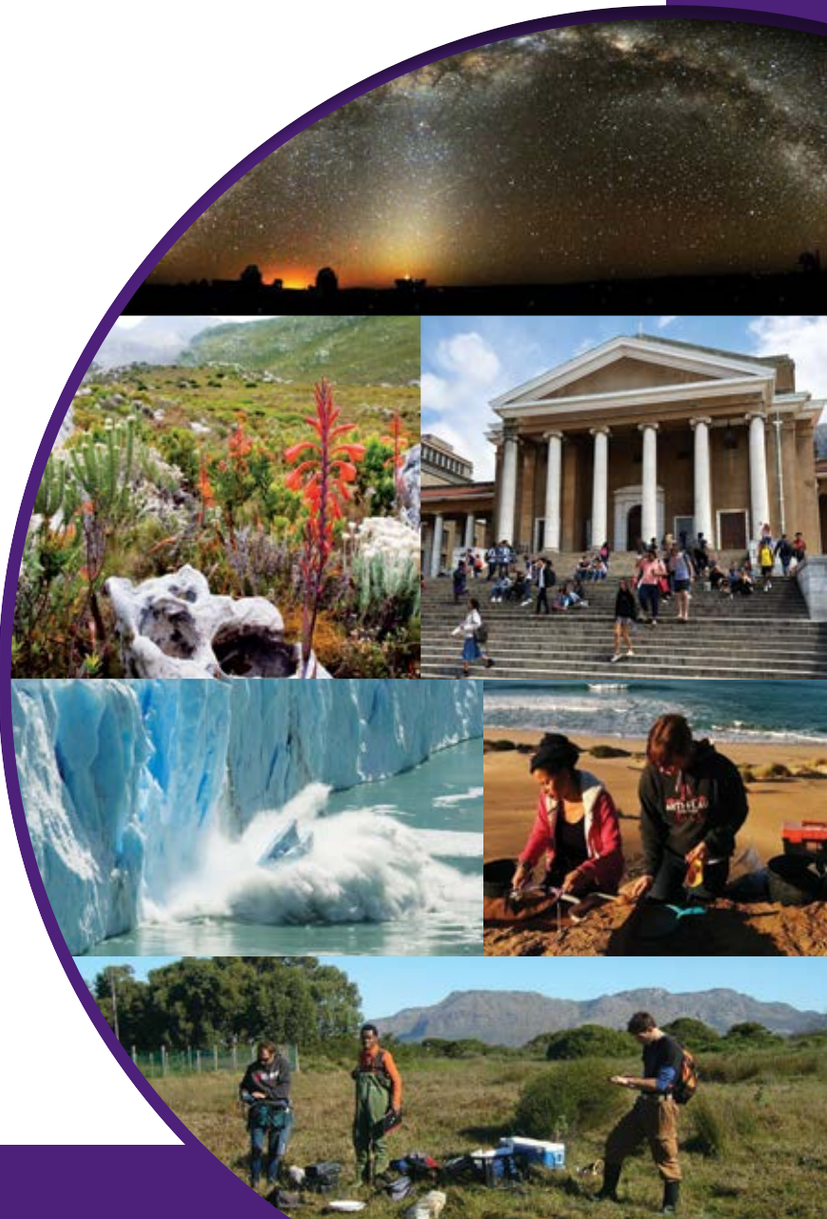
2018 began with an intake of new students into both undergraduate and postgraduate degrees. The academic year proceeded without interruption and final examinations took place in November. The traditional graduation pattern has been changed so that undergraduate students will graduate in April 2019, but a large number of Science Master's and Doctoral students will graduate at a ceremony in December 2018.

In this newsletter you will find highlights of the achievements of staff and students across the spectrum of sciences studied at UCT. Research continues to thrive in the Faculty; the range and scope of research projects are far too numerous to report on individually. As you will see captured here, much of the research in the Faculty continues to address issues of importance to Africa and to make the most of UCT's unique geographical position. This research is balanced by other curiosity-driven work into questions such as the origins of the universe, the evolution of human ancestors, and other topics of interest in the international arena.

Staff and students continue to accumulate accolades and prestigious national and international recognition. Dr Gregor Leigh received the Distinguished Teacher Award in 2018. Professor Kelly Chibale became out latest staff member to be A-rated by the NRF, a recognition that he is considered by his peers to be an international leader in his field. Professor Michael Meadows was inducted into UCT's College of Fellows in recognition of his research achievements, while Dr Sarah Fawcett received the College of Fellows Young Research Award for her significant contributions to research in her field. A particularly notable achievement was the Hamilton Naki Award made to Professor Ed February for his role in the development of nature reserves.

It has been my honour and privilege to serve as Interim Dean of the Science Faculty in 2018. I am pleased to advise you that Professor Maano Ramutsindela has been appointed as Dean from 2019. The Faculty will continue to grow from strength to strength under his leadership.

Susan Bourne
DEAN OF SCIENCE



Staff Achievements and Awards

2018 South African Institute of Physics (SAIP) Gold Medal

Professor Patricia Whitelock, Department of Astronomy was awarded the 2018 South African Institute of Physics (SAIP) Gold Medal for her outstanding research career in astronomy and astrophysics and her distinguished and extensive contributions to leadership, education and human capacity development of the Physics and Astronomy community. Her research is focused on understanding the late stages of stellar evolution and mass-loss of evolved stars, the structure of the Milky Way galaxy and the stellar content of the local group galaxies. Professor Whitelock helped establish the National Astrophysics and Space Science Programme and she was one of the key drivers behind the successful bid by South Africa to host the International Office of Astronomy for Development of the IAU.

Award for world class research despite challenges

At the National Research Foundation (NRF) Awards ceremony, where leading researchers in their respective fields were recognised, **Professor Ed February**, Department of Biological Sciences, received the Hamilton Naki Award, which honours individuals for achieving world-class research performance despite considerable challenges. Professor February's award citation acknowledges the pivotal role he played in directing the funding of ecological research and in the development of nature reserves. The award states, "He has garnered numerous awards and fellowships, including a gold medal for his work in the protection of biodiversity of the Cape Floristic Region".

Members of the Academy of Science of South African

Professors Kelly Chibale and **Kevin Naidoo** were honoured among 20 of South Africa's leading scholars and scientists inaugurated as Members of the Academy of Science of South African (ASSAf). Chibale's Drug Discovery and Development Centre (H3D) pioneers world-class drug discovery in Africa and he has become known for his pivotal work on malaria. He is a professor of organic chemistry and a member of UCT's Institute of Infectious Disease & Molecular Medicine. (IDM) Naidoo holds the DST/NRF SARChI Chair in Scientific Computing and is director of the Scientific Computing Research Unit in Chemistry. He uses informatics and computer-modelling techniques to interrogate data and simulate complex molecular processes in disease.

Accolade for being one of world's most highly cited researchers goes to Emeritus Professor William Bond

Congratulations to **Emeritus Professor William Bond**, Department of Biological Sciences, on being named a Highly Cited Researcher for 2018. He is among an elite group recognized for exceptional research performance demonstrated by production of multiple highly cited papers that rank in the top 1% by citations for field and year in Web of Science. The distinction earned derives from peers who have regularly acknowledged the influence of Professor Bond's research contributions in their publications and citations.

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The Minister's Special Award in the field of astronomy at the South African Women in Science Awards (SAWISA) 2018

Chair of Astronomy **Professor Renee Kraan-Korteweg** flew the flag with distinction for the Science Faculty when she won the Minister's Special Award in the field of astronomy at the South African Women in Science Awards (SAWISA) 2018. The award went to Renee in recognition of her "outstanding contribution to building South Africa's scientific and research knowledge base in advancing the field of astronomy". She was recognised for distinguishing herself in the field of South African radio astronomy by advancing the science of radio astronomy through her scientific contributions. Furthermore she was lauded for success in training the next generation of radio astronomers and for helping to elevate radio astronomy as a strategic research field.

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."

$500 000 National Academies Keck Futures Initiative (NAKFI) Challenge grant

Dr Melissa Densmore, Department of Computer Science, received a $500 000 National Academies Keck Futures Initiative (NAKFI) Challenge grant. Densmore is one of a group of four researchers across the globe who will be using these funds to address maternal and child health issues through a digital communication project. Melissa has been involved with a variety of healthcare projects around the world. These include developing a delay-tolerant tele-consultation system for doctors in Ghana, and infrastructure contributions to enable village health centres to consult with doctors at a local hospital.

Meadows inducted into UCT College of Fellows

Professor Michael Meadows, Department of Environmental & Geographical Science, was inducted into UCT's College of Fellows in recognition of his research on the Quaternary palaeoenvironments of southern Africa, which have made significant contributions to an understanding of the changing climates and associated environmental conditions in the region.

2018 recipient of the Piers Sellers 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.

Faculty Staff represent

SA on International forums:

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.

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.

NSTF AWARDS

The University of Cape Town's top scientific minds dominated at this year's National Research Foundation (NRF) Awards ceremony, accounting for 11 of the 37 academics honoured at the prestigious annual event.

P ratings, are awarded to upcoming researchers younger than 35 who have held a doctorate or equivalent qualification for less than five years at the time of application, and who are considered potential future leaders in their fields internationally. Two went to UCT scientists at this year's event:

Dr Sarah Fawcett, from the Oceanography Department has a research interest in the ocean's biogeochemical cycles, which stems from a desire to understand the connections between the different components of Earth's climate system. Her primary research field is Earth and Marine Sciences, and she obtained her PhD from Princeton University in 2012.

Dr Geoffrey Howarth, from the Department of Geological Sciences is an ingenious petrologist, and his interest lies in the evolution of ancient three-billion-year-old cratonic regions through the study of kimberlites, mantle xenoliths, diamonds and continental flood basalts. In recent years, he has expanded his research in applying his knowledge as a terrestrial petrologist to the study of Mars through the use of meteorites.

A ratings, which demonstrate unequivocal support by their peers for scientists as leading international scholars in their fields of expertise, and for their high quality and impact of recent research outputs, were awarded to:

Professor Kelly Chibale, Department of Chemistry in the Science faculty.

Professor Hans-Peter Kunzi, Department of Mathematics and Applied Mathematics in the Science faculty.

Professor Edward Rybicki, Department of Molecular and Cell Biology in the Science faculty.

Dr Sarah Fawcett,
researcher and lecturer in the Department of Oceanography, has been elected to the South African Young Academy of Science (SAYAS) - an organisation which aims to be the voice of the country's young scientists, helping to bridge the gap between science and society.

Fellows of AFRICAN ACADEMY OF SCIENCE

Professors Susan Bourne, Department of Chemistry, and **Michael Meadows,** Department of Environmental & Geographical Science, have been elected as Fellows of the African Academy of Sciences (AAS).

The AAS recognises excellence through the election of scientists into AAS Membership as Fellows, recognising them as world class research leaders.

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.

World Rankings

50

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.

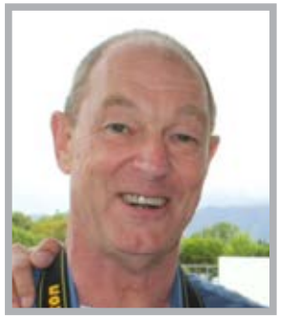
1

The Astronomy Department at UCT is ranked no. 1 in Africa & no.149 in the world in 2017/2018

according to the University Ranking by Academic Performance (URAP) metric in Astronomy and Astrophysics, based on five years of data (2012-2016). The extensive international research network is one of UCT Astronomy's strengths (ranked 130 in the world based on their international collaborations).

Distinguished Teacher Award

Gregor Leigh, a Physics lecturer, was one of four 2018 Distinguished Teacher Award winners. He taught 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.



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STUDENT Awards & Achievement

L'Oreal UNESCO WOMEN IN SCIENCE
Award for ornithologist

Postdoctoral Fellow **Dr Petra Sumasgutner** from the FitzPatrick Institute of African Ornithology recently received a L'Oréal UNESCO Women in Science award, awarded by the Austrian Academy of Science. The project Petra received the award for is entitled: "From fundamental research to applied conservation: Is a genetically distinct population of Golden Eagles (Aquila chrysaetos daphanea) threatened through extensive wind farm development in Kazakhstan and Mongolia?" This is a collaboration between herself, the Natural History Museum of Vienna, Austria, **Megan Murgatroyd** (Fitz post-doc) and **Shane McPherson** (UKZN post-doc and field technician in the Black Sparrowhawks Project at the Fitz).

Royal Society of Chemistry Award for INSPIRATION

Dr John Woodland, a Postdoctoral Fellow in the Department of Molecular & Cell Biology, 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 Royal Society of Chemistry 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 received the award in London—Congratulations John!

QUEEN'S YOUNG LEADER AWARD
for Science student

Siposetu Mbuli, a final year BSc (Chemistry and Oceanography) student with albinism, was honoured for her work with people living with albinism, through her foundation Love, This Skin. Siposetu received her Queen's Young Leader Award, from Her Majesty the Queen of England, at a ceremony at Buckingham Palace.

The idea for Mbuli's foundation was born in 2016 when she and a friend were discussing their experiences growing up with albinism and what they felt should change. Their organisation had the aim of helping people with albinism see beyond the negative perceptions and the limitations placed on them, or those that they place on themselves. The foundation empowers, educates and supports people with albinism, as well as their families and communities, by hosting workshops, community awareness drives and by highlighting positive messages about albinism.

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MORE STUDENT AWARDS

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 …

Trystan Lambert pictured back right with SAIP President Professor Patrick Woudt, Department of Astronomy

Trystan Lambert - an Astronomy MSc student - NASSP who won the best honours talk in Astrophysics at the SAIP2018 annual conference.

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 MacAlister with her supervisor Professor Dr Samson Chimphango

Science students scoop BEST PRESENTATION AWARDS at SASAS 2018 Conference

At the annual Conference of South African Society for Atmospheric Science, which had the theme: "Interactions between the atmosphere and ocean", several Science Faculty students were awarded best poster presentations:

The winners left to right: Temitope S Egbebiyi, Luleka Dlamini, Arielle Stella Nkwinkwa Njouodo and Dr Ross Blamey with Professor Sivakumar Venkataraman, SASAS president

Temitope Samuel Egbebiyi, a PhD student from the Climate System Analysis Group, Environmental & Geographical Science Department, won the overall best poster presentation titled - "Potential impact of climate departure on crop suitability over West Africa."

Luleka Dlamini, a Masters student, from the Climate System Analysis Group, Environmental & Geographical Science Department, won the best poster amongst student presentations for her honours project titled "The impact of drought on sugarcane yields in KwaZulu-Natal, South Africa."

Dr Ross Blamey, a Research officer from Oceanography Department won the best Oral presentation titled "The contribution of atmospheric rivers to winter rainfall in South Africa."

Arielle Stella Nkwinkwa Njouodo, a PhD student from Oceanography Department won the best Student Oral presentation titled "The impact of Agulhas current on coastal south African precipitation." She also won the Jackson award for publication of the year.

Computer Science programmers win SOUTHERN AFRICA PROGRAMMING COMPETITION

85 teams from Angola, Ethiopia, Kenya and South Africa participated in the International Collegiate Programming Contest (ICPC) Southern Africa Regionals. The UCT team "Dysfunctional Programmers" com-prising second year students **Bronson Rudner, Yaseen Mowzer and David Broodryk**, was the first ever in South African regionals history to have solved all eight problems and even have an hour to spare! They will represent UCT at the world finals in Portugal in April 2019 where they will compete against about 140 other winning teams from other world regions.

Irfan Nunkoo with his supervisor Dr Cecile Reed

PhD student **Irfan Nunkoo,** Department of Biological Sciences, received an award for his poster at the International Congress of Parasitology in Daegu, Korea. Irfan's research is focused on using fish parasites as indicators of cryptic population structure in snoek around the coast of southern Africa.

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RESEARCH in the Faculty

DATING THE CRADLE:
new timeline sheds light on early human history

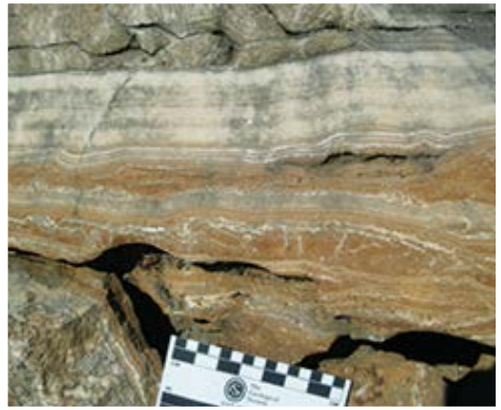
Robyn Pickering

New research from an international team of scientists led by **Dr Robyn Pickering**, an isotope geochemist in the Department of Geological Sciences, is the first to provide a timeline for fossils from the caves in South Africa's Cradle of Humankind – the world's richest site for fossils of our human ancestors. It also sheds light on the type of climate that our early ancestors lived in and how this changed in the past.

The research, recently published in the journal *Nature*, addresses assumptions that the fossil-rich caves of the Cradle could not be related to each other chronologically. It proposes that fossils in the region date to just six specific time periods. "Unlike previous dating work, which often focused on one cave, sometimes even just one chamber of the cave," says Pickering, "we are providing direct ages for eight caves and a model to explain the age of all the fossils from the entire region."

The results revealed that the fossils in the Cradle of Humankind date to six narrow windows of time between 3.2 million and 1.3 million years ago. **"Now we can link together the findings from separate caves and create a better picture of evolutionary history in southern Africa."** The flowstones are the key," says Pickering. "We know they can only grow in caves during wet times, when there is more rain outside the cave. "By dating the flowstones, we are picking out these times of increased rainfall. We therefore know that during the times in between – when the caves were open – the climate was drier and more like what we currently experience." "This is the most important advance to be made since the fossils themselves were discovered. Dates of fossils matter a lot."

Cradle of Humankind



Field photograph of massive flowstone layers from one of the South African hominin caves, with red cave sediments underneath. Photo: Robyn Pickering

The Cradle of Humankind, which lies about 50 kilometres northwest of Johannesburg is home to nearly 40% of all known fossils of our human ancestors, including Mrs Ples, the famous Australopithecus africanus skull, and Homo naledi. Using one of the oldest and most reliable methods of radiometric dating, known as uranium-lead dating, the research team analysed 28 layers of a type of rock that forms where water drips into a cave, known as flowstone. All of these layers of flowstone were found sandwiched between fossil-rich sediment in eight caves from across the Cradle.

"This means the early humans and their ancestors living in the Cradle experienced big changes in climate, from wetter to drier conditions at least six times between three and one million years ago. However, only the drier times are preserved in the caves, skewing the record of early human evolution.

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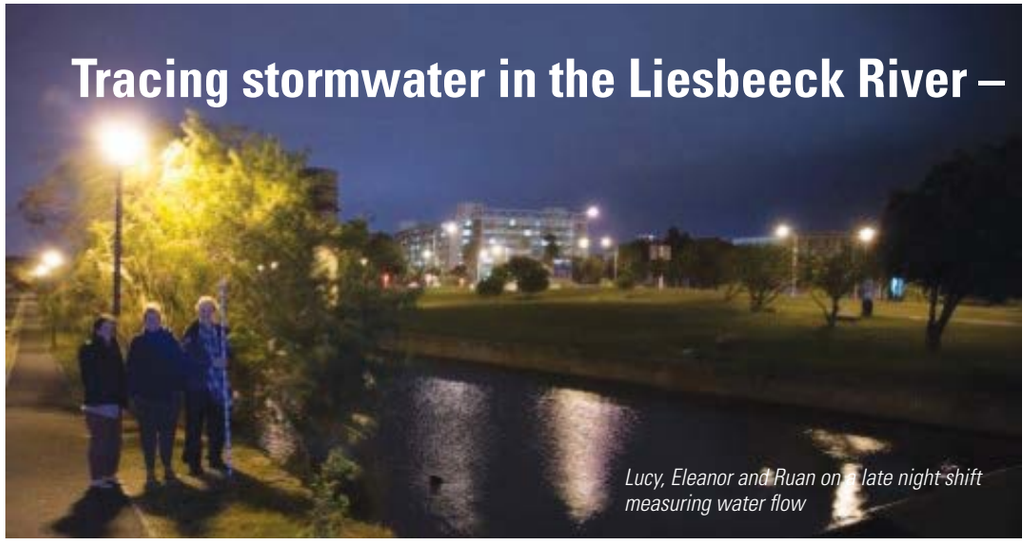


Lucy, Eleanor and Ruan on a late night shift measuring water flow

Before and After photos of the Liesbeeck River

STUDENTS' PASSION DRIVES SCIENTIFIC DISCOVERY

Three students from the Department of Biological Sciences: **Ruan van Mazijk, Lucy Smyth and Eleanor Weideman,** together with their supervisor **Associate Professor Adam West**, recently had a paper published in *WaterSA*. This paper looked at the source of water in the Liesbeeck River following a storm.

The paper "Isotopic tracing of stormwater in the urban Liesbeek River" is the product of an Honours module run in 2017 (the 'Day Zero' year) that looked at the source of water in the Liesbeeck River following a storm. Using Stable Isotopes, the team showed that almost all of the water in the river following a storm in a drought year, was recent rainfall, and not displaced groundwater, as had been shown in a previous study of a natural catchment in Jonkershoek in the Western Cape.

This finding indicates that this rainwater, falling on a hardened urban environment and then subsequently running through a highly canalized urban river into the sea, is effectively lost from the terrestrial system, without recharging groundwater. This suggests that utilizing this water in a storm capture project for aquifer recharge, or urban use, could benefit a water-stressed city without negatively compromising groundwater resources.

This research and outcome was notably remarkable for a one-week long Honour's module. Ruan, Lucy and Eleanor's engagement and dedication so impressed Associate Professor West that he suggested they write this up for publication after the module, under his guidance. The committed team of three duly did this and thereby gained their first exposure to the process of scientific publication and now have their first publication.

Associate Professor Adam West comments, **"I think this is a remarkable lesson in what is achievable in science, given a relevant question and the passion to see it through. The knowledge frontier is often closer than we think."**

How the world's smallest flightless bird got to Inaccessible Island

The story of the world's smallest flightless bird alive today begins on an inhospitable, isolated island in the middle of the southern Atlantic Ocean, aptly named Inaccessible Island. More than 2 500 kilometres from any mainland, the tiny Inaccessible Island, which is only 12 square kilometres, was formed by a now-extinct volcano. It is edged by sheer cliffs and a few rocky beaches and is uninhabited by people and mostly uninhabited by animals: no land mammals, reptiles, amphibians, butterflies or snails have been found there. But it is the only place where this little bird, the **Inaccessible Island rail *(Atlantisia rogersi),*** lives.

How the Inaccessible Island rail came to be on the island has been a matter of speculation for a decade. Earlier this month, a team of scientists from three continents, including **Professor Peter Ryan** and **Dr Martim Melo** from the FitzPatrick Institute of African Ornithology, in the Department of Biological Sciences, published research which cracks the mystery. Their results show that the Inaccessible Island rail probably originated from South America, where its closest living relative – the dot-winged crake – currently resides, more than 3 500 kilometres away. Modern genetic sequencing and one bird's DNA have revealed a new history of how the rail's ancestors accessed Inaccessible Island.

The researchers collected DNA from one male rail seven years ago and sequenced this using next-generation sequencing techniques and compared with DNA sequences from other species of rail, including from South America and Africa. By looking at the extent of the differences between the two birds' DNA and considering the amount of time it would take to accumulate these genetic changes, the researchers can tell that the Inaccessible Island rail probably immigrated around 1.5 million years ago. "Birds of the rail family are extraordinarily good at colonising remote islands," explains Professor Peter Ryan, who is also the living person who has spent the most time in the otherwise uninhabited Inaccessible Island, where he is currently on a three-month expedition.

"Finding themselves in an environment free of predators, the rails had no need to fly and could fully transition into their typical behaviour: skulking around in dense grass, like mice or rats," says Dr Martim Melo, a research associate at the FitzPatrick Institute of African Ornithology. When the birds arrived at the island, they found a place free of predators and abundant food. Because they no longer needed strong wings to survive, over time, they evolved into a flightless species – something not uncommon among rails. "We found that the birds did not walk by foot," said lead author Dr Martin Stervander of Lund University, now a postdoctoral researcher at the University of Oregon, in a media release. "They flew or were assisted by floating debris. Whether they flew all the way or were swept off by a storm and then landed on debris, we can't say. In any case, they managed to make it from the mainland of South America to Inaccessible Island."

The rails that live on Inaccessible Island have subsequently thrived and should continue to do so – as long as no predators are introduced to the island. Having no introduced predators is extremely rare among the world's oceanic islands.

Discovery of New Ocean Current

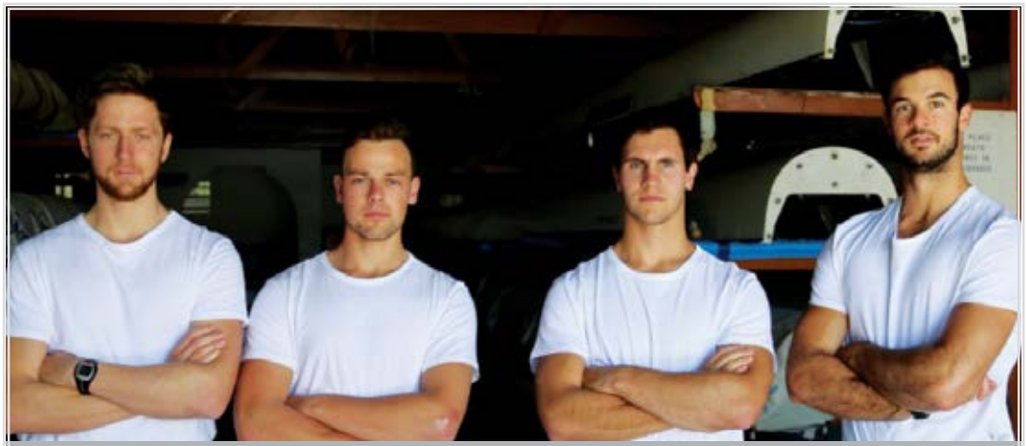
It's not often that PhD research makes world news. Department of Oceanography Doctoral candidate **Juliano Ramanantsoa's** discovery of a new current off south-west Madagascar has rounded off his doctoral research – and brought him and his co-authors international commendation. **The Southwest Madagascar 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" said Ramanansoa.

TRAVELS across the Globe



Matthew Boynton, Lee Gordon, Grant Soll and Cole Barnard

MAD 4 WAVES – Crazy Adventurers

Four (crazy!) young men from UCT are currently taking on one of the toughest endurance challenges: the Talisker Whisky Atlantic Challenge. They are rowing across the Atlantic Ocean in nothing but a rowing boat. The team MAD 4 Waves is made up of three engineering students, Cole Barnard, Lee Gordon, Grant Soll and **Matthew Boynton** a Physics Honours student. They are the only South African team entering the 2018 race and will be the youngest to ever have rowed across the Atlantic.

Team MAD 4 Waves set off from the Canary Islands on their 5500km journey across the Atlantic in December. They are taking on the extreme challenges of the Atlantic, with their sights firmly set on being amongst the first boats to arrive and embrace the crowds in Antigua. They have partnered with **MAKE A DIFFERENCE LEADERSHIP FOUNDATION** and will be raising funds with the objective of sponsoring a promising child through high school and raising funds to provide desks for 1000 learners across South Africa.

12.

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. **Dr Sarah Fawcett and Dr Katherine Hutchison,** 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 Ansorge 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."**

Firsts for the Science Faculty

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 for them to have the opportunity to discuss the research with the people who carry it out.

The Science faculty participated in the event this year for the first time. The UCT Club was abuzz for three evenings as UCT Postgraduate students and staff presented their research and engaged with the public and one another, 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 is 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.

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Events in the Faculty

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 Africa 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 trans-frontier parks and to give these communities access to trans-border natural resources, said Ramutsindela.

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.

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:

- ï Informal and social learning areas
- ï Communication hubs
- ï Venues for teaching and tutor/mentor-based cooperative learning activities
- ï A 'think tank' with a digital virtual wall.
- ï 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

Distinguished Alumni Lecture

OUR SMALLEST GENES AND CANCER

Pioneering Harvard University scientist and University of Cape Town (UCT) alumnus **Professor Frank Slack** returned to his academic roots to share groundbreaking research which holds the promise of new ways to cure cancer and other illnesses. Slack presented a lecture titled **"Our smallest genes and cancer – prospects for personalised medicine"** on 18 October, as part of the Faculty of Science's Distinguished Alumni Lecture Series.

Students and academics spanning three generations attended the lecture and were clearly inspired by the pivotal research outlined by Slack, the director of the Harvard Medical School Initiative for RNA Medicine. He graduated from UCT in 1987 with a BSc(Hons) in microbiology and biochemistry, before furthering his studies in the United States. He has been at the forefront of the discovery of a new class of non-coding genes known as microRNAs, which play a pivotal role in controlling important biological processes such as stem cell development, ageing and the progression of cancer.

"Cancer is a disease of our own cells, but also our own genes. When cells become cancerous they change their form and become resistant to drugs. They live much longer and divide more frequently. Scientists have been trying to work out how to kill these cells and, at the same time, leave the normal cells alone. With personalised medicine, it won't be too long in the future where every cancer patient will have their genome sequenced. Based on that, we can decide which drugs a patient should be taking."

Slack, who is known particularly for his work on lung cancer, which is resistant to almost every kind of drug, has been exploring personalised medicine in a bid to find targeted therapies for patients.

Together with his team at Harvard, he is passionate about bringing scientists and clinical trials together in this relatively new field, which holds so much promise. He described his ground-breaking work in microRNAs – the smallest known RNAs in our cells – which can be used as potential therapies in cancer. While proteins have traditionally been thought of as the building blocks and enzymes responsible for life, microRNAs are emerging as pivotal. "MicroRNAs are tiny regulators of other genes, including cancer genes, and are altered in cancer. They not only form part of the cancer process, but can be useful in diagnosing the cancer. We have ways to manipulate microRNAs and use them as therapeutics. We can inject them into people and they can work." According to Slack, the first clinical trials involving microRNAs are under way and could provide cancer therapies in the future.

Professor Slack sang the praises of the Science Faculty at UCT:
"I have been to the top institutions, but the workload here was incredible. I learnt so much. When I started my PhD in the US, I was extremely well prepared. My time at UCT had stood me in good stead and I thank my professors for the great start I got in academic life".

Professors Rybicki, Illing and Slack with Mariola Fouche

Professors Nicola Illing and Susan Bourne

15.

DISTINGUISHED VISITOR

to Science Faculty

Professor Ulrich Heinz, who is a Distinguished University Professor at Ohio State University (Columbus, Ohio, USA), spent two months in the Department of Physics at UCT as a Science Faculty Distinguished Visitor. He is a theoretical nuclear physicist who operates and works at the upper end of the energy range that nuclear physicists usually deal with. His special interest is what happens when you collide atomic nuclei with each other at very, very high energies. One can use these high energies to create new forms of matter. Professor Heinz is particularly interested in creating, studying and understanding quark-gluon plasma – a new state of matter that exists at extremely high temperatures and density.

The experiments Professor Heinz works on are mostly done at the Relativistic Heavy Ion Collider (RHIC) in the USA and the Large Hadron Collider (LHC) at CERN in Europe. South Africa and the Physics Department at UCT has a special relationship with CERN – initiated by **Emeritus Professor Jean Cleymans** and presently co-coordinated by **Dr Will Horowitz**, both in the Physics Department.

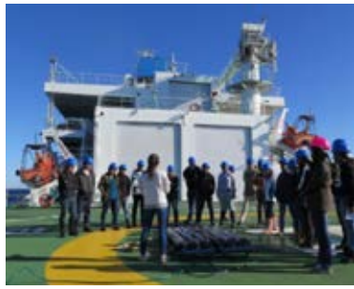
Advancing the science of measurement – launching MeASURe in the Physics Department

The Metrological and Applied Sciences University Research Unit (MeASURe), recently launched officially in the Department of Physics, will play a crucial role in boosting the prominence of measurement-based research in South Africa. Focused on applications which require novel measurement techniques, the new unit is working with the National Metrology Institute of South Africa (NMISA) on instrumentation that will lead to new standards for current and mass in the country.

This emerged at the launch event in August, at which unit director **Professor Andy Buffler** explained that their research focuses particularly on novel measurement techniques using neutron and gamma radiation, and nanoelectronics at ultra-low temperatures. The research also homes in on advancing the fundamental reference standards for measurement. "It is an appropriate time to launch MeASURe," he said, "since we are presently witnessing a redefinition of the SI base units which underpin all measurements." In the redefined International System of Units (the SI), all seven of the base units – the kilogram, ampere, kelvin, mole, second, candela and metre – will have reference to seven fundamental constants of nature. These include the speed of light in a vacuum, the Planck constant, the elementary charge, the Boltzmann constant, and the Avogadro constant.

The research unit was officially opened by Ndwakhulu Mukhufhi, the CEO of NMISA, at a dinner attended by 80 guests. Postgraduate students developed a board game about measurements that was played at the event. Buffler said their research not only focuses on using applications of interesting measurement techniques, but also on advancing the science of measurement itself. "That is unique for UCT and South Africa." The department's laboratories and renovated teaching labs have become a drawcard for students wanting to study at UCT. "More and more graduate students are choosing to work in these areas now that they can do real hands-on physics within the building." he said. The students also have the opportunity to interact with international collaborators involved in the range of research projects offered through MeASURe. "We envisage the unit to grow to become a portal into UCT for problems which require novel measurement-based solutions." MeASURe is also spreading the message about the value of laboratory work in science education. The unit will provide services for metrology education, both in industry and science laboratory teaching at school.

SEAmester continues to grow…

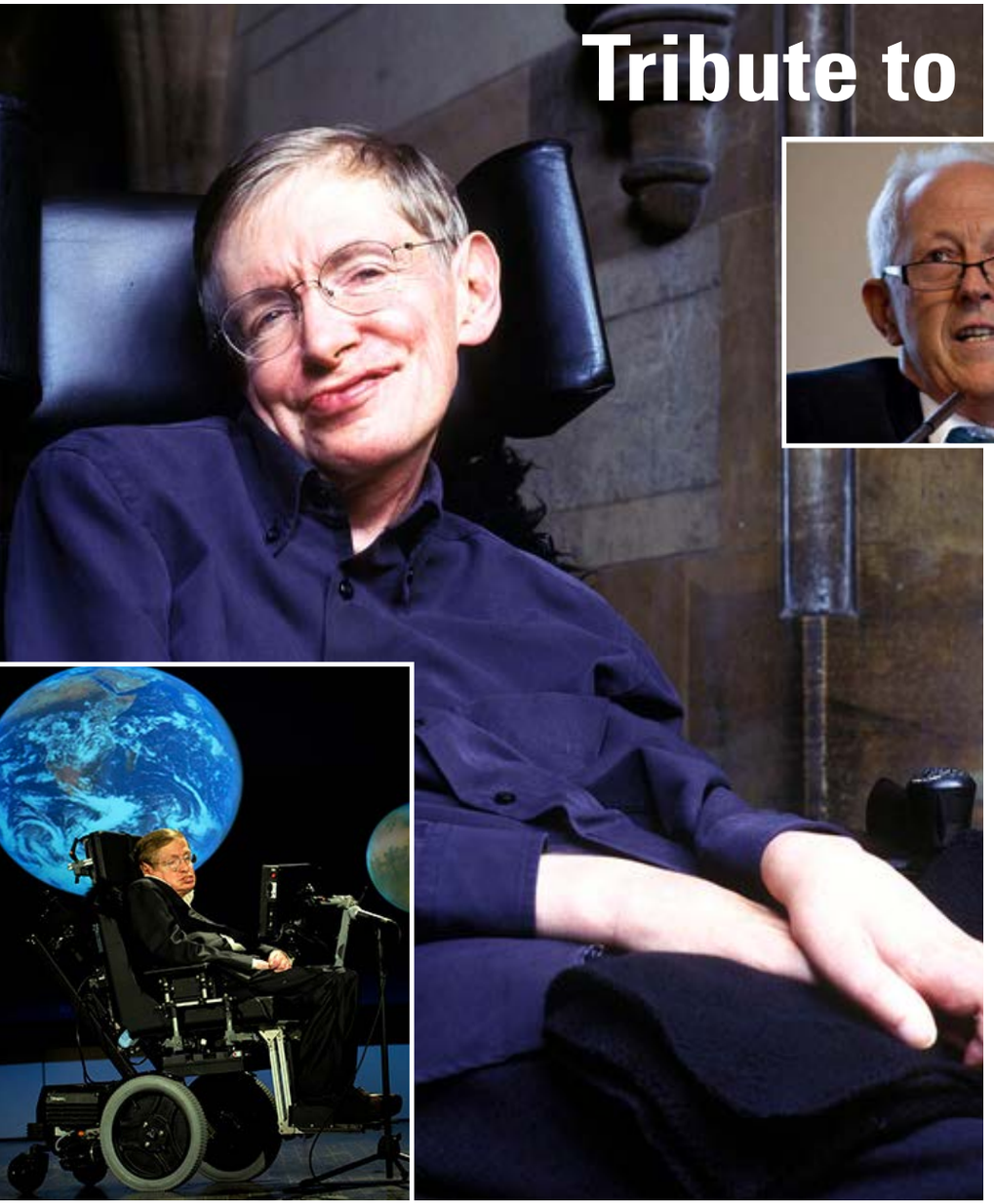


During July, the floating university SEAmester took to the seas again for the third time. SEAmester introduces marine science as an applied and cross-disciplinary field to students who have shown an affinity for these core science disciplines. It combines traditional class-room lectures with hands-on-ship-based 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 organiser of SEAmester **Associate Professor Isabelle Ansorge**, "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" she said.

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. This year they were 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 and observing the most amazing star shows!

Tribute to STEPHEN HAWKING



by Emeritus Professor George Ellis

Stephen Hawking, who passed away on 14 March 2018, 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

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Physics hosts Summer School to

CELEBRATE 10 YEARS OF SA-CERN

The Department of Physics recently hosted a two-week Summer School to celebrate 10 years of the SA-CERN collaboration. It was a busy two weeks of lectures, tutorials, discussions and interactions for students from across academic institutions in South Africa (WITS, Walter Sisulu, University of Johannesburg, University of Venda, Stellenbosch University) who have an interest in particle physics, both theoretical and experimental.

The summer school strived to get students connected and inspired about Particle Physics. Participants were taken to iThemba LABS – which is a unique facility, like no other on the continent. For many students this was their first glimpse of fundamental physics.

The summer school focus was on considering the fundamental constituents of matter and their features – specifically focusing on the few micro seconds after the Big Bang. Questions about the origins of the universe, how it all come about, what the history of what it went through is and how we engage with it through theory and experiment were raised. Students were encouraged to consider how we verify and develop well founded theories which can be tested and falsified. **Associate Professor Heribert Weigert,** who co-ordinated and organised the summer school, commented that not many Physics departments in South Africa combine experimental and theoretical physics and that this is really crucial to broaden world horizons.

The hope embedded in running a summer school such as this is that it would inspire students to pursue studies in this field. They would like to run more summer schools and workshops and utilise the SA-CERN funding to provide activities on a regular basis.

Part of their outreach goals would be to work with universities who don't have Physics departments offering studies in particle physics and also to work with high schools around the country, creating awareness of the field. This is part of a national long-term strategy to increase the pipeline of students into this important field of Physics.

Outreach: Growing Science in our Community

Physics entertains learners at LUCY & STEPHEN HAWKING BOOK LAUNCH IN KHAYELITSHA

Molo Mhlaba Primary School in the far-flung part of Khayelitsha, is one of a "network of Pan-African low-fee independent private schools for girls, providing quality STEM education through innovative teaching and learning strategies"

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

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 WHOOOSH!! and disappeared high over the roof tops, never to be seen again.

Turning "So near, yet so far" into "Close & getting closer": THANDOKHULU SCIENCE INITIATIVE

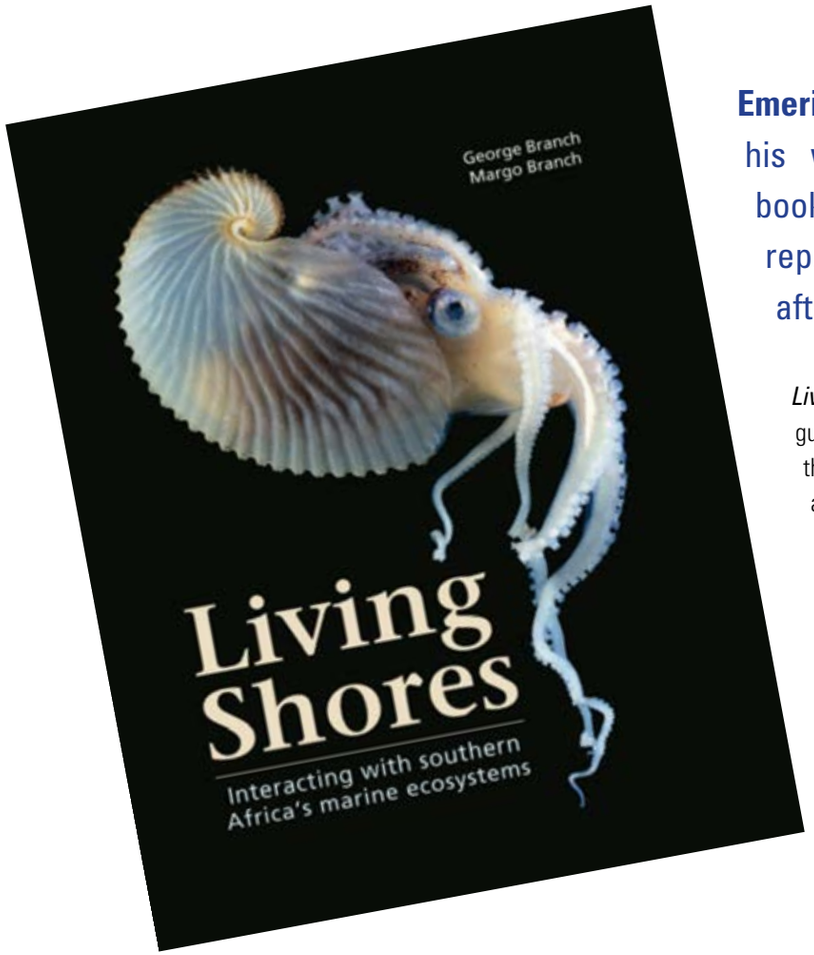
An exciting new initiative was recently started up by **Drs Barnett, Ngubane** and **Sunassee** from the Chemistry Department, and supported by keen postgraduate students within the Science faculty. Thandokhulu High School is just over the road from Dr Ngubane's Forest Hill room in Mowbray, at the doorstep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

The Thandokhulu Science Initiative (ThaScI) provides extra help to learners at Thandokhulu High School (THS) in their Science Curricula. Every Saturday morning 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 targeting learners from Grade 12, but the hope is that this will ultimately extend to younger grades.

The first session was held in May and 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 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…?

Books in the Faculty



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. Rocky shore, estuarine & coastal ecology; fisheries management & policy; impacts of mining; marine protected areas

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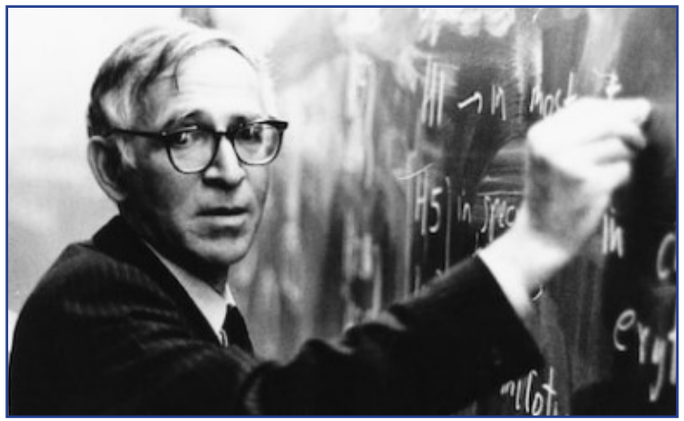
In Memorium



Sir Aaron Klug, one of the Science Faculty at UCT's most illustrious alumni, who obtained a Masters' degree in Physics at UCT, passed away in November, aged 92.

Professor Klug won the 1982 Nobel Prize in Chemistry for his development of crystallographic electron microscopy and his work in charting the infinitely complex structures of chromosomes, the body's largest molecules.

Klug was born in Zelvas, Lithuania, but was brought to South Africa at the age of two. After completing his schooling at Durban High School, and aged just 15, he won a scholarship to the University of Witwatersrand where he completed a BSc degree. He then decided to specialise in Physics and completed a Masters' degree in Physics at UCT, where he demonstrated in the laboratories to fund his studies. While at UCT he worked closely with Professor RW James, the X-ray crystallographer. After completing his MSc, he stayed on at UCT working on X-ray analysis of small organic compounds and developed a method of using molecular structure factors for solving crystal structures. During this time, Klug developed a strong interest in the structure of matter and how it is organised and took up a scholarship to study towards a PhD at Trinity College, Cambridge.

There X-ray photographs of molecules fascinated him and he studied the virus and was able to map out the general outline of its structure. He later became joint head of Structural Studies in the Medical Research Council Laboratory of Molecular Biology. His work led to the establishment of several biotech companies and the Wellcome Sanger Institute, a spin-off of the MRC laboratory founded as a DNA sequencing centre to participate in the Human Genome Project.

He was elected a Fellow of the Royal Society in 1969 and was knighted in 1988 and appointed to the Order of Merit in 1995.

He married Liebe Bobrow, a dancer and choreographer whom he met in Cape Town. She survives him with a son.

Keep Connected - Stay in Touch - Keep Connected

We value regular contact with our alumni, so please emails us on **katherine.wilson@uct.ac.za** We would like to hear about what you are doing with your Science degree in order for us to inspire a young generation of potential scientists and build career profiles of opportunities for Science graduates.

We would also like to cover interesting initiatives you are involved in, in future *Contact* newsletters.

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