December 2018 Faculty of Science University of Cape Town Vol. 7 Issue 2

Science Matters

Science Faculty Newsletter

Message from the Dean

As we approach the end of 2018, there are many things to celebrate in the Science Faculty. In this newsletter you'll find stories about some of the remarkable achievements of students and staff in the Faculty.

As I write this, the Deputy Dean and student advisors are working with Faculty Office staff to finalise the results of some 2,200 undergraduate and 1,000 postgraduate students for 2018. We are grateful to all staff involved in the teaching, support and administration of courses this year. Those students who have completed their degrees now will graduate in April 2019.

The December graduation ceremony will see 101 Masters and 38 PhD students receive recognition for the hard work that goes into achieving a postgraduate degree. This graduation period will also see the official robing ceremony of UCT's new vice-chancellor, Professor Mamakgethi Phakeng.

In 2018 we completed an academic year without disruption. For many this was a welcome relief after several years of turmoil. In the newsletter you will find an essay by the Assistant Dean for Student Support reflecting on what is required of students, and of the university, in the 21st century.

It has been my great honour and privilege to serve as Interim Dean during 2018, and I am grateful for the good will and support that I have received over this year. I wish everyone in the Faculty every success in the coming years, and I am confident that you will give the incoming Dean, Professor Maano Ramutsindela, your full support. The Faculty will be in good hands.

Susan Bourne

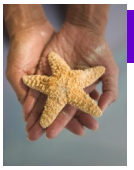
NRF Hamilton Naki award for Professor Ed February

At the recent 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. This award is named after a self-taught surgeon who trained generations of medical students in surgical techniques, and 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".

Endorsing February's nomination, VC Professor Mamokgethi Phakeng said he had overcome significant difficulties in his life to rise through the academic ranks and become an international leader in the field of plant ecology. "His research record is impressive by any standards but is astounding given that he did not get to complete his PhD until the age of 42, mainly because his early attempts to gain tertiary education were scuppered due to his involvement in the 1976 student uprisings," she wrote.

Professor Michael Meadows was inducted into UCT's College of Fellows in recognition of his research achievements. His research on the Quaternary palaeoenvironments of southern Africa has made significant contribution to an understanding of the changing climate and associated environmental conditions in the region.



Our Science Stars:

Special award in Astronomy for Professor Renee Kraan-Korteweg

Chair of Astronomy **Professor Renee Kraan-Korteweg** flew the flag with distinction for the Science Faculty at UCT 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. Further 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.

ASSAf honours scientists from UCT Science Faculty

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.

Using Computers to improve lives

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 teleconsultation system for doctors in Ghana, and infrastructure contributions to enable village health centres to consult with doctors at a local hospital.

"I decided I wanted to use my computing skills to help people and to address issues of global poverty, malnutrition, health", she said. Through these projects, Melissa found herself networking with academics and researchers from across the globe and based on their work, the group came up with the idea of empowering mothers in low-literacy and low-income communities to share healthcare information among themselves through a locally-available digital channel, which they named "Digital Street Theatre". The plan with Digital Street Theatre is to address the problem of maternal health education by empowering women to create their own educational content, then share it among one another using technology with which they are comfortable.

Astronomy Department ranked number 1 in Africa

The Astronomy Department at UCT is ranked number 1 in Africa and number 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). Congratulations!

UCT scientists shine at NRF 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.

Professor Hans-Peter Kunzi, Department of Mathematics and Applied Mathematics.

Professor Edward Rybicki, Department of Molecular and Cell Biology.

Profs Kelly Chibale and Ed Rybicki at the awards (1st & 2nd from left)

Oceanographer joins South African Academy of Science

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.

Sarah, who has recently been recognised with a P-rating from the NRF and a 2017 Claude Leon Merit Award, is interested in understanding the complex relationship between biogeochemical fluxes and primary productivity in the ocean. These processes have implications for past and future climate, ecosystem structure and function, ocean fertility and global biogeochemical cycles.

Election to African Academy of Sciences Fellowship

Congratulations to **Professors Susan Bourne** and **Michael Meadows,** who have just 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.

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 where they had to submit solutions to programming problems in a 5 hour period. The contest was unusually tough with only 32 teams submitting at least one correct solution. The UCT team "Dysfunctional Programmers" comprising second year students **Bronson Rudner**, **Yaseen Mowzer** and **David Broodryk**, (pictured left) 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.

Best Honours talk in Astrophysics

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

(Trystan is pictured back right—with SAIP President Prof Patrick Woudt, HOD of Astronomy)

Science students scoop best presentation awards at SASAS 2018 Conference

Science faculty post graduate students and staff recently attended the 34th Annual Conference of South African Society for Atmospheric Science. This year's conference theme was "Interactions between the atmosphere and ocean." Students who were awarded best poster presentations:

The winners, 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.

Biological Sciences student doing us proud!

Congratulations to PhD student **Irfan Nunkoo**, pictured right, with his supervisor **Dr Cecile Reed**, who 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.

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, 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 empower, 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.

L'Oreal UNESCO Women in Science Award for ornithologist

Petra on stage being interviewed about Golden Eagles

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).

Petra was accompanied by Post-doc Megan Murgatroyd and field assistant Shane McPherson on a trip to Mongolia to sample Golden Eagles *Aquila chrysaetos* and to fill the data gap on their genetic diversity. The team worked closely with the Kazakh Eagle Hunters and were able to gather over 100 Golden Eagle feather samples in the month that they were in Mongolia. Their host Taurekol introduced them to Kazakh culture and eagle hunter families. Traditionally Golden Eagles are either taken from a nest or are trapped as passage birds in their first year and are released back into the wild after several hunting seasons.

Shane McPherson and Petra Sumasgutner sampling a captive Golden Eagle

STAFF NEWS

Welcome to new staff in the Faculty

Chemistry
- **Martina Mayiya**—Admin Assistant

Computer Science
- **Dr Josiah Chavula**—Lecturer

H3D
- **Dr Jean Dam**—Chief Scientific Officer
- **Dr Preshendren Govender**—Principal Scientific Officer
- **Dr Lutete Khonde**—Chief Scientific Officer

Geological Sciences
- **Mrs Elretha Roos**—Admin Assistant

Mathematics & Applied Mathematics
- **Ms Aateefa Ansary**—Admin Assistant

Statistical Sciences
- **Mr Sulaiman Salau**—Lecturer

Farewell to staff

ACDI
- **Dr Dian Spear**
- **Ms Nomabelu Somatube**

Biological Sciences
- **Susan Mvungi**

H3D
- **Dr Colin Wilson**
- **Mr Duane Knowles**

Mathematics
- **Dr Robert Martin**
- **Sameya Esterhuizen**

MCB
- **Associate Professor Laura Roden**
- **Carin Liebenberg**

Retiring at the end of 2018

We wish them well on this new phase of life..

- **A/ Prof Simon Hall**—Archaeology
- **A/ Prof Mike Picker**—Biological Sciences
- **Mrs Sue Kuyper**-Biological Sciences
- **Mr Terry-Trinder Smith** -Biological Sciences
- **A/Prof Alan Hutton**—Chemistry
- **Mrs Salegga Valley**—Computer Science
- **Prof Steve Richardson**—Geological Sciences
- **A/ Prof John Compton**—Geological Sciences
- **A/ Prof Alexander Lanovsky**—Mathematics
- **Dr Henri Laurie**—Mathematics
- **Ms Madhu Chauhan**—MCB
- **Mr Ullrich Mutzeck**—MCB
- **Prof Graham Barr**—Statistical Sciences
- **Ms Letitia Njilo**—P&S—Geological Sciences
- **Mr Sammy Boysen** - P&S—PD Hahn

Long Service Awards

Congratulations to the following staff on their long service awards and staying power at UCT!

15 years:

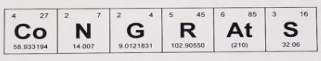
Mrs Joanne Polzin	Chemistry

25 years:

Ms Yolande Burrows	MCB
Dr Dalielah Jappie	Chemistry
Claire Lawrence-Naidoo	Chemistry
Mrs Pei-Yin Liebrich	MCB

35 years:

Mr Gerald Hesselink	Chemistry



Promotions in the Faculty:

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

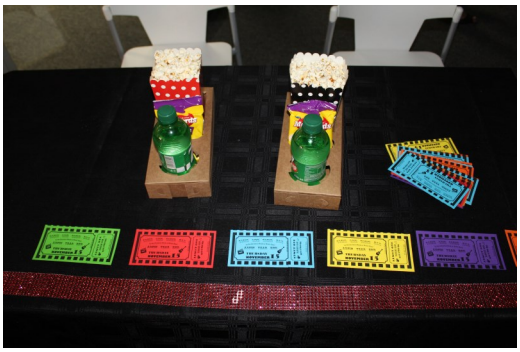
Department	Title	Name	Promoted to
Biological Sciences	Assoc/Prof	Michael Cramer	Professor
Chemistry	Dr	Anwar Jardine	Associate Professor
Chemistry	Mr	Abduraghman Gamieldien	Chief Scientific Officer
Computer Science	Dr	Maria Keet	Associate Professor
EGS	Dr	Piotr Wolski	Chief Research Officer
Geological Sciences	Dr	Emese Bordy	Associate Professor
Geological Sciences	Dr	Johann Diener	Associate Professor
Mathematics & Applied Maths	Dr	Alvaro De la Cruz Dombriz	Senior Lecturer
Mathematics & Applied Maths	Dr	Juana Sanchez-Ortega	Senior Lecturer
MCB	Dr	Inge Hitzeroth	Associate Professor/Chief Research Officer
MCB	Mrs	Bronwyn Arendze-Bailey	Chief Scientific Officer
Oceanography	Dr	Sarah Fawcett	Senior Lecturer
Physics	Dr	Will Horowitz	Associate Professor
Physics	Dr	Tom Dietel	Senior Lecturer

Adfin Year End Event: Night at the Movies..

By Farhana Moodley

Faculty ADFIN meetings are held monthly to update our administrators largely on financial policies, processes and systems. Departmental administrative staff are encouraged to connect with each other to establish optimal working methods.

The format of the meetings are restrictive, however, and not conducive for connecting across departments. So, to address this gap, two initiatives were introduced this year, which enabled administrators to collaborate, creating improvements to the financial administration environment. A theme we held onto for 2018 is "**T**ogether **E**veryone **A**chieves **M**ore" and the Faculty Finance Team (Shaahid Champion, Blommie Filmer, Aisha Hassan, Aneeq Abrahams, Louen Kleinsmidt, Nadiema Taylor, Sweetness Dyule-Nozewu, Mymoena Shaik and Farhana Moodley) worked together to present an admirable game show for the ADFIN Team members. Using creative talents to establish a stylish movie theatre environment, staff were welcomed with special movie tickets, walked through to a popcorn stand and presented with their popcorn combo by Louen and Sweetness. The stunningly dressed up Ushers (Aisha and Mymoena) accompanied our guests to their seats. Entertainment followed with Shaahid (our Movie Director) and Aneeq (our in-house DJ) who led various movie quizzes, testing the audience on their knowledge of various entertainment genres. The event was enjoyed by all and created great camaraderie and team spirit!



MAD 4 Waves—Crazy Adventurers

Photo caption: Matthew Boynton, Lee Gordon, Grant Soll and Cole

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.

Did you know that fewer people have rowed across the Atlantic than have reached the summit of Everest, journeyed to the North Pole or ventured into space? 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.

Distinguished Alumni Lecture: Our smallest genes and cancer

Professor Slack giving the Science Faculty Distinguished alumni lecture

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.

Professors Rybicki, Illing and Slack with Mariola Fouche

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 groundbreaking 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 Illing and Bourne who welcomed people to the event

Alumni and Staff connecting after the lecture

Distinguished Visitor to the Faculty

Professor Ulrich Heinz, who is a Distinguished University Professor at Ohio State University (Columbus, Ohio, USA), is currently spending 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. Under the extreme conditions created in high-energy collisions between atomic nuclei, the normal type of nuclear matter that you have inside atomic nuclei dissolves into quark-gluon plasma which, scientists discovered, can be thought of as dense liquid. Quark-gluon plasma is in principle described by a quantum field theory called Quantum Chromodynamics, but this theory is notoriously difficult to solve. Professor Heinz therefore uses more phenomenological models that are rooted in Quantum Chromodynamics to build a bridge between this fundamental theory and the experimental data collected in the nuclear collision experiments. 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.

Why is Uli Heinz here at UCT?

Since the 1990 Chris Engelbrecht Summer School in Cape Town, organized by Professor Jean Cleymans, Uli has visited South Africa multiple times – he really loves the country and enjoys the science being done in South Africa. He also has personal connections with the department of Physics: **Associate Professor Heribert Weigert** was one of his first graduate students, **Professor Andre Peshier** was the student of a colleague he collaborated with, and **Dr Will Horowitz** was a PostDoc with a colleague at Ohio State University where he works. He has also known **Emeritus Professor Jean Cleymans** for a very long time, from his time in Germany. Uli keeps being drawn back to South Africa, coming for meetings and conferences, so he decided that he would like to spend the last two months of his 2018 sabbatical leave at UCT.

Uli has been fascinated by South Africa's peaceful transition from apartheid, and he is invested in trying to do what he can to strengthen education in the country and make science accessible to all. He is currently talking to various people and considering ways to contribute and make a difference as he approaches retirement. He explained how it is relatively easy for someone like him to be a global citizen and, in particular, travel to South Africa because of good funding sources available, while access to travel funds is much more restricted for colleagues here. Consequently, he also sees the SA-CERN partnership as critically important – because this type of partnership makes funds available for young South African scientists to travel abroad and to connect with other scientists. He describes CERN as an exciting 'hotpot' of science.

What does Prof Heinz enjoy about being at UCT?

He finds it exciting to see the growth and development that is happening in the Department of Physics and with the students. As an example he mentioned one of the students he met at a meeting organized by UCT physicists few years ago who is now doing a PhD at Oxford University. He said he is thrilled to see the spectrum of students who he will be teaching at the summer school happening in November.

Of course, one of the highlights for Uli has been enjoying the warm weather here while it is freezing cold in Ohio and Europe – and getting out and about with his wife. They already went away for two weekends to the Cederberg and Bontebok parks, and they found both of these places truly spectacular. He enjoyed the dramatic mountains and the wide open spaces where there are few people and very little development – something he just doesn't see often back home. Their remaining weekends are already fully planned out with similar trips to other natural wonders offered by the country!

Research Bytes

Dating the Cradle: new timeline sheds light on early human history

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."

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.

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

Tracing stormwater in the Liesbeeck River - students' passion drives scientific discovery

Before and After photos of the Liesbeeck River

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.

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

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."

New hope in fight against African Horse Sickness

Researchers in the Biopharming Research Unit (BRU), Department of Molecular & Cell Biology have created a promising new vaccine candidate to help prevent the devastating effects of African Horse Sickness (AHS) – and they're producing it in tobacco plants. "It's extremely immunogenic, and also produces neutralising antibodies when administered to healthy horses," said BRU director **Professor Ed Rybicki.** This means that while the vaccine works really well in initial tests, it must be tested against an actual outbreak of AHS before it can be sold. The results were published recently in the respected *Veterinary Research* journal.

Sue Dennis, (pictured above with horse) PhD candidate and lead author on the study, says the UCT version of an AHS vaccine carries none of the risks of the currently available vaccine. "We've used tobacco plants to produce four different virus proteins that automatically assemble to form a virus-like particle (VLP). It looks the same as the virus, just without any genetic material, so it cannot replicate or infect horses with the disease," she said. This VLP is the vaccine which, when injected into an animal, prompts the immune system to produce antibodies to the virus that will fend off the real thing, thereby protecting the animal from disease.

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

Inaccessible Island rail . Photo Peter Ryan

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.

Inaccessible Island, where the Inaccessible Island rail lives. Photo Peter Ryan.

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 American 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.

Out and about in the Faculty

Student Support in the Faculty by Associate Professor David Gammon

The context in which we teach, learn and do research has undergone seismic shifts in the last few years. There might have been a time when academics could assume that students came to university from high school in balanced good health, well-prepared for what lay ahead, and sufficiently well-resourced that they could focus on the matter at hand. However, though we have eager and good students, the current picture is far different. The Faculty remains highly sought after, annually attracting approximately 8000 applications for about 500 places. It is tough to get in, and students need an aggregate of above 80% in matric to be competitive. And the demographics have changed dramatically in comparison with 10 or 20 years ago: the 2018 first year intake included 30% white and 45% black students.

While the school system has pockets of excellence, we face a backdrop of a relatively inadequate school system in terms of quality education in mathematics and the sciences. So while our students have good matric grades, their preparedness for the demands of university studies are often in question. For many of our students, this is underpinned by debilitating psycho-social factors, stemming from backgrounds in poverty and the other stressors that are a feature of life in South Africa.

We realized some time ago that we cannot just ignore all of this, and need to develop a more holistic and comprehensive approach to supporting our students through their studies. Our approach is built on the idea that we should combine and integrate various strands of support: not assuming that the causality works in just one direction, such as an onset of anxiety or a depressive disorder leading to a drop in academic performance, but that the converse might also apply, where a student starts falling behind in their academic work, triggering despair, anxiety and maybe even full-blown depressive disorder.

We need to take account of the complex interplay between these factors, and offer students support in how to learn effectively, developing their sense of responsibility and resilience in managing their lives and studies, and also providing ready access to health services if these are required. This requires an effective partnership between the Faculty and the University at large, and this has been part of the underlying work that has had to be done.

Images of students out and about on Science Odyssey

Assistant Dean **Associate Professor David Gammon** now drives this programme, and is responsible not only for setting up and running a range of interventions, but also being available to students for personal consultations, with a view to referring them to appropriate professional services or simply helping them with down-to-earth suggestions or even just good, old-fashioned empathy and a listening ear.
So what have we done? Here are some highlights:

- The **Orientation Programme** has been reimagined.
- We have a strong cohort of **Student Advisors**, academics who are available to guide students through the process of putting together a coherent science curriculum, within the array of choices.
- A series of **weekly support groups** is run by the Assistant Dean
- **The "Science Winter School"**, or, more recently, a **"Science Odyssey"** is run. The concept is to provide an opportunity for first year students to spend a time away, in a residential, relaxed environment, where they are exposed to exciting science and scientists, and encouraged to develop their scientific thinking skills and re-imagine their lives in Science.
- **A psychologist in the Maths building**—a service available to all Science students
- **One-on-one, informal, drop-in counselling** is offered by the Assistant Dean
- Providing support for academics and the range of issues they face.

Postgraduate Students represent the Science Faculty at the first Muslim-led Research Expo

The Muslim Students' Association (MSA) Postgraduate Committee hosted a *Research Expo* recently, showcasing the research contributions made to academia by Muslim postgraduate students and staff from UCT, UWC and Stellenbosch University.

The *Muslim Research Expo* was geared towards promoting social cohesion through communicating research endeavors to the general public. Both attendees and adjudicators were particularly impressed with the captivating research and caliber of presentations that were made accessible to a diverse audience of non-specialists. While the Expo was not restricted to one faculty, the majority of the poster and oral presentations came from the Science Faculty at UCT. The array of research topics presented included the anti-cancer activity of *Kraaibos* extracts and garlic-based trisulfides as well as oceanography studies of the *El Niño* 2015-16 seasonal rainfall. Outstanding presentations in each category were awarded prizes accordingly. Guest speaker Dr Habib Noorbhai (Mr SA 2017 and UCT Sport Science post-doctoral fellow), spoke on the integration of humanitarianism within academia and society. Dr Zeenat Gaibee (Medical officer and trustee of Madina Institute, SA) shared insight on the perceived dichotomy between an academic scholar and faith.

MCB hosts movie screening

The Molecular and Cell Biology (MCB) Department recently hosted the screening of the documentary *Food Evolution*, from the Academy Award® nominee Scott Hamilton Kennedy and narrated by Neil deGrasse Tyson. Amidst a brutally polarized debate marked by passion, suspicion and confusion, the documentary explores the controversy surrounding genetically modified (GM) crops. It shows how easily misinformation, miscommunication, confusion and fear can overwhelm objective analysis when all sides claim to be on the side of science.

The screening was followed by a discussion, when Prof. Johan Burger (Stellenbosch University) and Mr. Tim Plasket (University of Cape Town) answered questions and commented on remarks made by the attendees. The main outcome was that scientists need to learn how to communicate better with a broad audience, trying to keep the conversation flowing and the public engaged.

You don't have to be Spielberg to make a good movie!"

In this digital age, with ever shorter attention spans, scientists need to use multiple media forms to communicate the excitement of their research.

With this in mind, the Science Faculty hosted a workshop where participants learned to use their cellphones and free editing software to create high quality video clips. The aim is to use these online to promote the science being done at UCT to a wider audience.

A/ Prof Adam West setting up a selfie shot for an exercise

Dr Adam de Beer, a film and video specialist, presented a 4 hour workshop which aimed to teach staff and students how to create compelling visual footage of their research. It was a hands-on workshop and the participants learned how to capture and edit their own footage, using only their cellphone.

Lessons learned in this pilot will be used in future workshops, and participants are encouraged to share the results with as wide an audience as possible.

Aspirant movie makers in One Button film studio

Science Career Café Event

The Career Service hosted a Science Career Café event—an evening of panel discussions where Science graduates and alumni discuss their work and career prospects for Science students. This event featured speakers from the WWF, Two Oceans Aquarium, CSIR, Distell, Auerecon and Cipla to name a few . The topics were: Careers with Biological Sciences; Careers with Maths and Physics; Careers in the Environmental Sector and Careers with Biochemistry, Chemistry and Microbiology.

Students attending the Career Café commented that they found the insight into work/ company culture, and making the transition from varsity to work, valuable. They also appreciated learning about the different directions that can be taken; the day-to-day description of job duties and how and which university skills are useful in the workplace. Participants commented that it was valuable to have young people sharing their work experience and that it is good to know that it is okay to have a degree which is broad. They also appreciated gaining information about how to actually get a job. Others comments were that they were glad to hear that "it is possible for a physics major to continue a career path in finance" and that the presenters showed a "more realistic view of a future in science—not just academia and research."



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

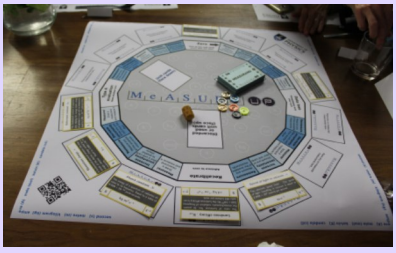
The Metrological and Applied Sciences University Research Unit (**MeASURe**), recently officially launched in the Department of Physics, will play a crucial role in boosting the prominence of measurement-based research in South Africa. Focused on applications which require novel measurement techniques, 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 on 29 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.

Assoc Prof Mark Blumenthal, who specialises in electrical metrology, demonstrates levitation at the launch.

The research unit was officially opened by **Ndwakhulu Mukhufhi,** the CEO of NMISA, at a dinner attended by 80 guests. Postgraduate students developed a 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 schools.

Participants playing the MeASURe game



The board game

Eager participants in the MeASURe game

Womxn in Physics making their mark

Women in Physics enjoying a lunch at the talk

The Department of Physics recently hosted a Womxn in Physics lunch to highlight the issue of under representation of women in Physics and to encourage current students to consider further studies in the field. At the event, two postgraduate students spoke about their journey in Physics and the lessons they have learned along the way.

Nasheeta Hanief, a solid-state physics doctoral candidate in the Nano-electronics research division encouraged and inspired with her story of choices and success in her field. Nasheeta started off with a BSc in Molecular & Cell Biology and then did an honours and master's degree in Material Science and engineering. She described how her career path was not straight and upwards. She commented that women face challenges, however they should not be barriers – she herself got married while working on her Master's, and had a child during her PhD – so it clearly is possible to juggle these different aspects of life and succeed. Nasheeta currently holds the position of Chief Scientific Officer in the Aaron Klug Centre for Imaging and Analysis in the Electron Microscope Unit and is working on completing her PhD.

Isobel Kolbe, who is in the final stages of writing up her PhD in Physics, entitled her talk "In all things academic, never accept 'No'", with a by-line "How to get a PhD and see the world, even if you've never been the best at anything physicsy!" She encouraged the audience to push the boundaries, not be inhibited and fearful, and if someone says 'no' to keep asking until you get a positive response! She commented that you will always be surrounded by people who know more than you do and that students should swallow their pride and ask questions. For Isobel, her studies have been the passport to extensive travel to many different countries across the globe. Isobel works in theoretical high-energy particle physics, essentially trying to understand the results that come from the Large Hadron Collider (LHC) at CERN in Geneva, Switzerland, which is the largest particle collider in the world. She is particularly interested in the physics of heavy ion collisions, in which large droplets of matter are heated to 100 000 times the temperature of the center of the sun, recreating some of the conditions that were present in the universe about a millionth of a second after the big bang. A good understanding of matter at that time in the universe's evolution could answer some of the major open questions about the universe.

Outreach in the Faculty:

Phenomenal Physics:

The Physics Department hosted 200 learners from 20 schools for the annual Phenomenal Physics event. The event showcased a wide range of experiments and demonstrations and had the learners sitting on the edge of their seats and engaged in voting processes.

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 said that "good science is science you can disprove if need be." He explained that you can gain confidence if your science survives – but that you can never attain absolute certainty.

Associate Professor Weigert 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 such as these 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.

In Memoriam

The passing of **Yvonne Brink**, was noted with great sadness by the Department of Archaeology, where she worked for many years and made a valuable contribution. Yvonne began her career at the University of Cape Town by studying languages and the cultures of the ancient world, developing a passion for archaeology in the process. Leaving her post as junior lecturer to raise a family, she returned after a long absence to study archaeology 'for a year'. The year spun out to encompass more than two decades of part time teaching and research.

Last Laugh...