December 2017 Faculty of Science University of Cape Town Vol. 6 Issue 2

Science Matters

Science Faculty Newsletter

Message from the Dean

The end of a longer than usual academic year is fast approaching and despite the unfortunate disruptions late in October by a very small, but rather violent, group of students, we were able, for the most part, to complete the semester successfully. I am deeply grateful to staff and students who stood firm against the disruptions and intimidation and insisted on completing their lecturing and administrative duties, and attending classes, despite the anxiety of possibly being chased out of class. Imaginative planning to secure the examinations proved successful and despite the scepticism of the "tent" (also known as "November Hall"), 592 exams were written over 34 exam sessions. The logistics were impressive. With marking coming to an end, we will successfully conclude the year with final Faculty Examination Committee meetings, and results will be approved at the Senate Executive Committee meeting on 22 December. Our (postgraduate) graduation ceremony will take place on 20 December at 6:00 pm, and I encourage you to attend to join in on the graduation celebrations of your postgraduate students.

This 2017 end of year issue of "Science Matters" contains a range of articles capturing the successes of our staff and students over the past semester and there is much to celebrate. It is clear that the unpleasant experiences on campus in 2016 have not prevented our colleagues from excelling in their commitment to internationally competitive science, and the quality of our students and their achievements continues to shine through.

Four of our staff, Professors Dunsby, Hewitson, Reason and Ryan were elected to the UCT College of Fellows in recognition of their research standing in the international arena. Alvaro de la Cruz-Dombritz and Juana Sanchez-Ortega (both from the Department of Maths & Applied Maths) received College of Fellows Young Researcher Awards in recognition of the research achievements. At a national level Dr Robyn Pickering (Geological Sciences) brought honour to our Faculty by winning the TW Kambule-NSTF Award for Emerging Researchers, and Will Horowitz from Physics the prestigious Meiring Naude Medal for early career contribution to science.

The Faculty continues to receive recognition for its strength in Marine Science, with John Bolton, Peter Ryan and Sarah Fawcett all receiving national accolades from SANCOR for their research contributions ; Sheetal Silal from Statistical Sciences received recognition from the Operations Research Society for her contributions to the discipline.

A number of our postgraduate students received recognition for their achievements, including students from the departments of Chemistry, Computer Science, Environmental & Geographical Science, Molecular & Cell Biology and Oceanography. Amongst other interesting articles, the following pages capture high-lights of a selection of our staff's research achievements, and illustrate the breadth and depth of the research undertaken in the Faculty.

Early in the semester the Faculty felt the very sad and untimely loss of a young staff member, Dr Karl Wilkinson (Chemistry Department), who passed away unexpectedly. Our thoughts are with his family and friends as they adjust to his passing.

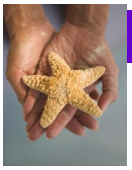
I wish you all every success in the coming years and ask that you give the incoming Dean, Professor Susan Bourne, the same great support you gave me over the past seven years. The Faculty will be in good hands.

Anton le Roex

Four new UCT Fellows in the Science Faculty

Four of the eleven new Fellows inducted into UCT's prestigious College of Fellows are from the Faculty of Science. They are: **Professor Bruce Hewitson**, Department of Environmental & Geographical Science; **Professor Chris Reason,** Department of Oceanography; **Professor Peter Dunsby,** Department of Mathematics & Applied Mathematics and **Professor Peter Ryan**, FitzPatrick Institute of African Ornithology.

From left: Prof Peter Dunsby, Prof Lucy Gilson, Prof Graeme Meintjes, DVC Prof Mamokgethi Phakeng, Prof Bruce Hewitson, Prof Michael Lambert, VC Dr Max Price, Prof Malcolm Collins, Prof Chuma Himonga and Prof Chris Reason.



Our Science Stars:

Young Researcher Awards

The College of Fellows Young Researcher Awards honour the significant contribution that UCT's young researchers have made to research in their particular fields. Two of the six recipients of the Young Researcher Award in 2017 were from the Science Faculty. They are:
Dr Alvaro de la Cruz-Dombriz and **Dr Juana Sanchez-Ortega**, both from the Department of Mathematics & Applied Mathematics.

This year's recipients of the awards (from left) Dr Sudesh Sivarasu, DVC Prof Mamokgethi Phakeng, Dr Alvaro de la Cruz-Dombriz, VC Dr Max Price, Dr Juana Sanchez-Ortega, Dr Shannon Morreira and Dr Ross Hofmeyr

NSTF Award for Emerging Researcher

Dr Robyn Pickering, from the Department of Geological Sciences, was awarded the TW Kambule-NSTF Award for Emerging Researchers at the annual National Science and Technology Forum (NSTF) Awards Ceremony. The awards, known in the South African research community as the 'Oscars of Science', recognise and reward excellence in science, engineering and technology, and innovation in South Africa.

Dr Pickering, who is an isotope geochemist, has successfully adapted uranium-lead dating techniques to provide the first set of direct ages for the South African caves in which early human fossils were found. "My dream since undergraduate days was to date local cave sites, and I had to go away (to Europe and Australia) to learn how to do that," Pickering told the Mail & Guardian. "But I'm excited to be back and help train and inspire a new generation of scientists. Married and with two small children, I am aware that I can be a positive role model for young women. I also want to help ensure that expertise and funding come to South Africa and stay here."

Dr Robyn Pickering (right) after receiving her Award from the Minister of Science and Technology Mrs Naledi Pandor (left)

UCT and Science features in M & G's top 200

Four of the exceptional young people featured on the 2017 Mail & Guardian 200 Young South African list, are Science students, alumni and staff. The list features notable South Africans under the age of 35 who have made a mark for themselves. They are:

Dr Banothile Makhubela, is currently a senior lecturer in Chemistry at the University of Johannesburg. Dr Makhubela holds a PhD from UCT. She has received numerous awards, both locally and internationally. Her research is currently focused on synthetic organometallic chemistry with applications in manufacturing second and third generation biofuels.

Samir Randera-Rees, a conservationist and TV personality, is a water source areas programme manager at the World Wildlife Fund. He completed a BSc in environmental science and economics at UCT. His long term goal is to be a leader in the conservation sector and use his skills and influence to achieve sustainable, positive change.

Dr Sarah Fawcett, ocean biogeochemist from the Department of Oceanography, was the principal investigator of the only African-led project that has been selected to participate in the Antarctic Circumnavigation Expedition, which drew scientists from around the world. The aim was to see first-hand, through a broad range of scientific disciplines, what impact climate change is having on the Southern Ocean.

The national head of mentorship at the Association of South African Black Actuarial Professionals, **Malizole Mdlekeza**, spends his time helping other young black South Africans break into the actuarial science profession. He holds a BSc in statistics and a postgraduate diploma in actuarial science from UCT.

Marine Sciences trio honoured

UCT marine scientists **Professors Peter Ryan** and **John Bolton,** Department of Biological Sciences and **Dr Sarah Fawcett**, Department of Oceanography, were recently honoured at the South African Network for Coastal and Oceanic Research (SANCOR) triennial awards at the Southern African Marine Science Symposium.

The awards recognise distinguished scientists, technicians, communicators and emerging researchers in the marine and coastal sciences. Professors Ryan and Bolton received the Gilchrist Memorial Medal, which recognises the contributions of distinguished scientists to marine science, who foster excellence in South African marine sciences and prioritise the country's marine and coastal environments. Dr Fawcett was one of only two recipients of the SANCOR Young Researcher Award.

John Bolton photographed in Japan on a kelp-collecting exercise. Photo Lydiane Mattio.

Professor Bolton is a leading expert on the biology and phylogeography of seaweeds, the biology and biogeography of kelp and integrated seaweed-marine animal aquaculture. He has served on almost all seaweed-based National Research Foundation projects over the past 30 years. His citation recognises that most of the published research on the commercial production of seaweed has been produced by research projects Bolton has lead and highlights how he has had a significant impact on education and unwavering investment in redress, influencing students, the research community and potentially marginalised communities. Professor Bolton wasn't able to attend the presentation to receive the award, because at the time he was on a singing tour in South America with the Cape Town Male Voice Choir and he comments that he was, "The first person to be awarded the Gilchrist Medal and sing 'Shosholoza' live on Uruguayan TV on the same day!"

Professor Ryan is director of the FitzPatrick Institute of African Ornithology and described as one of the most prolific marine scientists that South Africa has produced. But as the citation for the award highlights, he doesn't just study birds—he works on pollution and marine litter, he dabbles in fish and barnacles and he makes a real contribution to the management and conservation of marine resources.

Dr Fawcett, a Princeton biochemical oceanography graduate, is a lecturer in the Department of Oceanography. Broadly, her research seeks to understand and quantify the complex relationships between biogeochemical fluxes and primary activity in the ocean, with implications for past, present and future climate ecosystem functions, ocean fertility and global biogeochemical cycles. To support her research and students, she has secured funding from various sources to ensure that her students have opportunities to present their research, participate in research cruises and field campaigns, and to be trained in innovative techniques.

Dr Sheetal Silal's research recognized

Dr Sheetal Silal, from the Department of Statistical Sciences was awarded an Honorary Visiting Research fellowship at Nuffield Department of Medicine, University of Oxford.

Dr Silal also recently received a recognition award by the Operations Research Society of South Africa at their Annual Society Conference in September 2017. This award is made to individuals who have served the profession of *Operations Research* in an exemplary fashion and Sheetal's citation recognised her "high-calibre research as well as her excellent service rendered to the local profession of operations research in general, in her capacity as lecturer and mentor of a new generation of operations researchers".

PhD candidate wins international green award

PhD candidate Megan Lukas receives her Green Talents award in Berlin, Germany

PhD candidate **Megan Lukas**, from the Department of Environmental & Geographical Science, was one of 25 young scientists honoured with a Green Talents award at the International Forum for High Potentials in Sustainable Development, which took place in Germany during October.

The Green Talents award is conferred by the German Federal Ministry of Education and Research to provide young researchers across the globe with a platform for sharing their views on green concepts, with a mind to changing the world for the better.

Lukas, who is pursuing her doctoral degree in Environmental & Geographical Science, was selected from hundreds of applicants from 95 different countries.

"I still can't believe I was selected and that I went to the forum. But I obviously felt very honoured, especially knowing that I was selected out of 602 applications," she commented.

Lukas was recognised for her research on how people connect to their environment within the under-resourced township setting of Nyanga, in Cape Town. Her work is concerned with how pro-environmental behaviour, sustainable living and attachment to place unfold in such settings, where green space, trees and recycling facilities are often lacking .

Science Faculty Famelab winner using light to ensure food security in times of drought

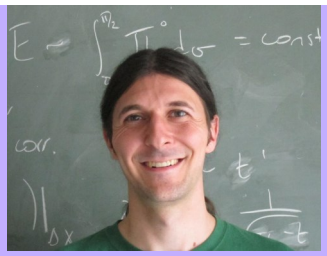
From left: UCT Deputy Vice-Chancellor for Research & Internationalisation Professor Mamokgethi Phakeng; British Council Cape Town Director, Jean September; UCT Famelab winner, Nyasha Chimhandamba and runner up Kolisa Sinyanya

"It is said that what hides in the dark will be revealed in the light. So what if I told you that I want to use light to illuminate one of the most prominent issues in the darkest times of drought?" This was **Nyasha Chimhandamba**'s opening to the winning presentation at the UCT Famelab finals. One of the major agricultural effects of drought is salt stress on plants. Chimhandamba, currently doing her honours in Molecular & Cell Biology, is working on creating a luminescent biosensor that will let off a blue light to indicate when plants are salt-stressed.

Chimhandamba was one of 10 university finalists to compete in the final UCT heat of the international Famelab competition where the competition was stiff. Famelab is the world's biggest science communication competition.

Runner up **Kolisa Sinyanya**, also from the Science Faculty, is a PhD researcher in the Department of Oceanography and is working to better understand how the oceans absorb increased carbon dioxide in the atmosphere. "The oceans have been saving our planet for millennia," says Kolisa, "and continue to do so every single hour. " But the oceans are not solely responsible for saving our planet from human-induced climate change, she warned. "We have to take responsibility by watching our very own carbon footprint."

Outstanding Early Career Contributions to Science



Congratulations to **Dr Will Horowitz** in Department of Physics, who was awarded the Meiring Naude Medal, in Recognition of Outstanding Early Career Contributions to Science. He received the award for his internationally recognised contribution to the theory of high energy/elementary particle physics, his significant contributions to the development of the UCT Centre for Theoretical & Mathematical Physics as a world-renowned research facility, and his passion for sharing knowledge and expertise with students.

Computer Science programmers show their merit

The recently held ACM International Collegiate Programming Contest (ICPC) Southern Africa Regionals topped last year in being the largest ever since its commencement 15 years ago, with 107 teams having submitted at least one possible solution. There were sites in Angola, Benin, Burkina Faso, Ethiopia, Ivory Coast, Kenya, Mauritius, Niger, Nigeria, Senegal, and Togo, and in South Africa at UCT for the Western Cape (hosting 17 teams from UCT, UWC, and SU), Grahamstown (RU, NMU), Pietermaritzburg (UKZN), and Pretoria (UP, Wits, NWU).

In this annual 5-hour nonstop team programming contest, teams of three students have to solve as many problems as they can, using just one PC per team. The Western Cape team that had the first correct solution (in 16 minutes and 17 seconds) was the UCT team "Dijkstra's little Salesmen" consisting of **Victor Gueorguiev, Andrew Mc Gregor** and **Tae Jun Park**. The UCT team that solved 7 problems and came first in the Western Cape site and second in the overall classification was "Dysfunctional Programmers", consisting of 1st year students **David Broodryk, Yaseen Mowzer** and **Bronson Rudner**. Second in the Western Cape and third overall was "Just Doing Java v2", consisting of 3rd year students **Jonathan Alp, Jonathan Bouwer** and **Dylan Sims**. Third in Western Cape and fourth overall was "Gergle Hersh Cerd", consisting of 2nd year students **Matthew Morris** and **Jeremy Wilkinson**, who also received the fun award for 'persistent programmers' (most wrong submissions on a problem before getting it right).

With the three teams of young Computer Science undergraduate students having performed well, and good performances of the other two first year teams, the future looks bright.

Science PhD student wins best oral presentation at International Conference on Biological Inorganic Chemistry

Professor Tim Egan and Roxy Openshaw

PhD student **Roxanne Openshaw**, a PhD student in the Department of Chemistry, working with Professor Timothy Egan as her supervisor, won the best oral presentation at the 18th International Conference on Biological Inorganic Chemistry in Florianopólis - Brazil.

The conference is specifically targeted at biological inorganic chemistry such as parasitology research in Malaria. Roxy's research involves looking at the behavior of antimalarials, specifically b-haematin inhibiting compounds, within the malaria parasite *plasmodium falciparum.* It involves looking at the trends of how drugs accumulate within the parasite and the relationship to the amount of haem being produced by the parasite because of the inhibiting effect of b-haematin inhibiting compounds.

The hand-over of the SAIP president's mace from the former president Professor Azwinndini Muronga to Professor Woudt

President of SA Institute of Physics from Astronomy at UCT

Professor Patrick Woudt, Department of Astronomy, has been elected as President of the South African Institute of Physics (SAIP) for the next two years.

The SAIP has a range of divisions and fora focusing on different aspects of physics. SAIP is the voice of physics in South Africa. It supports the South African physics community through the organisation of annual conferences, and various important initiatives such as the Physics teacher development workshops and the hosting of a national physics olympiad.

STAFF NEWS

WELCOME TO NEW STAFF

ACDI
- Mr Ryan Fortune—NVI Portfolio Coordinator
- Ms Nadine Methner—Research Officer

Department of Astronomy
- Dr Magaretha Pretorius—Lecturer

Institute for Data Intensive Astronomy
- Dr Angus Comrie

Department of Biological Sciences
- Ms Boitumelo Marope—Departmental Assistant
- Mr Calvan Hartnick—Assistant Technical Officer

Department of Chemistry
- Mrs Joanne Polzin—Administrative Assistant
- Mr Wade Petersen—Lecturer

H3D
- Ms Tandokazi Ntsabo—Senior Scientific Officer
- Ms Felicia Stuurman—Laboratory Assistant

Department of Molecular & Cell Biology
- Ms Sibahle Ngwenya—Departmental Assistant
- Dr Felix Dube—Lecturer

Department of Physics
- Ms Martina Mayiya—Senior Secretary

Department of Statistical Sciences
- Associate Professor Timothy Gebbie

FAREWELL TO STAFF

Department of Archaeology
- Dr Domingo Salazar Garcia

Department of Biological Sciences
- Dr Laura Blamey
- Ms Kamladevi Scheepers

Department of Chemistry
- Mr Zaeem Najaar
- Sibahle Ngwenya

H3D
- Mr Andries Oelofse

Department of Geological Sciences
- Dr Beth Kahle

Department of Molecular & Cell Biology
- Ms Sibhale Ngwenya

Department of Statistical Sciences
- Dr Miguel Lacerda
- Mr Chun-Kai Huang

Staff Retiring:

We say goodbye to staff who are retiring, many whom have been at UCT for a considerable number of years:

Department of Archaeology
- Mr John Lanham

Department of Biological Sciences
- Professor John Bolton

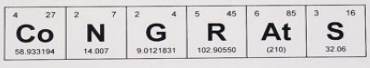
Department of Chemistry
- Associate Professor Bette Davidowitz

Department of Computer Science
- Professor Edwin Blake

Department of Geological Sciences
- Mr David Wilson

Department of Molecular & Cell Biology
- Mr Charles Hendrickse
- Mr Peter Louw

Department of Physics
- Mr Gregor Leigh



Promotions in the Faculty

Department	Name	Promoted to
Archaeology	Rebecca Ackermann	Professor
Archaeology	Shadreck Chirikure	Professor
Biological Sciences	Arjun Amar	Associate Professor
Biological Sciences	Desmond Barnes	Chief Technical Officer
Chemistry	Clive Oliver	Senior Lecturer
Chemistry	Eileen Murray	Principal Scientific Officer
Computer Science	James Gain	Professor
Envir & Geog Science	Babatunde Abiodun	Associate Professor
Geological Sciences	Phil Janney	Associate Professor
Molecular & Cell Biology	Rob Ingle	Associate Professor
Molecular & Cell Biology	Shakiera Sattar	Chief Scientific Officer
Physics	Sahal Yacoob	Senior Lecturer
Physics	Clint Sadler	Principal Technical Officer
Statistical Sciences	Chun-Kai Huang	Senior Lecturer

Research Bytes

Photo: Gillian Soames

Africa's largest eagle in free fall

The population of Africa's largest eagle species is in freefall in South Africa, and may be soaring towards extinction, according to a new study based on changes in sighting rates over the last twenty years**.** The research was conducted by **Dr Arjun Amar** and PhD student **Daniël Cloete** from the FitzPatrick Institute of African Ornithology, in the Department of Biological Sciences, using two Southern African Bird Atlas Project (SABAP) surveys carried out twenty years apart. Their previous research showed that comparing these surveys provided an accurate way of measuring changes in the population size of this eagle species.

Martial Eagle sightings have dropped by as much as 60% since the late 1980s, in stark contrast to human population growth across their shared natural habitat, said the study published recently in the scientific journal *Bird Conservation International*. Although the exact reasons for the decline remain unclear, researchers say their findings point to an urgent need to better understand the threats to this iconic bird.

Worryingly, the study also highlighted a marked decline in Martial Eagle sightings within protected areas, including those in the world famous Kruger National Park and the Kalahari Gemsbok National Park. However, declines of the species in protected areas were not as severe as elsewhere, suggesting that these areas could act to buffer the factors leading to declines.

Martial Eagle total population figures are still relatively inexact, but their conservation status was uplisted in 2013 from Near Threatened to Vulnerable – which means they are recognised to be globally threatened. The study published recently provides the most accurate assessment for the decline of the species in any African country and was only possible due to an army of volunteer bird watchers who contribute their sightings to the SABAP database.

The study found significant declines in three provinces; these were Kwa-Zulu Natal, Mpumalanga and Limpopo. Changes differed across the biomes (distinct regions with similar geography and climate), with the species faring worst in the Grassland, Savannah, Indian Ocean Coastal Belt and the Nama Karoo biomes. However, there was better news in the Fynbos biome of the Western and Eastern Cape, where reporting rates remained more stable over the last 20 years.

"Despite having full legal protection in South Africa, this species is known to be targeted and killed by farmers who blame the species for predation of their livestock, or may be accidentally killed by poison left to kill other predator species," the authors noted. Another major threat for the Martial Eagles, may be electricity infrastructure such as power lines, particularly among juveniles which have a wider territorial range.

Photo: Rene van der Schyff

Dr Amar, the lead author of the study said "this analysis was only possible thanks to the efforts of many hundreds of dedicated volunteer bird watchers who contribute their records to the SABAP survey database". Dr Amar added "we have now quantified the decline of the species in South Africa, but that is the only the first step. We now need urgent research to better understand the factors which are responsible for causing this iconic species to be lost from our countryside, so that these factors can be better controlled".

A new era in astrophysics…involving 70 observatories and multiple telescopes around the world

Recently LIGO/ Virgo and approximately 70 observatories around the world announced a major breakthrough in modern astrophysics – the simultaneous detection of gravitational waves and the detection of an electromagnetic counterpart. This heralds the birth of multi-messenger astronomy. The detection resulted from a merger of two neutron stars. With a merger of two black holes - we don't expect to see any counterpart in the electromagnetic spectrum. However, a merger between two neutron stars results in a kilonova - an explosive event producing a short gamma ray burst, followed by emission in the rest of the electromagnetic spectrum as material is thrown out into the surroundings.

The detection of this event resulted in a multitude of papers being published across a broad range of journals such as *Science and Nature* and saw a historic capstone paper written up, with more than 3000 people collaborating on the paper. **Professor Patrick Woudt** from the Department of Astronomy at UCT, together with Rob Fender and Paul Groot, a new UCT SARChI Chair, are among the authors who contributed to this paper through their involvement in the ThunderKAT/ MeerKAT program. Professor Woudt describes how "astronomy has now officially entered the world of particle physics in terms of competing for the most co-authored paper".

Principal Investigators of MeerLICHT in Sutherland after the successful installation of the MeerLICHT telescope Profs Paul Groot and Patrick Woudt

MeerKAT, SALT and SAAO telescopes all took part in the amazing follow-up campaign and it is inspiring to see South Africa's strong involvement in this major breakthrough. Although not yet fully commissioned, the MeerKAT experiment contributed in this study to its first major scientific publication. The recently installed MeerLICHT telescope has come into its own by providing an additional dimension to observational astronomy by allowing simultaneous measurement of both optical and radio wavelength spectra. MeerLICHT is robotically coupled to MeerKAT such that both telescopes observe exactly the same area of sky, but measure the two different wavelength bands. Data from MeerKAT and MeerLICHT will be analyzed in real time, reporting new detections as they are found.

Installation of the game-changing new MeerLICHT telescope in Sutherland

Someone who has hands-on experience in the development and installation of MeerLICHT, is **Kerry Paterson**, (pictured right) a PhD student of **Professor Patrick Woudt**'s in the Department of Astronomy. Kerry's PhD thesis focuses on MeerLICHT, and particularly on the data side, working on the data pipeline and reducing and cleaning the images. This entails removing cosmic rays and masking satellite trails and saturated stars, so that they can do an analysis of the underlying data. Looking for transients is done by using the principal of image differencing, whereby if a star is changing, they will be able to see the differences in the observations.

Kerry did an undergraduate degree of Astronomy and Physics at UCT and then did her Honours and Masters through the National Astrophysics and Space Science Programme (NASSP). Her current work on her PhD requires a great deal of technical skills and coding which she developed while learning to code in Python while an undergraduate. Kerry has also been involved in the installation of the MeerLICHT telescope in Sutherland: assembling the telescope, putting in the cables, getting it pointed in the right direction and commissioning it, over the last five months.

At the moment, the telescope is installed and the astronomers are getting data from it, but it is still being fine-tuned and the official opening will be in the early part of 2018. One of the unique aspects of MeerLICHT is that it has a wide field of view and takes really amazing images. When MeerLICHT is fully operational it will be completely robotic and will link up with and follow MeerKAT. It produces an image every minute and has six different filters which enable it to view different parts of the magnetic spectrum. This means being able to see the colours of stars with different filters, such as the transients on the blue side and those with a lot of dust with the red filter.

Kerry, who clearly is a hands-on dynamo, has enjoyed being part of the installation of this amazing new telescope and enjoys observing the skies and figuring out what it all means. What comes after her PhD? She says she would like to stay in research and in this dynamic field, where change and new discoveries are a constant.

When endemics go epidemic

Species like the Karoo acacia are estimated to have encroached on 10 to 20 million hectares across South Africa's grassy biomes. Photo: Alexey Yakolevlev, Wikimedia Commons

A recent paper published by Biological Sciences' researchers **Associate Professor Adam West** and **Professor William Bond**, draws attention to the global phenomenon of invasive native plant species. West explains that in the past, invasive plant species were mostly assumed to be aggressive alien species. "The classic example is something like what the Australian acacias do here in South Africa," he explains. "They can spread rapidly and change everything from the soil to the biotic interactions, to the way water flows through the system." But in the Anthropocene it is not just alien species that are spreading beyond their traditional boundaries. "We're starting to see indigenous plants exceeding their historical ranges and causing considerable impact. And invasion biology is not quite sure how to deal with that," says West.

One important example of the phenomenon is the encroachment of trees into grassland. "Trees and shrubs are on the move in Africa and around the world," explains West. "Contrary to popular assumptions, there has been a noticeable and quantifiable increase of trees into global savannas and grasslands over the last 50 years." South Africa is no exception: Species like the Karoo acacia, vaalboom and mopane are estimated to have encroached on 10 to 20 million hectares across South Africa's grassy biomes, mostly in the north-western regions of the country. Altering the density of trees, whether they are native or alien species, can have serious repercussions for grassland areas. The encroachment of trees impacts everything from agricultural management to local biodiversity, water catchment areas and levels of carbon and nitrogen cycles. "In Africa we have seen how the expansion of native trees has reduced grass productivity and species richness," says West. "This results in decreasing quality of available forage and can impact savanna wildlife."

So why is this happening more frequently? West points to human activity. "Changing temperatures and levels of carbon dioxide, fluctuating rainfall and human transformation of the landscape are all the most likely reasons behind the increase in native species becoming invasive," he says. "At current-day rates of encroachment, a volume of water equal to the Berg River Dam will be lost to the expansion of alien tree species in the Western Cape by the year 2045. We urgently need to understand the potential impacts of native plant expansions elsewhere in a similar manner," he says.

Tracking collars reveal city baboons' raiding tactics

Professor Justin O'Riain , Department of Biological Sciences, is part of an international team that has revealed in a study published by *Scientific Reports,* how canny baboons in Cape Town use a sit-and-wait tactic before raiding people's homes for food. This has been shown by data gathered from bespoke baboon-tracking collars.

"Raiding baboons are a real challenge in the Cape Peninsula," said Professor O'Riain, co-author of the study: 'Extreme behavioural shifts by baboons exploiting risky, resource-rich, human-modified environments'. "The baboons enter properties to raid in gardens and bins, but also enter homes and sometimes take food directly from people." In a previous study, the team showed that while Cape Town's baboon-management strategy was keeping baboons away from the urban space, some males were still finding ways in. The team built bespoke baboon-tracking collars and, using GPS and accelerometer sensors, tracked the movements and activity levels of 10 males. The collar data reveal that male baboons were staying at the city edge, engaging in short but intense forays to the urban environment when opportunity presented itself, similar to a sit-and-wait strategy. The data show that because of their raiding tactics, the baboons studied foraged for only about 10% of their time. This is considerably less than the non-raiding baboons in the Cape Peninsula or elsewhere on the African continent, which spend at least half of their time foraging. The researchers discovery of these raiding tactics of these canny baboons, indicates that strategies will need to be refined to further improve Cape Town's already successful baboon-management programme.

Travels across the globe….

Climate Change PhD Researcher Exchange Scheme

The University of Cape Town, in partnership with the University of East Anglia, UK, has established an exchange programme on Climate Change, made possible through the Newton Fund (NRF/RCUK). The PhD researcher exchange seeks to bring together student researchers and their supervisors in order to foster long-term collaborations between research groups and individuals from both institutions, to focus on areas of synergy, such as: (a) Understanding the climate system, including the ocean and atmosphere; (b) Developing capacity to cope with a changing climate – in particular the integrated modelling of impacts, and adaptation in a developing country context.

This year, the three Faculty of Science PhD researchers who were selected for the exchange are: **Temitope S. Egbebiyi, Kwesi Akumenyi Quagraine** and **Siyabusa Mkhulani**, from the Climate System Analysis Group (CSAG) in the Department of Environmental & Geographical Science. Temitope's research focuses on projecting the timing of climate in terms of departure from historical variability and its impacts on crop yield over West Africa. Kwesi's research focuses on advancing our understanding of the co-variability of climate processes and features relevant to southern Africa. Siyabusa's research seeks to address the integration of seasonal forecast information of crop models for climate variability management, for small-scale farmers of South Africa.

Left to right: Temitope S. Egbebiyi; Kwesi Akumenyi Quagraine and Siyabusa Mkhulani

Marine Biology Professor sings in South America:

Professor John Bolton of the Department of Biological Sciences made a trip to South America in July 2017 which had nothing to do with his other pastime of Marine Biology. He travelled to Argentina and Uruguay, as part of the Cape Town Male Voice Choir (CTMVC), on a singing tour with the Cenestra Male Choir, an African choir from the East Rand. Funding from the Lotto facilitated this wonderful opportunity to collaborate and sing to completely different audiences, and to work towards transforming the CTMVC to represent and perform to a wider public in the Cape Town region.

John commented, "It is hard to describe how enthusiastic the audiences were. Packed houses were entertained in the beautiful Metropolitan Cathedral in Montevideo (with the Uruguayan National Children's Choir), the remarkable Kirchner Cultural Centre in Buenos Aires, and the City Hall in La Plata, among other more local venues such as community halls and a children's hospital. The choirs were cheered off the stage with soccer chanting, serenaded with car horns on the streets of Buenos Aires, and called back from the bus for thanks from the priest, and a chaotic encore, in a local church concert".
Anyone who may like to sing with the choir are welcome to write to John at john.bolton@uct.ac.za, or contact the CTMVC via Facebook.

The choirs in Montevideo Cathedral

Professor Bolton performing in Buenos Aires

An impromptu 'flashmob' on the ferry across the river Plate

Student jets off to be part of leadership development programme in Washington DC

Blessed in front of the White House

Blessed Ngwenya, 2017 chair of the Science Student's Council, was selected as one of 20 students in the country to take part in the South Africa-Washington International Program (SAWIP). This is a leadership development program that seeks to inspire, develop and support diverse new generations of emerging South African leaders to be active in bringing about social and economic transformation and justice within a sustainable democracy. SAWIP develops young leaders through a seven-month program which includes development sessions which run concurrently with their university studies; six weeks of professional exposure and an intense leadership curriculum in Washington DC; two community service components; followed by ongoing involvement and development within the SAWIP alumni network post graduation.

Blessed explains, "During my 6 weeks in Washington DC, I stayed with a host family, who gave me an experience of some of the things I was deprived of, growing up in one of the underprivileged parts of South Africa. Navigating DC turned out to be easy given the efficiency of the Metro and the naming of the streets. In order to engage more with the politics of the space I was in, I attended breakfast meetings hosted by a group of members of the Democratic party with my host dad, and I met the Chairperson of the Democratic party for the state of Maryland (Kathleen Matthews) as well as a few other political figures.

I did my internship in the Vitreous State Laboratory(VSL) at the Catholic University of America, where I worked on a research project titled: **Scintillating crystals for hadron structure studies and instrumentation**, under the supervision of Associate Professor Tanja Horn and co-supervised by Professor Ian Pegg. This involved reviewing the physics and detection requirements of neutral final states and building parts of the instrumentation to grow Lead Tungstate crystals to be used in electromagnetic calorimeters. I got to visit Jefferson National Laboratory to see the work that they do there. On the last day of my internship, I submitted an abstract of my work to the American Physical Society and it was accepted and scheduled for presentation at the Division of Nuclear Physics conference happening at Pennsylvania in October.

The SAWIP curriculum in the USA was broad in the sense that it gave me access to spaces where I engaged with professionals both in the public and private sector and it opened high level networking opportunities. I spent time engaging with young leaders from the Republic of Ireland, United Kingdom, Israel and Palestine. I completed a short training program on Human Rights and I co-facilitated a workshop on Identity and Social Justice at the World affairs council leadership academy with the rest of the team.

Some of the most exciting things I did were watching a baseball match; going on a sail boat trip where I was at the helm of the boat; visiting historical/cultural sites, such as the library of Congress, the National Museum of African American History and Culture, The US Capitol, the Supreme court, Washington monument, etc. Watching the display of fireworks on the 4th of July (Independence Day) on the stairs at Lincoln Memorial was amazing, it was like a site of galaxies accelerating towards the surface of the earth."

Blessed on the Brooklyn Bridge in New York

Blessed with the team at the Consulate

Blessed in the lab with a colleague

More travels across the globe….

Antarctic researchers break the ice

A second successful winter voyage aboard the ice-breaking research vessel *SA Agulhas II* into the Antarctic Marginal Ice Zone (MIZ) has been undertaken by members of the University of Cape Town Sea Ice Research Team. While the *SA Agulhas II* makes regular trips to the Antarctic in summer, the frequent storms and harsh conditions during winter make for a difficult working environment. Despite the conditions, the expedition was a success, building upon the first research trip carried out last year and continuing to expand the knowledge base about the region.

The MIZ Pilot Project is a multidisciplinary research effort, headed by **Associate Professor Marcello Vichi** from the Department of Oceanography, and Dr Keith MacHutchon and Dr Sebastian Skatulla from the Department of Civil Engineering. The principal objectives of the project for this trip were to: (a) obtain core and pancake samples of the MIZ sea ice to determine physical and mechanical properties, (b) deploy trackers to measure floe movement and waves in ice; (c) carry out sea-ice observations for defining the boundaries of the MIZ and (d) collect data for the Antarctic Sea Ice Processes and Climate (ASPeCt) expert group.

Out and About in the Faculty

Molecular Farming Workshop co-hosted by Biopharming Research Unit by Professor Ed Rybicki

The Biopharming Research Unit (BRU) in the Department of Molecular & Cell Biology, co-hosted a Molecular Farming Workshop in Franschhoek, with iBio Inc. of the USA, in order to:

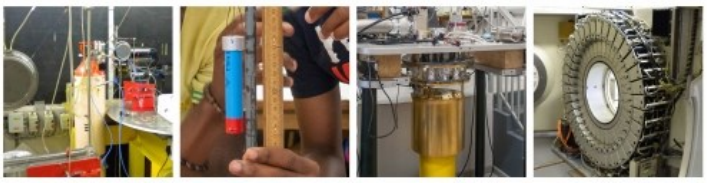
- Thoroughly explore the landscape of molecular farming endeavours in South Africa, from products to IP support, to freedom to operate issues
- To determine the level of support for this work from funders and venture capital
- To explore the possibility of South African entities partnering with iBio to get a cGMP pilot manufacturing facility built in South Africa.

The hosts invited representatives from DST, DTI, IDC, MRC, TIA and Cape Venture Partners as potential or actual funders, manufacturers of human and animal vaccines and others involved in the legal, commercialisation and biosafety aspects of this work. There were keynote presentations from various stakeholders and meetings to discuss how to move forward with getting a dedicated cGMP-compliant plant-based manufacturing facility established in South Africa.

Despite some misgivings about regulatory hurdles and the potentially high cost of such a facility, there was general agreement that the case for it had more than satisfactorily been made and all that remained was to work out how to facilitate it happening. DST, TIA and DTI representatives committed to conducting a feasibility study to assess the national need and iBio Inc's Barry Holtz promised the use of their sophisticated modelling capability to plan a variety of options. This appears to be the start of an ongoing series of meetings…

New Developments in the Faculty

MeASURe - new research unit in Physics at UCT



Physics has a new research unit –MeASURe—the focus of which is on applications which require novel measurement techniques, and on research which advances the fundamental reference standards for measurement. "It an appropriate time to launch MeASURe," says the Director, **Professor Andy Buffler,** "since we are presently witnessing a redefinition of the System International (SI) base units which underpin all measurements." In the new SI, four of the base units (the kilogram, the ampere, the kelvin and the mole) will be redefined in terms of fixed numeral values of four fundamental constants of nature: the Planck constant, the elementary charge, the Boltzmann constant, and the Avogadro constant.

"Within MeASURe, we are working with the National Metrology Institute of South Africa (NMISA) on instrumentation which will lead to new standards for current and mass for South Africa," adds Professor Buffler. The recent acquisition of an 8mK dilution refrigerator by the Department of Physics allows the realization of the new quantum electrical standards right below the foyer of the RW James Building. We have also constructed a table-top Watt Balance which is the precursor to the new reference for mass for South Africa, replacing the arcane artefact, the International Prototype of the Kilogram, held in a vault in Paris."

Another major activity within MeASURe is associated with the applications of neutron beams and gamma-rays. The Department of Physics operates a laboratory which uses PET scanners for fundamental studies of fluid flow, and is working with iThemba LABS and NMISA to establish the world's first fast neutron beam reference facility to be accredited by the ISO. Other current projects span medical radiation physics, nuclear engineering and physics-based simulations of radiation and materials.

"We will be looking for new partnerships within UCT and beyond," adds Professor Buffler, "and we envisage the unit growing to become a portal into UCT for problems which require novel measurement-based solutions."

Master's Specialisation in Computational Science has its first graduate

Tharindu Senapathi being congratulated by Professor Kevin Naidoo

The Master's degree programme, specialising in Computational Science was launched in 2016 with a cohort of six students from diverse backgrounds, ranging from electrical engineering through to Biochemistry, Physics and Chemistry, enrolling in the new degree programme. The degree programme was established to address a growing critical dependence in every academic discipline grounded in scientific and engineering research for the use of computer simulation and large scale data analysis to understand observed phenomena and advance the frontiers of disciplinary knowledge.

The research topics that the current class of students are undertaking, are mostly focused on developing analytic and simulation models for the life sciences. Engineers joining the programme are particularly keen on developing machine learning algorithms for cancer classification and coding on SCRU's state-of-the-art High Performance Compute Machines. Students from a chemistry and biochemistry background have focused on research challenges in the bioinformatic analysis of the effect of pharmaceuticals on gene expression levels in cancer patients and the development of reaction models for enzymology.

Tharindu Senapathi, who is pictured above with **Professor Kevin Naidoo**, Head of the Scientific Computing Research Unit, made the transition from training in Chemistry in Sri Lanka, to the use of models and data analytics, that resulted in the development of inhibitors of key enzymes which are at the root of breast cancer tumour development.

New Research Unit in Biological Sciences

iCWild was conceived following a competitive call by the University of Cape Town's Research Committee for "new flagship research areas in response to the abundant evidence of great potential at UCT to invigorate interdisciplinary research and to give such scholarship a higher profile". iCWild was nominated by the Faculty of Science and was subsequently selected by the University Research Committee as one of five new interdisciplinary Institutes at UCT. The unit's director is **Professor Justin O' Riain.**

iCWild, is a research led interdisciplinary team of academics, who in partnership with NGOs, local government and civil society are dedicated to understanding and mitigating conservation conflicts. They seek co-operative solutions at the interface between disciplines – biologists, sociologists and historians will work with agriculturalists, economists, philosophers, educators and engineers and many other disciplines, exploring new approaches to resolving chronic conflicts between society and wildlife. iCWild conforms to UCTs developmental model which seeks to actively grow a new cohort of research leaders in strategically identified areas, aligned to institutional, regional and national priorities.

Conservation conflicts currently being focused on by iCWild include conflicts between wildlife and people within communities over limited resources (e.g. livestock, crops, natural resources) and between community members and other stakeholders on how best to manage or mitigate these conflicts. iCWild challenges the divide between the social and natural sciences and between local and scientific knowledge as it strives to understand and ultimately guide the realignment between humans and the natural systems we depend on.

Firsts for the Faculty…

Mpati with Prof Kraan-Korteweg (r)

Mpati Ramatsoku, studied for a joint UCT - University of Groningen PhD in Astronomy. She is the first person to receive this joint PhD and has defended her PhD in Groningen and will graduate this year. She describes the experience of being registered simultaneously at two universities, having two supervisors and having her thesis examined by committees at both universities as pretty intense!!Professor Renee Kraan-Korteweg was her supervisor at UCT. Her thesis was based on observations and analyses of a large concentration of galaxies, mostly belonging to a bright X-ray 3C 129 galaxy cluster that had remained hidden behind the thick dust layer of the Milky Way in the so called Zone of Avoidance. Mpati has subsequently received a postdoctoral fellowship with a leading researcher at the Italian National Institute for Astrophysics Cagliari. Congratulations Mpati!

Zubeida Khan, has just completed her PhD in Computer Science at UCT and she is the first black female PhD graduate in the Department of Computer Science. Zubeida has always been interested in science, because, in her words, "I have never been satisfied in conforming with that which already exists. I believe that there is always room for fresh new ideas and improvement and science is one of the few fields that encourages this innovation and creativity". Her research interests include improving the current state of the web by using ontologies, which are logic-based representations of reality and the concepts and relations between them.

While working on her PhD, Zubeida had two children (now 2 years and 4 months), all the more challenging because her family lives in Durban, so she had to do some serious juggling! Congratulations Zubeida!

For the immediate future, Zubeida will be working as a senior researcher at the Council for Scientific and Industrial Research (CSIR) in the Defence, Peace, Safety and Security group, in the Cyber defence subgroup.

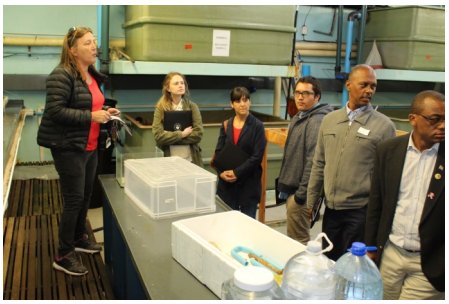
Outreach in the Faculty

Phenomenal Physics

After a two year interruption, Phenomenal Physics, the Department of Physics' flagship, annual outreach afternoon for Grade 11 science pupils from local schools, was back with a bang (and a flash, and a whoosh!) in RW James LT3A on Wednesday 27 September. A team of nine lecturers, organised and led by **Dr Spencer Wheaton**, presented a slick 3-hour programme of physics demonstrations which included some old favourites (such as the smashed frozen thumb) and several brand new items (like the balloonterludes), aimed at whetting pupils' appetite for studying science (particularly physics) at UCT.

The marketing aspect was emphasised this year by a special presentation by UCT's Admissions Office, which gave prospective students a clear idea of how to maximise their chances of being accepted at UCT, but the main focus of course was on the often interactive, sometimes hands-on, always intriguing welcome to the world of wonderful physics. Students and their teachers were kept on the edge of their seats by demonstrations involving light, sound, air, magnetism, electricity and liquid nitrogen and, for the first time, blue, magnetic and highly reactive liquid oxygen.

Science Teacher's workshop: A glimpse into Science at UCT



The Science Faculty Marketing Committee organised an afternoon of exposure to research in the Science Faculty, for Science teachers from across the greater Cape Town area. The aim of the event was to engage with teachers and inspire them to encourage their top students to study Science at UCT.

Professor Anusuya Chinsamy–Turan gave a talk on the history of life; **Dr Lara Sciscio** spoke about ichnology and ancient footprints preserved in stone; **Dr Dorit Hockman** showed the audience about foldscopes—low-cost handheld paper microscopes and **Ms Rageema Joseph** spoke about how plants know when to take up "arms". The teachers also did a tour of the laboratories in the Departments of Chemistry, Physics and Biological Sciences

100 up project hosted by MCB and Physics

The 100UP programme is an initiative which targets learners from disadvantaged backgrounds and exposes them to various faculties and aspects of university life. The learners are part of the UCT-run Schools Improvement Initiative. In assisting them with access to UCT, the initiative aims to address under-representation of these communities at our university. Along with the UCT Physics department, Molecular & Cell Biology hosted 100 matric learners from Khayelitsha. The learners gained some fun but practical experience in the MCB laboratories. They started off by trying to identify Patient Zero using the iodine-starch test, and then really got their hands dirty extracting their own DNA with dishwashing liquid and vinegar! A big thanks to the Molecular & Cell Biology and Physics Departments for hosting the learners and to the volunteers who so willingly assisted!

Farewell to Professor Anton le Roex as Dean of Science

DVC's, Past Dean's and current and past staff paid tribute to **Professor Anton le Roex** at a farewell event organised at the Claremont Cricket Club, in his honour. Anton has been Dean of Science for seven years. Previously he was Deputy Dean of the Faculty of Science for ten years and was HOD of the Department of Geological Sciences for 15 years. He has now amassed a total of 37 years of service to UCT.

In the speeches Anton was described as adaptable, having a high integrity quotient, being a strong leader, level-headed, having an amazing ability to be pragmatic about looking for solutions, having academic acumen and an actuarial ability to present figures and budgets, while having a thorough knowledge of each department and the individuals in them, in the faculty.

Professor Hugh Corder highlighted how in the current academic climate, the university depends on people who are deeply loyal and give of themselves, and engender respect, as Anton has. He described Anton as a man of extraordinarily few words, who provides sound guidance and indicated that the evidence of his leadership is reflected in a very well run faculty, and that many of the successful faculty approaches have been applied to the university as a whole.

Professor Daya Reddy joked that Anton would now need to join the Has-Dean support group in order to transition from this busy position where he worked a twelve hour day most days…..

So what will Anton be doing now that he is no longer at the helm of Science? He plans to take a sabbatical in 2018 to catch up on his long lost research interests; to ensure that he graduates remaining postgraduate students and has time to finish up projects he has been working on. His area of interest in geology is that of geochemistry and specifically the geochemical evolution of igneous rocks and the interior of the Earth. He hopes that having time off from the demanding rigours of being dean, will allow him time to follow up on his research interests, delving back into geochemical techniques to find out how the physical world works in contrast to the less fathomable human world, and then to spend time in his other home in the Cederberg wilderness.

Images by Gregor Leigh and Katherine Wilson

In Memorium

The Science Faculty mourns the loss of **Dr Karl Wilkinson**, a lecturer in the Department of Chemistry**.** Karl came to the UCT in 2008 as a postdoctoral fellow with a coding talent that was instrumental in the initiation of a great project that brought about UCT's active participation in the field of quantum chemistry software development for next generation high-performance computers. He was a specialist in writing complex quantum code for graphical processing units. He did this despite suffering from intense bouts of migraines.

Associate Professor Neil Ravenscroft, head of the Department of Chemistry, said, "There are moments in the lives of even the most rational amongst us when we are reminded of our frailty and of the strength we draw from being amongst like-minded souls. Today is such a day for the colleagues and students in the Scientific Computing Research Unit and the Department of Chemistry. We have lost Karl Wilkinson, a friend, a colleague, a mentor, a young mind that gave us so much."

Dr Kevin Naidoo, a colleague and former mentor, said, "Karl went about his teaching and research in a quiet but determined way that showed so much promise. As a researcher he threw everything he had at the most challenging problems; as a colleague he was always willing to share his talents and insights with students and staff alike. In the nascent field of scientific computing at UCT, he had started to make a mark that would without a doubt become large footprints over time. He will be missed very much by all who knew him."

Dr Wilkinson is survived by his wife, Amilinda Wilkinson, a staff member in the Land and Accountability Research Centre in the Faculty of Law.

Last Laugh