

# CONTACT

NEWSLETTER OF THE FACULTY OF SCIENCE • DECEMBER 2015  
UNIVERSITY OF CAPE TOWN



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## SOME ARTICLES IN THIS ISSUE

- New Institute for Data Intensive Astronomy
- Fishermen connect to the future with app
- Bird declines show that climate change is more than just hot air

## Message from the Dean

The past year will be remembered for the unprecedented level of student unrest and protests, both at UCT and throughout the country. Although at the time the level of student unhappiness and nature of the protest action at UCT was felt to be extreme, in hind-sight UCT came off fairly lightly compared to some other universities. Disruptions started with the “Rhodes Must Fall” movement early in the year, which eventually led to the removal of the statue of Cecil John Rhodes, which overlooked the rugby fields. Towards the end of the year the national “Fees Must Fall” campaign took over and led to a level of disruption to academic activities that was unprecedented at UCT and across the country. The circumstances leading to the disruptions at UCT were extraordinary, and the issues deeply complex.

Much of the student unhappiness relates to an increased awareness around broad issues of transformation, with heightened frustration at the very slow progress UCT (and the country) is making on this front. The Science Faculty is no exception and we have taken time to reflect on our current situation, and discuss openly what the major issues are that cause the discomfort and frustration experienced by many in our Faculty. The Science Faculty arranged an Assembly in the second semester to allow all staff and students the opportunity to express their views on what is wrong, what might be right, and how we as a Faculty might do things differently, and with greater awareness in future. Our goal is to progress in the coming year with more purpose in ensuring inclusivity, respect and representivity in our student and staff bodies.

The second semester protests, primarily around the “Fees Must Fall” campaign, while closely linked to issues of transformation, were initially more about the national crisis in university funding from government, a very worthy cause over which to protest. The national outcome was a zero % fee increase in 2016, fortunately with significant bail-out funding coming from government to offset the lost revenue. Whereas the cause of the “Fees Must Fall” protest was laudable, the unfortunate turn that the protests took, with intimidation, disruption and aggression

becoming increasingly common was deeply disturbing. Nevertheless, despite the examinations having to be delayed by two weeks due to these disruptions, the November set of examinations eventually ran remarkably smoothly. The opportunity was given to students to defer one or more of their end of year examinations to January if they felt that their preparation for their examinations had been compromised by the disruptions and unrest; a significant number took up the offer.

Although 2016 is likely to see on-going debate and student protest around the issues that surfaced in 2015, I am hopeful that they will be conducted in a manner that respects the rights and views of others. I am hopeful that as a Faculty we will be able to return relatively undisturbed to our core business of research and teaching, but without losing sight of the very real and legitimate needs and difficulties faced by a large proportion of our student population.

Despite the disrupted year, our Faculty staff and students continued to excel across many fronts in both teaching and research. A number of our staff were rewarded for their excellence in research, with prestigious national and international awards, and it is particularly gratifying to see the strength of our younger staff in this regard. The Faculty



was successful in being awarded two new DST/NRF SARChI chairs (Prof Jill Farrant and Dr Amanda Weltman), and we are proud to have two new NRF A-rated scientist (Professors Russ Taylor and Patricia Whitelock). Equally satisfying was Dr Adam West being one of four recipients of a UCT Distinguished Teacher Award in 2015.

The following pages capture some of the national and international achievements of staff and students, and thereafter there are short articles on some of the interesting scientific research that is being done by members of the Faculty.

I hope that you enjoy this 2015 edition of “Contact”, and as alumni please remain in touch with us.

**Anton le Roex**  
**Dean of Science**

## SOME FACULTY ACHIEVEMENTS IN 2015

Science Faculty staff regularly make headlines nationally and internationally for excellence in research and teaching, receiving a wide variety of awards in recognition of their achievements, and being elected to executive positions on international bodies. The pool of academic talent within the Faculty is something we are exceptionally proud of.

### Staff Achievements and Awards

» The Astronomy Department boasts two new A-rated scientists: **Professors Russ Taylor** and **Patricia Whitelock** (also at SAAO) both received A-ratings in 2015. **Professor Brian Warner** maintained his A-rating and together with **Professor Michael Feast**, the department now has four A-rated scientists.

» Two prominent female researchers in the Science Faculty have been awarded DST/NRF South African Research Chairs Initiative (SARChI) Chairs in their respective fields, as part of the Department of Science and Technology (DST) and National Research Foundation (NRF) initiative to promote women in research. We congratulate:

- › **Professor Jill Farrant**, Department of Molecular & Cell Biology, who was awarded a Chair in Systems biology studies on plant desiccation tolerance for food security; and
- › **Dr Amanda Weltman**, Department of Mathematics & Applied Mathematics, who was awarded a Chair in Physical Cosmology.

» **Professor Susan Parnell**, Department of Environmental & Geographical Science, was recognized as the Emeka Anyaoku Visiting Professorial Fellow by the Institute of Commonwealth Studies at the University of London for 2015/6.

» **Professor Kelly Chibale**, Department of Chemistry, has been profiled in the Royal Society of Chemistry's campaign: "175 Faces of Chemistry: Celebrating diversity in science".

» **Professor Renée Kraan-Korteweg**, Department of Astronomy, was named as one of six new UCT Fellows, in recognition of her standing as an international leader in her research into large-scale structures in the Zone of Avoidance, and the discovery of a large nearby spiral galaxy, named Dwingeloo 1, hidden by the disk of the Milky Way.



» **Professor Ed Rybicki**, Department of Molecular & Cell Biology, was honoured as the top achiever and is one of the first recipients of the Deputy Vice-Chancellor's Award for Achievement in Innovation, for his innovative work in the area of biopharming. His research has pioneered the production of human and animal viral vaccine antigens internationally, mainly via the avenue of transient expression in plants.

» **Professor Andy Buffler**, Department of Physics, has been elected a Fellow of the Teaching Advancement at Universities Programme coordinated by the Higher Education Learning and Teaching Association of Southern Africa (HELTASA).

» **Professor Anusuya Chinsamy-Turan**, Department of Biological Sciences, won the Academy of Science of South Africa (ASSAf) Science-for-Society Gold Medal for outstanding achievement in scientific thinking to the benefit of society.

» **Professor Michael Feast**, Department of Astronomy, received a Lifetime Achievement Award from the NRF. Professor Feast is quite possibly the only academic to have published papers in Nature 66 years apart: the first in 1948, when he was just 21, and most recently last year when he was 87.

» In recognition of her ground-breaking research presented to plant biologists across the globe, **Professor Jill Farrant**, Department of Molecular & Cell Biology, won the Erna Hamburger prize from the EPFL-WISH Foundation. The citation acknowledges the quality of her research and her standing as a role model to biologists and women in Science, worldwide.

Professor Farrant received the award in September in Switzerland.



## SOME FACULTY ACHIEVEMENTS IN 2015

» **Emeritus Professor John Field**, deputy director of the Marine Research Institute (Ma-Re), was awarded the Intergovernmental Oceanographic Commission's NK Pannikar Memorial Medal for his lecture: "From the Indian Ocean to the World Ocean and back in 50 years", which he delivered at an Ocean Science Day in Paris.

» **Professor Graham Jackson**, Department of Chemistry, was recently awarded the South African Chemical Institute Fellowship Award. The award is made to a SACI Member of at least 10 years standing who has demonstrated excellence and leadership in the areas of both the profession as an educator and/ or in the management of chemistry and has volunteered service to the chemical community.

» **Dr Arjun Amar** from the Percy FitzPatrick Institute of African Ornithology, Department of Biological Sciences, received a Claude Leon Merit Award for Early-Career Researchers. He will use the funds to continue monitoring the population dynamics and evolutionary ecology of the Black Sparrowhawk population in the Cape Town urban and sub-urbans area.



» The Science Faculty is proud to have four staff members elected as Fellows of the Royal Society of South Africa in 2015. They are:

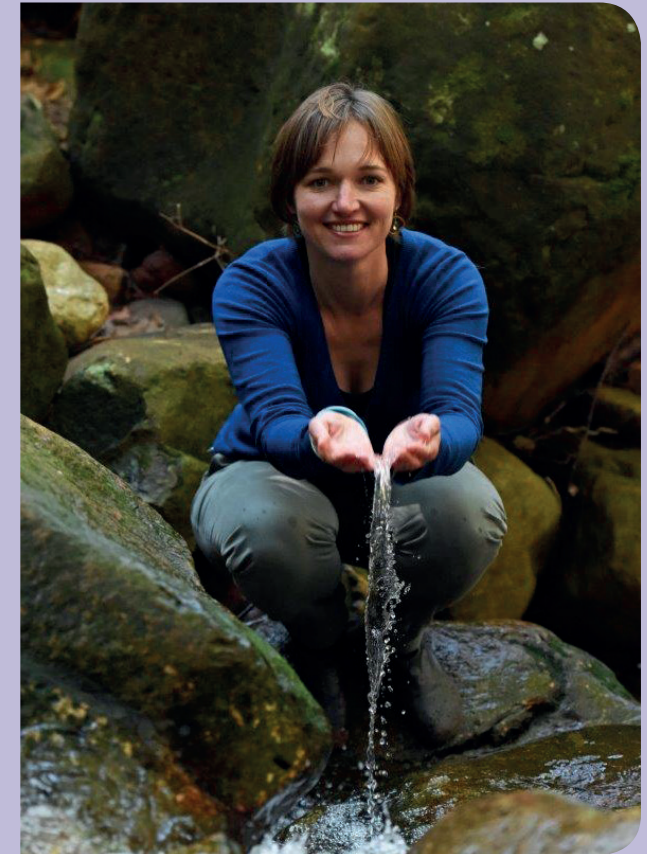
- » **Professor Tom Jarrett**, from the Department of Astronomy
- » **Professor Michael Meadows**, from the Department of Environmental & Geographical Science
- » **Professor Kevin Naidoo**, from the Department of Chemistry
- » **Associate Professor Heribert Weigert**, from the Department of Physics

## Distinguished Teacher Awards

» **Dr Adam West**, a Senior Lecturer in the Department of Biological Sciences, who is renowned for his creativity and catering to different learning styles in his classes, was named as one of four UCT Distinguished Teachers for 2015. Dr West is described as a passionate and engaging teacher who holds students' attention, develops them and allows them to achieve their potential. His Fame Lab and smart phone app utilisation attest to his commitment to innovation and full engagement with the needs of his students. His approach to teaching aims to make a lasting difference in how students think, both about themselves and the world around them.



## Women in Science Awards



» **Dr Gina Ziervogel**, a Senior Lecturer in the Department of Environmental & Geographical Science, and a Research Fellow in the African Climate and Development Initiative at UCT, won the Distinguished Young Women Researcher Award at the National Women in Science Awards 2015. Her work focuses on adaptation to the impacts of climate change, from the household level, up to the village and municipal level, within the context of African poverty alleviation and development.

## SOME FACULTY ACHIEVEMENTS IN 2015

# Student Awards and Achievements

A number of our students excelled both locally and internationally during 2015. The quality of our students remains a source of great pride to the Faculty.



» **Muneebah Adams** (pictured above), a PhD student in the Department of Chemistry, was awarded a prestigious scholarship at the Women in Science Awards 2015. Parasite resistance to current treatments is growing, and a serious threat in Africa, with its high prevalence of infectious diseases. Muneebah's research is aimed at finding novel strategies to combat endemic diseases such as malaria, and particularly resistant strains.

» The UCT team, "I Can't Pronounce Catachtonic" comprising **Yaseen Hamdulay, Robert Spencer** and **Sean Wentzel**, together with their coach **Dr Maria Keet**, from the Department of Computer Science, came second in the Africa & Middle East region of the International Collegiate Programming Contest (ICPC) World finals held in Marrakech, Morocco. They were the only team from Sub-Saharan Africa and one of ten teams in the Africa & Middle East Region, out of a total number of 128 teams who participated. **Sean Wentzel** won the ICPC Quest and was delighted to bring his first prize back to Cape Town.

» **Wade Petersen**, a PhD student in the Department of Chemistry, received the SASOL postgraduate medal for young innovative chemists, characterized by innovation, independence and enterprise. Wade has made significant strides in the synthesis of chiral aza-quaternary centres—an as yet unresolved problem in organic chemistry.

» **Jasmine Ferreira**, an Honours student in the Department of Chemistry won the James Moir medal at the 2015 SA Chemical Institute Awards Ceremony, for being the top Honours student in 2015, achieving a first class pass.

» The Amazingly Complicated Macros team from UCT, consisting of **Ashraf Moolla, Robert Spencer** and **Robin Visser**—all from the Department of Computer Science, won the ICPC southern African regional contest and will go to the finals in Thailand. UCT teams scooped 1st place and 4th, 5th, 6th, 8th and 9th place out of 71 teams from Benin, Cameroon, Niger, Nigeria, South Africa and Togo.



» A team of students from the Department of Statistical Sciences, comprising **J. Combrink, R. Nhapi, D. Rance, T. Wolf-Piggott, T. Phaweni, Q. Dube, A. Scarcella** and **G. Dlamini** (pictured above), placed second in South Africa in the highly competitive "Barclays' Hackathon". This is an international 24-hour competition where teams from around the world tackle a set of real-world IT problems from Barclays. The group were the only student team, and only team from Cape Town, and faced off against 53 professional teams within the field of data analytics.



FEATURE ARTICLES

## UCT leads a new Institute for Data Intensive Astronomy (IDIA)

The first decade of this century has seen a tremendous advance in information and digital technologies that are fundamentally changing scientific inquiry and empowering global change. Universities that adapt to and are part of this data revolution will be globally competitive in this new era.

The Square Kilometre Array drives one of the most significant big data challenges of this new era of research. The mid-frequency dish array of SKA will be deployed at the Karoo site in South Africa toward the end of this decade, incorporating into its infrastructure the South African MeerKAT SKA precursor telescope. MeerKAT itself is now under construction, with first science observations expected this year and full operations in 2017. Researchers in the Department of Astronomy at the University of Cape Town are playing a leading role in the key science projects of the MeerKAT project.

On September 3, South Africa established the Inter-University Institute for Data Intensive Astronomy (IDIA). Lead by **Professor Russ Taylor**, Department of Astronomy, IDIA is a partnership of three universities, including the University of the Western Cape and North-West University. IDIA builds on the strengths at each of the partner universities to create a collaboration to address the challenge of Big Data.

A primary goal is to create data science innovations and to build the human capital in data science in South Africa that will be required to ensure scientific leadership by South African researchers in the Square Kilometre Array. IDIA also aims to catalyze developments in data science beyond astronomy, which will help to position South Africa in this important new growth area for the economy.



Cutting the IDIA cake (from left) Bernie Fanaroff, Prof Tyrone Pretorius (UWC), Naledi Pandor, Prof Russ Taylor, Dr Max Price.



*IDIA a flagship project that responds to the big data challenge of the Square Kilometre Array (SKA). The IDIA – will bring together researchers in the fields of astronomy, computer science, statistics and eResearch technologies, to create data science capacity for leadership in the MeerKAT SKA precursor projects, and other precursor and pathfinder programmes.*

## UCT Archaeologists part of the team working on new human ancestor *Homo naledi*

Associate Professor Rebecca Ackermann and her PhD student Lauren Schroeder, members of the Department of Archaeology, were part of the team who recently described a new human ancestor, *Homo naledi*.

This species is an extremely important find for palaeoanthropology and South Africa. It is one of the most complete hominin finds ever, both in terms of numbers of individuals and representation of body parts. Over 1500 fossils of this species have so far been recovered, representing at least 15 individuals. This means that the researchers are able to say something not just about a jawbone of one individual, but about variation within this species and how all of the parts fit together. One surprising thing about *Homo naledi* is that this hominin had quite a

mixture of features, some of which were very ape-like, and some of which were very human-like. It will be very interesting, once there are secure dates for these fossils, to see how they relate to the bigger picture of human evolution.



Lauren Schroeder and Associate Professor Rebecca Ackermann.

FEATURE ARTICLES

## Plants that trick dung beetles into spreading their seeds

An exciting and rare example of deception in plant seed dispersal has recently been published in *Nature Plants* by Professor Jeremy Midgely, Department of Biological Sciences, and colleagues. Examples of flowers, especially orchids, which look like other plants or insects in order to attract animals that will pollinate them are numerous, but whether mimicry is used to help disperse seeds is controversial. The study by Professor Midgely and colleagues has shown that the nut seeds of *Ceratocaryum argenteum* — which are larger than those of related restio species, give off a pungent smell reminiscent of antelope droppings, which serves as a disguise to aid their dispersal.

Whereas the size and texture of the nuts suggest that they could be collected and cached by small mammals, no mammals that display this 'scatterhoarding' behaviour are known in the study region of the De Hoop Nature Reserve. Camera traps set up by the researchers showed indigenous rodents ignoring the nuts. Since the seeds are hard and offer no reward to the dung beetles, they too should show no interest in the seeds, since the nuts are too hard for them to eat or lay eggs in. However, camera traps showed dung beetles (*Epirinus flagellatus*) rolling nuts away and burying them. The authors analysed the volatile chemicals given off by the seeds and found that their concentration and composition were similar to those emitted from eland and bontebok dung, as is their shape. By mimicking antelope dung, *C. argenteum* may be tricking the dung beetles into planting their seeds without reward.



## Fishermen connect to the future with smartphone app

With the increasing affordability of mobile devices and the rapid development of internet systems and mobile apps, more and more organisations are utilising this ubiquitous method of communication to develop sophisticated monitoring systems to address some of the world's pressing social and ecological challenges.

The department of Agriculture, Forestry & Fisheries, partnered with Dr Serge Raemaekers, Department of Environmental & Geographical Science, and launched a new fishing application called Abalobi. The app, currently in pilot stage, will, according to Serge, "empower fishers and change power dynamics in an industry where most small scale fishers have remained marginalised". He says that it aims to be a log book or diary, where the fishers can record their catches, species, price of sale and other information.

The app and associated technology aims to address a major problem faced by small scale fishers, namely the gap between scientific knowledge and local fisher knowledge. He explains, "The very contextualised

local knowledge does not make its way into fisheries management; but also, the scientific understanding of fish-stock models does not always gel with the local knowledge owned by the fishers". The second factor is that fishers often don't get a good price for their catch and are not empowered in the value chain. The app will allow small-scale fishers to interact with each



Dr Serge Raemaekers wants to narrow the gap between scientific knowledge and local fisher knowledge.

other through instant messaging. In this way they can work together to get better prices. In a pilot project run with a group in Struisbaai, fishermen used the app to set a minimum price for their line fish. In the long term the app will help with safety at sea, connecting fishers to markets and consumers and building a knowledge hub for fishers to keep up with the latest trends and regulations.

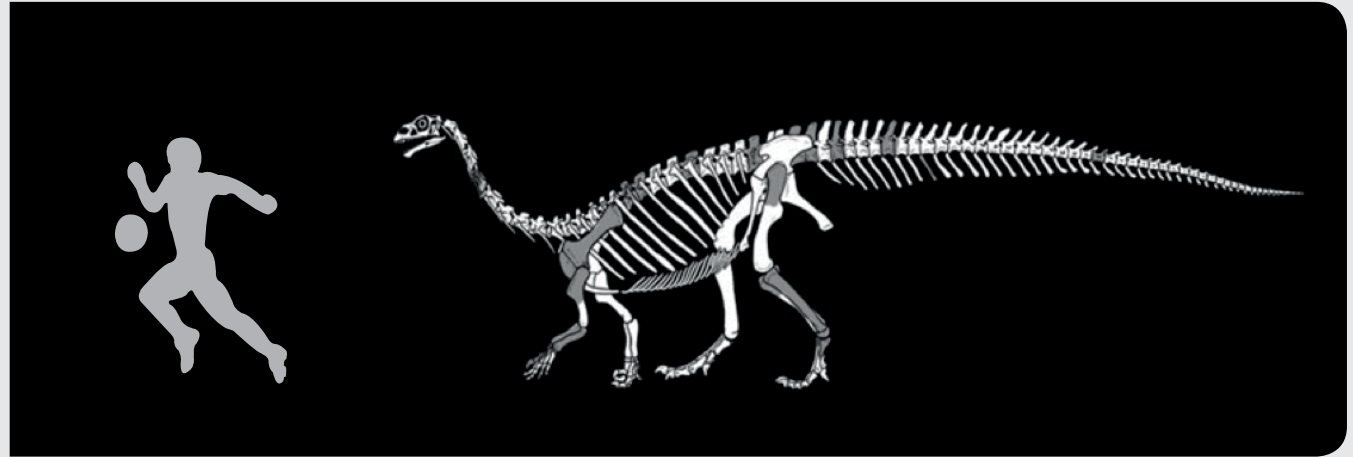
## FEATURE ARTICLES

# The million year old monkey: antiquity of primate fossil confirmed

An international team of scientists have dated a species of fossil monkey found across the Caribbean to just over 1 million years old. The discovery was made after the researchers recovered a fossil tibia (shin bone) belonging to the species of extinct monkey *Antillothrix bernensis* from an underwater cave in Altigracia Province, Dominican Republic. The fossil was embedded in a limestone rock that was dated using the Uranium-series technique.

In a paper published in the *Journal of Human Evolution*, the team use three-dimensional geometric morphometrics to confirm that the fossil tibia does indeed belong to *Antillothrix bernensis*, a primate that is now known to have existed on Hispaniola relatively unchanged for over a million years. This monkey, roughly the size of a small cat, was tree-dwelling and lived largely on a diet of fruit and leaves.

**Dr Robyn Pickering** of the Department of Geological Sciences, a lead researcher involved in the dating of the limestone surrounding the fossils, said scientists had long been puzzling over the age of primate fossils from this region – since the days of Darwin and Wallace.



*Sefapanosaurus* as compared to a soccer player to give an idea of its size! Shaded bones in the *Sefapanosaurus* skeleton shows the fossilized remains in the collections.

# New Sesotho-named dinosaur from South Africa

South African and Argentinian palaeontologists have discovered a new early dinosaur from South Africa. The specimen was found in the late 1930s, in the Zastron area of South Africa about 30km from the Lesotho border. Close scrutiny of the fossilized bones of this approximately 200 million year old dinosaur has revealed that it is a completely new dinosaur. One of the most distinctive features is that one of its foot bones, the astragalus, has a “cross” shape, for which the dinosaur is named. Considering the location of the fossil discovery, it was decided that a Sesotho name would be appropriate, and since in Sesotho, “sefapano” means “cross”, the dinosaur was named *Sefapanosaurus*.

**Professor Anusuya Chinsamy-Turan**, Department of Biological Sciences, and PhD student, **Emil Krupandan** are part of the team that named the dinosaur. The remains of the *Sefapanosaurus* include limb bones, foot bones, and several vertebrae. It is considered to be a medium-sized sauropodomorph dinosaur i.e. among the early members of the group that gave rise to the later long necked giants of the Mesozoic.

Professor Chinsamy-Turan says, “The discovery of *Sefapanosaurus* shows that there were several of these

transitional early sauropodomorph dinosaurs roaming around southern Africa about 200 million years ago.”

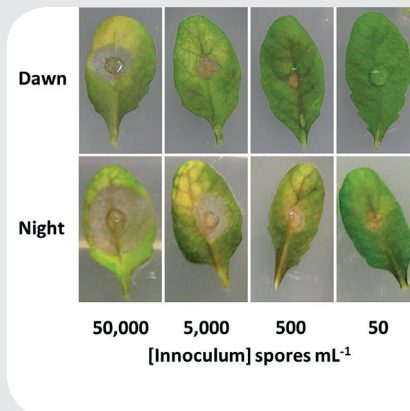
Argentinian co-principal investigator of the RSA-Argentina collaboration, Dr. Diego Pol, says, “This and other recent dinosaur discoveries in Argentina and South Africa are revealing that the diversity of herbivorous dinosaurs in our continents was remarkably high back in the Jurassic, about 190 million years ago, when South America, Africa, and other southern hemisphere continents were a single supercontinent known as Gondwana.”



FEATURE ARTICLES

## Plant defence against pathogens linked to time of day

Drs Laura Roden, and Rob Ingle, from the Department of Molecular & Cell Biology, have recently published research that shows that plants are better able to defend themselves against fungal pathogens, when inoculated at dawn, rather than at night. The pathogen they used was *Botrytis cinerea*, which is a widespread, generalist pathogen. Their work could have significant impact on crop management and pest control strategies.



Dr Roden explains that plants are able to anticipate changes in the daily environment, such as sunrise and sunset, temperature and even likelihood of pathogen infection. They are able to do this via a molecular clockwork mechanism called the circadian clock. Drs Roden and Ingle found that the defence response to *Botrytis cinerea* is delayed in plants inoculated at night—when spores would usually be less abundant. This may have implications for management of bacterial and fungal infections of crops, in terms of effective times for treatments, as well as in plant breeding for resistance.

## Using plant traits to predict the response of Fynbos to drought in biodiverse regions

Climate change-induced drought is threatening the world's biodiverse hotspots but a new standardizable system to describe drought strategies in plants will help conservationists understand the impact of future drought, says a new paper by Dr Robert Skelton, Dr Adam West and Professor Todd Dawson in the *Proceedings of the National Academy of Sciences*

Similar to measuring blood pressure and metabolism in humans to determine how they might react to thirst or hunger, the system measures simple plant traits to get an index for responses to drought-induced starvation and thirst. Understanding how sensitive biodiverse regions are to drought is crucial. But although plant physiologists have hundreds of years of research to draw on, predicting the impacts of drought on plants, particularly those in complex, bio-diverse systems, has been difficult

A key component of the fieldwork involved measuring the “pulse” of the plants. To do that, Dr Robert Skelton, who is now doing postdoctoral studies in plant science at the University of Tasmania in Australia, was up in the mountains before dawn a few days every month to measure the plants' water stress and carbon gain. Part of the project involved building miniature probes and attaching these to plant stems and logging the data, every 15 minutes over a two year period. Although he found a continuum of drought response strategies in these communities, he also found considerable variation in drought response among the species. “While the three familiar fynbos plant types like restios, ericas and proteas all showed similar classes of response to desiccation or starvation, there were considerable differences among species, showing how important biodiversity might be in protecting ecosystems from change.”



Drs Rob Skelton (left) and Adam West attaching probes to fynbos to measure the biological ‘pulse’ of these plants.





## FEATURE ARTICLES



# Scientific voyage to retrieve vital ocean data

**After two years of negotiation between scientists and government ministers, the polar research vessel *SA Agulhas II* headed into the southern Ocean during 2015 for a scientific voyage. On board were a UCT Oceanography team of five MSc students, led by Associate Professor Isabelle Anson, whose goals were to retrieve moorings with vital information on how climate change is affecting the world's ocean current system.**

This was the first dedicated scientific voyage funded by the Department of Science and Technology (DST). During logistics voyages to Gough and SANAE in 2013 and 2014, Associate Professor Anson and her team deployed moorings to collect the data needed to monitor the Meridional Overturning Circulation (MOC), a system of surface and deep ocean currents that extend across the globe. This system is the main pathway

for the large-scale circulation of heat, salt and carbon dioxide from the tropics polewards. The moorings have hourly records of temperature, salinity and current flow – physical variables essential if oceanographers are to understand the role that changes in the volume of warm salty Indian ocean water may have on the Atlantic, and further afield. Climate models have predicted that increased levels of greenhouse gases may be interfering

with this process by slowing down the circulation in the North Atlantic – the northern limb on the MOC. The moorings will provide a high-resolution dataset of the ocean flow south of Africa. As part of their training, the five MSc students onboard gained hands-on experience of retrieving moorings, downloading data and making sense of how the oceans south of Africa are responding to changes in ocean circulation.



## EVENTS IN THE FACULTY

# Bird declines show that climate change is more than just hot air

Scientists have long known that birds are feeling the heat due to climate change. But a new study of a dozen affected species in the Western Cape suggests their decline is more complex than previously thought – and in some cases more serious.

There could be several reasons why birds are being negatively affected by the changing climate, according to the study by scientists from the Percy Fitzpatrick Institute at the University of Cape Town and the Centre for African Conservation Ecology, Nelson Mandela Metropolitan University.

The study, published in *Conservation Physiology*, which includes some well-known species such as the Malachite Sunbird and the Familiar Chat, suggests that contrary to expectations, the birds' heat tolerance - or lack thereof - is not necessarily the main factor causing species to decline. Other factors like changing fire and rainfall patterns, and new bird behaviour patterns could also be responsible.

Lead researcher **Dr Susie Cunningham**, of the Percy Fitzpatrick Institute, says a better understanding of how climate change affects bird species could help develop conservation strategies to increase chances of survival; "We know climate change is linked to changes in species' numbers and distributions, but we don't always know exactly how or why," Cunningham says. "We need to figure out the factors actually driving declines before we can develop proper conservation measures to halt them." "Fynbos birds are particularly important in this regard because they live in an area that has been extremely stable, climatologically speaking, for a very long time. So changes in climate are not something they are used to. Furthermore, six of the species we studied are endemic to the fynbos, so if we lose them from this biome, we lose them altogether," she explains.

The new study profiles the well-being of twelve fynbos bird species based on a comparison of data contained in two Southern Africa Bird Atlas surveys conducted fifteen



Orange-breasted sunbird (photo: Davide Gaglio) & Cape Sugarbird (photo: Alan Lee)

years apart. This data were matched with climate data for the comparative period, as well as with physiological data. Bird survey and climate comparisons produced some interesting findings, including:

- » All 12 of the study species, which included both endemic and non-endemic fynbos birds, show range declines over the fifteen-year period.
- » Bird species living in naturally warmer areas are generally faring better than those in cooler areas, but species experiencing greatest warming within their ranges are declining fastest. These patterns are strikingly similar to patterns observed in the Northern Hemisphere, suggesting warm-adapted birds are faring better under climate change, globally.
- » Endemic bird species, which typically favour cooler habitats, appear to be more vulnerable to climate change than non-endemic species.
- » Highest rates of climate warming were recorded in

inland (mountainous) areas, whereas some coastal areas have cooled.

- » Eight of the 12 study species (and five of six Fynbos endemics) show declines in reporting rate or local extinction in more than half of their habitat range.

A key aspect of the study is a comparison of climate and bird population data with the heat response – or 'thermal tolerance' – of each bird species. In this way researchers assessed to what extent birds can cope with changing temperature, and whether this is the primary indicator of changes in bird abundance.

Cunningham says the overall findings suggest scientists should not jump to conclusions about bird physiology when assessing the effects of climate change: "The main findings are that physiology, though often considered the ultimate factor limiting species distributions, may not be the factor responsible for warming-related declines in most Fynbos birds," she explains.

## EVENTS IN THE FACULTY

# Distinguished Visitors to the Faculty of Science during 2015

As part of the new Science Faculty research strategy, three Distinguished Visitors will be invited annually to spend two to three months in a host department in the Faculty. Two of the first three such Distinguished Visitors, both internationally leading researchers in their fields, spent time at UCT in 2015.

» **Professor Ray Norris**, an astrophysicist from CSIRO in Sydney, Australia and the University of Western Australia, spent 3 months in the Department of Astronomy, as a Science Faculty Distinguished Visitor. Professor Norris' area of expertise is how galaxies evolve and form in the universe. He is also leading one of the key projects driving the Australian SKA Pathfinder named EMU (Evolutionary Map of the Universe) which will use radio waves to detect 70 million galaxies, compared to the 2.5 million discovered over the entire history of radio astronomy.

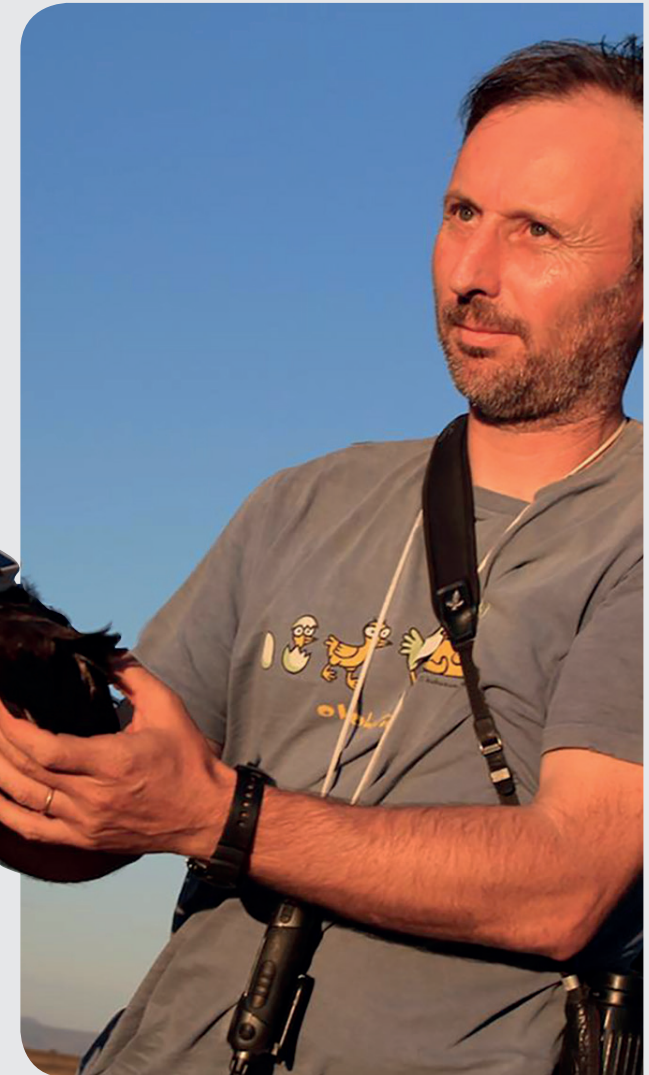


Professor Norris' visit has been about collaborating and looking at ways of maximising the benefits and uses of the ASKAP and MeerKat radio telescopes. He is also well known for his work on Aboriginal astronomers - having written a book entitled "Emu Dreaming: An introduction to Australian Aboriginal Astronomy". While in South Africa he has made contact with people working with the culture of the indigenous SAN astronomers and this has contributed to his research about the cultural underpinnings of the SKA project. While in Cape Town, Professor Norris has enjoyed seeing the sights, visiting the Kruger National Park and experiencing the delights of the local wine farms.

» **Dr Francois Mougeot**, a biologist who is currently a researcher for the Spanish Research Council and is based in central Spain, was hosted as a Science Faculty Distinguished Visitor for four months by the Percy Fitzpatrick Institute of African Ornithology within the Department of Biological Sciences.

Dr Mougeot's work focusses on understanding how individuals, populations and species respond to changing environmental conditions. His research encompasses studies in behavioural ecology, eco-physiology, population ecology and conservation. He is particularly interested in understanding how environmental variability influences individual behaviour and fitness, and ultimately demography and population dynamics. He considers both natural processes (e.g. predator-prey and parasite-host interactions) and anthropogenic drivers (e.g. land use changes, hunting, environmental pollution). His research focuses on species of conservation concern or whose population size fluctuates greatly over time, and is based mostly on field studies of free-living individuals and natural populations. Ultimately, he aims to contribute scientific-based evidence that can help the conservation of threatened or declining species, as well as the resolution of ecological conflicts such as those arising between human activities (e.g. farming, hunting) and biodiversity conservation.

While at UCT he gave a talk entitled, "Parasites, testosterone and population cycles: insights into population ecology from long term studies of red grouse *Lagopus lagopus scoticus*".



## EVENTS IN THE FACULTY



### DISTINGUISHED ALUMNI LECTURE

# Unravelling the Okavango – Professor Terence McCarthy

**The secrets of Okavango’s delicate but robust ecosystem are rooted in a unique give and take exchange involving the geology, geochemistry, and flora, said alumnus Professor Terence McCarthy, who delivered the annual Science Faculty Distinguished Alumni Lecture at UCT, titled ‘Unravelling the Okavango’. Professor McCarthy completed his BSc (Hons) and Master’s degrees at UCT in the Department of Geochemistry.**

Now an emeritus professor in the School of Geosciences at the University of Witwatersrand, Professor McCarthy has contributed more than 30 years of research to the study of the Okavango Delta ecosystem, and other southern African wetlands. The Okavango, an alluvial fan and not a delta, is a network of waterways, islands and levees, some 250km from beginning to end and is made up of permanently flooded, seasonally flooded and occasionally flooded regions.

Although government agencies had generated good maps, aerial photographs and a large body of hydrological, geological and climatic information on the

Okavango by the 1970s, Professor McCarthy argued that its ecosystem was little understood. Why did the channels of water through dense papyrus change form and direction over the years? What caused blockages of papyrus in the channels? How did the levees form? What role did hippos, elephants and even termites play? It has taken years of field trips and collaborations for him to piece together the puzzle of this complex ecological system.

Mostly, sedimentation drives change in the Okavango, says Professor McCarthy. “But the processes that regulate sedimentation are almost all biological in origin. It’s managed by the biota and is constantly changing, a

remarkably resilient system.” He enthralled the audience with recollections of sailing up the Nqoga channel from the distal end to the headwaters in a houseboat in 1987. By 2002 the channel had disappeared; the trees had died on the surrounding islands, which had ‘drowned’ and filled with papyrus. New channels “nucleate” on trails on the river bed used daily by hippos to access the vegetation on the island and banks. This network of hippo trails picks up surface flow, erodes the bed, and forms new channels. “This is very important for the ecosystem,” said Professor McCarthy. The papyrus vegetation is so dense and impenetrable to flow, that water height has a step-wise profile across the delta.

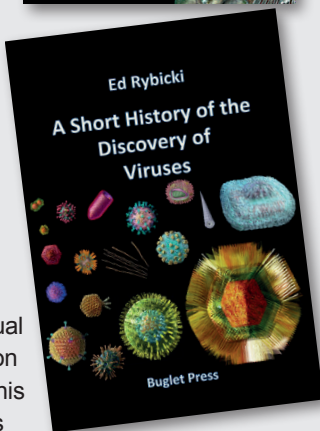
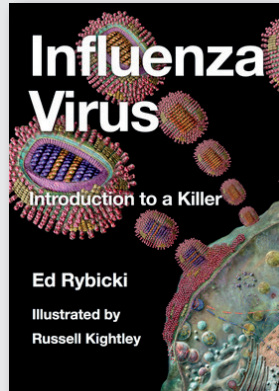
## SCIENCE FACULTY

# Books in the Faculty

» **Professor Ed Rybicki**, Department of Molecular & Cell Biology, has recently published two books on viruses: *A Short History of the Discovery of Viruses* and *Influenza Virus: Introduction to a Killer*.

Influenza virus is one of the biggest and yet one of the most insidious scourges to have hit humankind: from 1918 to 1920, the “Spanish Flu” pandemic killed more than 50 million people across the world; subsequent pandemics in 1957, 1968 and 1977 killed millions more, and the count is still unclear on the 2009 pandemic. However, in any given year up to 400 000 people die of so-called “annual flu” – yet universal vaccination against flu is still a dream. This book aims to inform students and lay people about viruses, how they work, how pandemics arise – and what can be done to stop them, and specifically the use of vaccines.

Viruses as a concept are just a little younger than bacteria - they were first described only in the 1890s - yet have probably co-existed with cellular life through nearly the whole of evolutionary history on this planet. This book gives an account of the history of the discovery of viruses, with some case studies on particular aspects, concentrating on the technological developments that were necessary for the discovery events to happen.

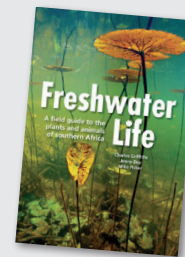
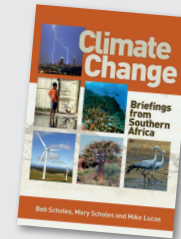


» **Associate Professor Mike Lucas**, Department of Biological Sciences, is one of the three authors of a new book: *Climate Change: Briefings from Southern Africa*.

The book answers questions such as:

- » How do greenhouse gases regulate the Earth's temperature?
- » How hot will it get?
- » Will South Africa run out of water?
- » Is sea-level rise something to worry about?
- » Do cow-farts really cause global warming?
- » Will marine fisheries collapse?
- » Isn't climate change just part of a long-term natural cycle?
- » Can solar and wind power meet our energy needs?
- » How can I reduce my carbon footprint?

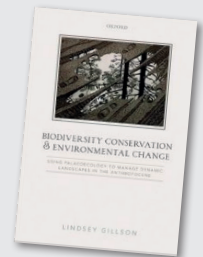
» *Freshwater Life – A field guide to the plants and animals of Southern Africa* by **Charles Griffiths, Jenny Day & Mike Picker**, Department of Biological Sciences, is the first comprehensive, illustrated field guide to aquatic life in the southern African region. Certain chapters in the book were written by other Departmental staff (Gary



Bronner – mammals, Peter Ryan – birds, Cecile Reed – copepods). This book spans all aquatic life forms, from vertebrates, through insects, molluscs and other invertebrates, to aquatic plants and algae. More than 1,000 freshwater organisms are included, and descriptive text and notes on the ecology of each species are accompanied by photographs and distribution maps. A comprehensive introduction details the ecology and significance of freshwater systems in southern Africa.

» **Biodiversity Conservation & Environmental Change** by **Associate Professor Lindsey Gillson** from the Department of Biological Sciences.

This new book illustrates how a knowledge of long-term change in ecosystems can inform and influence their conservation, integrating perspectives from archaeology, environmental history and palaeoecology. It also describes the implications of long-term ecology for biodiversity conservation and ecosystem management, providing a context for interpreting today's changing landscapes. The book includes topical case studies with a broad geographical and taxonomic coverage to ensure the book's global relevance.



## KEEP CONNECTED – STAY IN TOUCH – KEEP CONNECTED

We value regular contact with our alumni, so please email us on [Katherine.wilson@uct.ac.za](mailto:Katherine.wilson@uct.ac.za). We would like to hear about what you are doing with your Science degree in order to enable us to build career profiles of opportunities for Science graduates. We would also like to cover interesting initiatives you are involved in, in future *Contact* newsletters.

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