December 2015 Faculty of Science University of Cape Town Vol. 4 Issue 2

Science Matters

Science Faculty Newsletter

Message from the Dean

The past six weeks of this second semester of 2015 saw unprecedented waves of student protests across our campus and across the country. The initial cause of the student protests was a long overdue reaction to government's continued marginalization of tertiary education through the decreasing subsidy provision, with consequent increasing fees to make up the shortfall. It is unfortunate that the initial very legitimate national cause was compromised by the ugly turn that many of the protests took and the associated infringement of individual rights. Despite the disruptions, the examinations, although delayed, were concluded successfully.

With the delayed end of year examinations, and with many students deferring their exams to January 2016, December graduations this year will be a diminished celebration – only research Master's and PhD students, and a few who met their degree requirements in June, will graduate in person in late December 2015. Despite the impact of the student unrest some 30 PhD and over 60 Master's students will graduate at the 19 December graduation ceremony; we look forward to celebrating with them as they are capped in Jamieson hall.

In amongst the first semester (Rhodes must fall) and second semester (fees must fall) student protests, and associated disruptions to university life, our staff continued to excell in their teaching and research. Some of these achievements are captured in the pages that follow. These include an NRF Lifetime Achievement award, two new SARChI Chair appointments, a UCT Fellow award and a UCT Distinguished Teacher Award. A number of exceptional staff and student achievements, both on the national and international stage, are briefly reported on.

Research by faculty staff and students continues to flourish. The new and exciting Big Data initiative with focus on the future needs of the SKA is now well off the ground after the formal launching of the Institute for Data Intensive Astronomy (IDIA), with UCT, UWC and NWU as founding members. A related coursework Master's programme in Data Science involving a number of Science Faculty departments is at an advanced stage of planning. The Faculty was able to provide seed funding to the six new Faculty research impact areas, within which a suite of exciting inter-disciplinary proposals have been developed. We look forward to seeing them come to fruition during the course of next year. Amongst other successes, the Science Faculty was fortunate in being awarded one of the five new UCT inter-disciplinary research "Institutes" which will be formally established early in the new year.

Some of the on-going research activities in the Faculty are captured in the following pages.

I wish you all an enjoyable and peaceful, if somewhat shortened, festive break once the extended second semester activities are over.

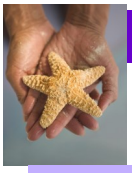
Anton le Roex

New UCT Fellow—Professor Renée Kraan-Korteweg, from Department of Astronomy

Professor Renée Kraan-Korteweg, from the Department of Astronomy was named as one of six new UCT Fellows. Renée joined UCT in 2005 as incoming Chair of Astronomy and following a decade under her scientific leadership, the Astronomy Department has been transformed from a small academic department into a large and vibrant community of multi-wavelength astronomers who are leading large international scientific projects on world-class facilities such as SALT (the Southern African Large Telescope) and MeerKAT (the precursor to the SKA radio telescope).

Dr Adam West, from Department of Biological Sciences recognised as a UCT Distinguished Teacher

Dr Adam West, who is renowned for his creativity and catering to different learning styles was named as one of UCT four Distinguished Teachers for 2015. He 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.



Our Science Stars:

New SARChI Chairs

Two prominent female researchers in the Science Faculty have been awarded SA 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, (left) from the Department of Molecular & Cell Biology, who was awarded a Chair in Systems biology studies on plant dessication tolerance for food security; and

Dr Amanda Weltman, (right) from the Department of Mathematics & Applied Mathematics, who was awarded a Chair in Physical Cosmology.

Lifetime Achievement Award from NRF to Professor Michael Feast

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. He has had a minor planet named after him (Asteroid no. 10985 Feast, discovered from Mt Palomar in October 1977) and has represented South African astronomy at the highest international level.

Feast began his career in astronomy in 1952 and worked at the Radcliffe Observatory in Pretoria, which at that time was the largest telescope in the Southern Hemisphere. His work in this period contributed enormously to the understanding of Large and Small Magellanic Clouds, our nearest neighbouring galaxies. Feast also made a number of contributions to the understanding of our own Milky Way Galaxy. His most recent ground-breaking work was the unexpected discovery of young (Cepheid) stars in the flared outer disc of the Milky Way.

Perhaps Feast's most important contribution to astronomy has been his leadership as director of the SAAO from 1976 to 1992. He was responsible for the development of the SAAO as a major international and national facility. The observatory, under his leadership and still today, works at the forefront of astrophysics, greatly stimulating the development of astronomy in the country. During this period an international review panel described SAAO as "... producing the most cost-effective astronomical research in the world". The work carried out at the SAAO during Feast's directorship has led to the recognition of South Africa as a major component in world astronomy.

Four Science Faculty staff elected as Fellows of the Royal Society of South Africa in 2015

The Science Faculty is proud to have 4 staff members who were elected as Fellows of the Royal Society of South Africa, during 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

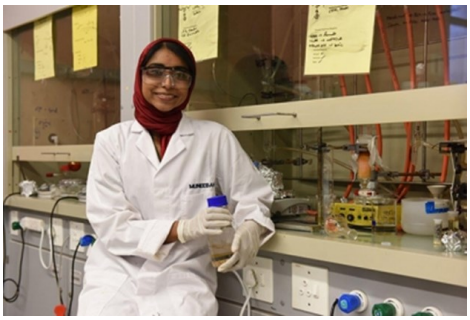
Professor Tom Jarrett

Professor Michael Meadows

Professor Kevin Naidoo

Professor Heribert Weigert

Muneebah Adams from Department of Chemistry wins DST Fellowship Award



Muneebah Adams, 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. She is working on the preparation and evaluation of organometallic complexes such as potential antiplasmodial agents (which target the malaria parasite) and antitrichomonal agents (which target trichomoniasis, a common sexually transmitted disease). Her work will contribute to the growing library of compounds being evaluated for their biological activity, which will provide insight for future drug design.

Distinguished Young Women Researcher

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 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. She argues that, "society won't be able to meet its poverty reduction goals unless it sees the overlap between development and environmental health". Environmental services provide the bedrock for water, sanitation, housing, food security, etc, but society tends to emphasise the importance of the physical sciences in addressing things like climate change and adaptation. And while it is important to understand the technical side of how these work, if you don't understand the societal contexts in which these events unfold, the governance issues, the social side of things—you aren't going to realise the benefits of climate adaptation that the physical sciences can give you.

This year's award recognised women 41 years or younger, whose work is aligned with the Millennium Development goals. Dr Ziervogel says, "My research was well suited for this, because it addresses two of the goals, ensuring environmental sustainability and addressing poverty".

Dr Ziervogel donated R5 000 of the R50 000 prize to the eight young 'ambassadors' on the Piketberg project—volunteers who are assisting the researchers and need additional resources to continue with their work. The

Professor Kelly Chibale profiled in Royal Society's 'Hall of Fame'

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

Zambian-born Chibale holds the South Africa Research Chair in Drug Discovery and is founder of H3D, Africa's first integrated drug discovery and development centre. He is also founding director of the South African Medical Research Council Drug Discovery and Development Research Unit at UCT, which works to find cures to endemic African diseases.

Seen by the RSC as a role model for African scientists, Chibale was also chosen for his support of research programmes that integrate scientists with different expertise and from different disciplines, crucial for tackling major scientific challenges.

One example is the malaria drug discovery project, led by H3D and involving researchers in medicinal chemistry, biology and pharmacology and involving collaborations with institutions in Switzerland, India and Australia.

IOC-UNESCO medal for Emeritus Professor John Field

Emeritus Professor **John Field** who is deputy director of the Marine Research Institute (Ma-Re), was awarded the Intergovernmental Oceanographic Commission's NK Pannikkar Memorial Medal.

John delivered a memorial lecture in Paris where recent developments in ocean science were presented to the IOC's 147 member states, networks and partners at an Ocean Science Day on 17 June. The day took the form of lectures and a panel discussion with eminent experts, aimed at helping decision makers gain a better understanding and awareness of challenges and emerging issues around ocean science and governance.

Presentations and debates focused on the links between ocean health and human wellbeing; the potential of the latest advances in monitoring technology; current scientific challenges in the Arctic; the legacy of the International Indian Ocean Expedition; as well as the need to develop new ocean knowledge and technologies for the benefit of society.

He shared the experiences he had had on board the seventh cruise of the RV Anton Bruun during the first International Indian Ocean Expedition (IIOE) in the 1960s. In his lecture, John provided insights on the legacy of the first IIOE, and the fundamental changes that have revolutionised our understanding of the global ocean in the 50 years since then. He also talked about the potential of IIOE-2 in light of new technological advances.

Chemists excel at SA Chemical Institute Awards

Professor Graham Jackson, (pictured left) from the 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. Graham has authored over 100 publications and has made important contributions to chemical speciation of transition metal complexes in aqueous solution, especially in the field of copper complexes, and to the development of NMR spectroscopy in South Africa.

At the same award ceremony, **Wade Petersen,** (pictured right) 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. Professor Timothy Egan says, "Wade has shown himself to be a talented experimentalist, and coupled with his high academic grasp of chemistry theory, has managed to pull off a huge achievement for both himself and the discipline as a whole".

Jasmine Ferreira, won the James Moir medal for being the top Honours student in 2015, achieving a first class pass.

Computer Science whizzes win at Intercollegiate Programming Contest...and head to Thailand

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. They were the only team to solve 6 problems. UCT teams scooped 1st place and 4,5,6,8 and 9th place out of 71 teams from Benin, Cameroon, Niger, Nigeria, South Africa and Togo.

Our achievers across the board and the world….

Professor Igor Barashenkov, from the Department of Mathematics & Applied Mathematicss, has been awarded a Marie Curie grant from the European Commission to study combs (sequences) of solitons in microwave resonators. This is part of a joint consortium between the UK, Sweden, Russia and UCT.

Dr Roisin Kelly, from the Department of Biological Sciences, won the Andries Brink-Kaye award for the most outstanding publication in the Cardiovascular Journal of Africa, for 2014. The award was for a paper that she wrote with her colleagues at the Hatter Institute for Cardiovascular Research at UCT.

At a recent European Crystallographic Meeting in Rovinj, Croatia, **Francoise Amombo Noa**, a PhD student in Chemistry, was surprised at the excitement with which she was greeted at the Cambridge Structural Database stand. It turns out that she was a co-author of the Database's 750 000th entry. While at the conference, Francois presented a paper on her PhD project, "Halogen bonding in host-guest compounds: Structures and kinetics of enclathration and desolvation".

Emeritus Associate Professor Jenny Day won the 2015 Mondi Award of the South African Wetlands Society for Wetlands Education and Skills Development.

Barclays Hackathon—Team from Statistical Sciences excels..

Barclays' hackathon is a 24-hour event where teams from around the world gather and tackle a set of real-world problems from Barclays. It is an international competition with 54 team entries. The UCT team from Statistical Sciences—the only student team and the only team from Cape Town, faced off against 53 professional teams within the field of data-analytics. The team (pictured right) were **J. Combrink, R. Nhapi, D. Rance, T. Wolf-Piggott, T. Phaweni, Q. Dube, A. Scarcella** and **G. Dlamini.**

The team was presented with five topics and had an hour to select which one they felt they could break within 24 hours. The topic they selected was 'Collection data analysis' and it involved predicting the success, as well as solving for the optimal days, on which to hit a transactional bank account with a NAEDO (Non-authorised electronic debit order).

They downloaded a virtual machine on which to access the protected data and the team dispersed into several groups, some working on the final app, some considering how to most efficiently code predictors for the data and someone performing regressions on the 43 or so variables. Alongside an app designed with *Shiny* to manage and present data, the team successfully answered all components of the Collections Data Challenge and presented the condensed cumulative results within a three minute skype call.

The team was proud to be the 3rd distinguished team; placed 2nd in South Africa, in this highly competitive international competition. The Global winners were the Bohemians from the Czech republic.

International Society of Conservation Biology's Distinguished Award goes to Dr Kerry Sink

By Emeritus Professor George Branch

Dr Kerry Sink (right front of photo) with her team

Dr Kerry Sink, who graduated from the (then) Department of Zoology at UCT, was this year awarded the Society of Conservation Biology Distinguished Award for absolutely outstanding leaderships and self-sacrifice in mainstreaming marine biodiversity conservation research into South Africa's development planning, policy, management and industrial arenas.

Kerry works across the science-policy continuum, using scientific advice to achieve lasting conservation change. She has improved conservation of offshore ecosystems, with research and mainstreaming efforts across the biodiversity, fisheries, mining, shipping and petroleum sectors. She is deeply committed to marine science and conservation, and invests heavily in mentorship and human capacity development in the marine sector, as well as in relationships to ensure that science supports sound decision–making.

Kerry was awarded a Foundational Biodiversity Information Research Grant for her large collaborative project "SeaKeys: Unlocking Foundational Marine Biodiversity Knowledge". She led the marine component of South Africa's National Biodiversity Assessment, which involved developing South Africa's first national marine and coastal ecosystem classification, mapping 27 pressures on marine biodiversity, collating data on species threat status, invasive species and genetic diversity, and assessing ecosystem threat status and protection for South Africa's 136 relevant ecosystem types. Kerry was nominated by the fishing industry as a Most Influential Woman in Business and Government, and won the award in her category.

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**, (pictured right) from the 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 technology aims to address two major problems 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 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.

Computer Scientists design mobile applications to encourage children to read.

Two undergraduate students from the Department of Computer Science, **Erin Versveld** and **James Foster**, had a research paper accepted by the *South African Institute for Computer Scientists and Information Technologists Conference*. Associate Professor Michelle Kuttel, commented that this was the fruit of their Summer Undergraduate Research Experience (SURE) initiative, a project that ran in 2013 and 2014 and said that all involved were very proud of this research achievement by undergraduate students.

The paper was presented by Erin at the conference this year and their paper was entitled "Comparison of effectiveness of two mobile application designs for encouraging children to read**.**"

Faculty Distinguished Visitors to the Faculty of Science during 2015

Professor Ray Norris - Department of Astronomy

Professor Ray Norris, an astrophysicist from CSIRO in Sydney, Australia and the University of Western Australia, has 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—Percy Fitzpatrick Institute of African Ornithology

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.

Francois' work focusses on understanding how individuals, populations and species respond to changing environmental conditions. His research is cross-disciplinary, encompassing studies in research fields such as 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*"

STAFF NEWS

WELCOME TO NEW STAFF

Department of Biological Sciences
- **Daphne Meyer**—Departmental Assistant

Department of Chemistry
- **Dr Karl Wilkinson**—Lecturer

Drug Discovery & Development (H3-D)
- **Dr Colin Wilson**—Scientific Officer
- **James Biwi**—Scientific Officer

Department of Computer Science
- **Professor Thomas Meyer**—Professor
- **Dr Mmaki Jantjies**—Lecturer

Department of Environmental & Geographical Science
- **Mogamad Toffar**—Administrative Officer

Department of Geological Sciences
- **Dr Robert Sloan**—Lecturer

Department of Mathematics & Applied Mathematics
- **Dr Alvaro de la Cruz Dombriz**—Lecturer
- **Dr Juana Sanchez-Ortega**—Lecturer

Department of Oceanography:
- **Dr Sarah Fawcett**—Lecturer
- **Cashifa Karriem**—Administrative Officer

Percy Fitzpatrick Institute
- **Dr Robert Thomson**—Senior Lecturer
- **Susan Mvungi**—Librarian

Department of Physics
- **Dr Sahal Yacoob**—Lecturer

Department of Statistical Sciences
- **Nodumo Maqubela**—Administrative Assistant

Science Faculty Office:
- **Pedro Beziek**—Administrative Officer
- **Farhana Moodley**– Finance Manager

FAREWELL TO STAFF

Department of Biological Sciences
- **Shaamielah Davids**
- **Sarojini Pillay**
- **Vuyiwe Bathaka**

Department of Chemistry
- **Professor Graham Jackson**
- **Pauline Smit**
- **Joey Paulse**

Department of Computer Science
- **Dr Mmaki Jantjies**

Department of Environmental & Geographical Science
- **Ruwani Walawege**
- **Aldino Arendse**
- **Vuyokazi Mafanya**

Department of Geological Sciences
- **Bruce Cairns**
- **Victor Moisey**

Department of Mathematics & Applied Mathematics
- **Dr Filip Cools**
- **Cynthia Sher**

Department of Molecular & Cell Biology
- **Mzoxolo Batyi**

Department of Oceanography
- **Dr Bjorn Backeberg**
- **Emlyn Balarin**

Department of Physics
- **Associate Professor Margit Harting**
- **Liezel van Zyl**
- **Dr Indresan Govender**
- **Michelle Lawrence**

Percy Fitzpatrick Institute
- **Professor Graeme Cumming**
- **Tania Jansen**

Scientific Computing Research Unit
- **Louise Bezuidenhout**

Department of Statistical Sciences
- **Alison Davids**

Faculty Office:
- **Sue Custers**
- **Shuaib Kriel**
- **Shoma Moodley**
- **Lucrishia Dennis**

The Changing Face of Faculty Finance

Finance Manager, **Sue Custers**, who has been in the Faculty since June 2007, will be retiring at the end of 2015. **Farhana Moodley**, previously a Finance Manager at UKZN, will be taking over the helm as Faculty Finance Manager, from 1 January 2016.

Farhana was welcomed to the Faculty Finance team at the recent Adfin year end gathering, held in the MCB tearoom on 12th November 2015.

Back row: Aneeq Abrahams, Shaahid Champion, Louen Kleinsmidt
Front row: Lisl George, Farhana Moodley, Sue Custers, Aisha Hassan

Chemistry scores gold on sporting field…

Giselle Vicatos, an MSc student in the Department of Chemistry, was part of the women's fencing team which won gold at the African games in Brazzavile, Congo, in August. Giselle, whose team recently won the gold medal for the women's epee fencing event at the African Games (previously known as the All-Africa Games), now has the Olympics 2016 firmly in her line of vision. She said, "Before the finals, the four of us sat down together and strategised how each of us could capitalise on our individual strengths and use that to our advantage. The Egyptians were strong opponents, therefore it was vital that at every point in the match we knew exactly what our goal was and how to achieve it." Attending the African Games had been a great exercise in building team cohesion and confidence ahead of important Olympic qualifier events. To qualify for the Olympics in 2016, the team must be ranked number one in Africa, as well as top 16 in the world. They currently meet both criteria. To maintain this position, they must now perform at four international team qualifier events, which will be held in various countries around the world.
"One of the biggest challenges we face is financing these qualifier events due to a lack of funding, but we remain positive that we will overcome this hurdle and make our country proud in Rio," she said.

The women's epee fencing team (in green tracksuits) celebrate their gold medal at the African Games. Aphiwe Tuku, Giselle Vicatos (UCT Masters student), Randall Daniels (Manager), Tamryn Carfoot and Juliana Barrett.

Batting up a storm…

Zaeem Najaar, Administrative assistant from the Department of Chemistry—a very keen cricketer, was invited to be one of only six local batsmen, to bat against Vernon Philander for one over. Zaeem scored 15 runs and was the winner. His prize was two fridges full of Jive drinks (one of which had to be donated to his cricket club).

Zaeem Najaar (far left) and being congratulated on winning (above)

Research Bytes

How Garlic Kills Cancer Cells

New research by UCT Chemistry Department's **Dr Catherine Kaschula** and her research team, has established how a compound found in the crushed cloves of garlic, know as ajoene, killed cancer cells. Garlic, which has long been recognised for its medicinal properties and has been a staple in healers' arsenals for centuries, has been know to have an anti-cancer effect, although no one has understood - until now - how it works.

Ajoene is one of the main compounds formed when heating crushed garlic. Using the compound on breast cancer cells and human oesophageal cancer cells, researchers showed that ajoene was not only toxic to these cancer cells, but they also established how the compound exerted its toxic effect on the cancer protein. Dr Kaschula used synthetic organic chemistry techniques to clip a fluorescent tag onto the compound, ajoene, which enabled them to track the movement of the compound in the cancer cell by visualising the fluorescence. This showed how the ajoene penetrates cancer cells and attaches itself to proteins within a certain part of the cell, causing the cancer cell to die.

Front: *Kevin Dzobo , Sophie Rees-Jones, Vuyolwethu Siyo*
2nd row: *Ellen Ngarande Rossana Tuveri, Fabien Servan , Chesa Cox*
Back: *Daniel A Kusza, Catherine Kaschula, Roger Hunter, Iqbal Parker*

Catherine said that the latest findings reaffirm existing research that dietary garlic lowered the risk of cancer. "Our findings provide an explanation as to why ajoene is toxic to cancer cells. While much of this research is at an early stage, it offers hope in the face of the huge increase of cancer in South Africa.

Ocean-acidification and Consequences for Abalone Aquaculture by Mike Lucas

A consequence of the rising CO_2 concentrations in the atmosphere due to fossil fuel combustion is that atmospheric CO_2 concentrations are rising faster and higher than they have done over the last 800 000 years. When CO_2 combines with seawater, it forms a weak solution of carbonic acid, which lowers the ocean's pH slowly, because of the buffering capacity of carbonate and bicarbonate ions in the ocean. This process is called ocean acidification, and it is accelerating and will be felt strongly here on the west coast of South Africa. The average pH range at Hermanus is substantially lower than the average for the Atlantic and Pacific Oceans. The reason relates to the water originating from the Benguela upwelling system, which comes originally from the South Atlantic and Southern Ocean at 1000m to 400m depth. When this cold water makes contact with the atmosphere at about 50-55°S, it absorbs large amounts of atmospheric CO_2, resulting in these waters having a pH of about 7.87—among the lowest pH values anywhere in the global oceans.

Aquaculture of the South African abalone (Haliotis midae) is a major growth industry in South Africa and is based largely on the west coast and around Hermanus on the south coast, in particular. Several farms here are growing and exporting several hundred tonnes of abalone each year. However, like all organisms with shells made of calcium carbonate, they are vulnerable to low pH, which causes the shells to dissolve. This affects both the formation of the shell and the physiology of the abalone, resulting in lower growth rates and impacting on taste, thereby impacting the economics of abalone aquaculture. The Abalone Farmer's Association are investing money into research by UCT Biological Sciences' student **Nina Lester** who is assessing the impacts of ocean on abalone growth rates due to acidification and seeking ways to minimise these impacts.

Grow-out tanks on a farm in Hermanus

Dung hits UCT headlines again….. How plants trick Dung Beetles into spreading their seeds.

Dung Hits UCT headlines again…

The Cape Restio *Ceratocaryum argenteum* produces large hard nuts that are buried by dung beetles. These nuts smell like dung but provide no food for dung beetles or their larvae - a classic example of biological deception. These are the surprising findings of a paper just published by biologists from UCT and UKZN in the journal *Nature Plants*.

Jeremy Midgley, Joseph White, Steve Johnson and Gary Bronner

Deception is a very interesting biological phenomenon as it involves a co-evolutionary arms race between one species (the deceiver or mimic) that benefits from resembling another species (the dupe or model) with no advantages, and sometimes even fitness costs, for the latter.

Deception for seed dispersal is relatively uncommon. Some plants produce hard red or black seeds (such as the so-called lucky beans) that look like berries, but these do not seem to fool birds and are hardly ever eaten or dispersed. Dung beetles being duped into dispersing "dung-like" *Ceratocaryum* nuts may therefore be the best example globally of faecal mimicry for seed dispersal. **Jeremy Midgley**, Harry Bolus Professor of Botany, says, "I have had a long interest in seed burial by certain Cape rodent species and was convinced that the enormous size of *Ceratocaryum* seeds would make them attractive to rodents, either to immediately eat them or to bury them". He, together with MSc student **Joseph White** and UCT small mammal expert **Dr Gary Bronner**, investigated if free-ranging small mammals were interested in *Ceratocaryum* nuts "We used motion-sensing trail cameras to observe small mammal interactions with the nuts and it seemed that they were either disinterested or even repelled by the seeds. When they cracked open seeds it was clear small mammals were interested in the nutritious inner parts of the seeds" recollects Joe White.

The most surprising result from their field experiments was the discovery of dung beetles dispersing *Ceratocaryum* nuts. "Through both camera trapping and direct observation, we saw dung beetles being attracted to the nuts, rolling them away and then burying them by pulling them down from below." comments Gary Bronner. Jeremy wondered what would happen if they put these nuts out in the savanna and whether they would fool savanna dung beetles.

The million year old monkey: new evidence confirms the antiquity of fossil primate from the Dominican Republic

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 Altagracia Province, Dominican Republic. The fossil was embedded in a limestone rock that was dated using the Uranium-series technique.

Robyn Pickering in the field. Photo by Andy Herries

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 we now know 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.

Young Scientists take the vital signs of the Atlantic Ocean by Sven Ragaller, Dept of Oceanography

Young scientists on board RV Polarstern. Photo Pauhla Mc Grane

The research vessel RV Polarstern recently arrived in Cape Town after a 5 week voyage from Germany, during which 32 international young scientists were trained in how to observe and measure the vital signs of the Atlantic Ocean. The young people from 19 different countries in Europe, Africa, Asia and America, included 4 students from UCT, namely **Angelee Annasawmy, Mohammed Kajee, Ngwako Rabodiba Adam Mohale** and **Amy Wright**. The aim of the sponsored voyage, was to increase ocean-going training and build capacity for marine research.

The Atlantic Ocean, with its biogeographical gradients in temperature and salinity, as well as zones of upwelling, is an integral part of our planet's acclimatization system. With the backdrop of climate change and an increasing El Niño signature, it is imperative to know how our ocean functions. We therefore need the ships, the instrumentation and, most importantly, well-educated scientists all over the world to secure the ocean's future for our planet.

Amy says, "This was an awesome experience, where I could put my University knowledge to good practical use, along with 31 other young scientists. I will never forget what I learnt on the cruise and we are all grateful to the crew and teachers for their time and patience".

Health and Safety Training in the Faculty by Monique Muller

Chemistry is the first known UCT department to officially appoint post-graduate student volunteers from the research laboratories in accordance with the requirements of the Occupational Health and Safety Act, as Safety, Health and Environmental (SHE) Representatives. Besides their studies, they now officially assist with identifying hazards, investigating incidents and implementing Chemistry and UCT's SHE procedures and policies in their designated areas.

Chemistry is responsible for training these representatives and identified a gap in the accredited 2-day SHE Representative training, which did not cover the specialised hazards and risks one would find in the post-grad, research and undergrad laboratory environments.

Monique Muller from the Department of Chemistry took the initiative to write a one day Laboratory SHE Representative course. The bi-annual training is to be conducted in-house by an officially IOSM registered SHE Risk Professional and Assessor, namely Monique, who is UCT's Chemical Safety Officer . The course is free to all SHE Representative post-grad students and UCT staff members. Staff members who decide to attend must also complete the official UCT 2-day accredited SHE Representative course. The first training session took place in November this year and favourable feedback was received. The next session is planned for end of March 2016.

South Africa's highest-resolution continuous sediment archive for the Holocene

Our understanding of present and future climate change can be greatly enhanced by palaeoenvironmental data. Palaeoenvironmental data can reduce uncertainties within climate models and can provide a basis for the sustainable management of ecosystems. The Holocene (the last ~10,000 years) is an important phase in the earth's geological history, characterised by high climate variability and large-scale global changes.

Staff members, postdoctoral fellows and postgraduate students from the departments of Environmental & Geographical Science (EGS) and Geological Sciences have been involved in a major collaborative research project called RAiN (Regional Archives for Integrated iNvestigations). This project is based on closely integrated investigations of terrestrial and marine environmental archives in South Africa. One of the most exciting outcomes of this project has stemmed from the fieldwork that was conducted in the Wilderness lakes region of the Western Cape. Contributing heavily to the 1 ton(!) of scientific samples collected during this fieldwork campaign, was a rather special sediment core from Eilandvlei. As seismic surveys of this lake had led the researchers to believe that it would be possible to retrieve about 6 metres of sediment, the 30.5 m core that was ultimately recovered surpassed their wildest expectations. Through the use of radiocarbon dating it has been determined that this sediment core covers the last 9,000 years - making it the highest resolution continuous palaeoenvironmental archive for southern Africa.

The preliminarily geochemical, diatom and pollen analyses conducted by two EGS postdocs and one German doctoral student demonstrates that this archive provides invaluable information on the history of sea level change and climate variations along the southern Cape coast through the Holocene.

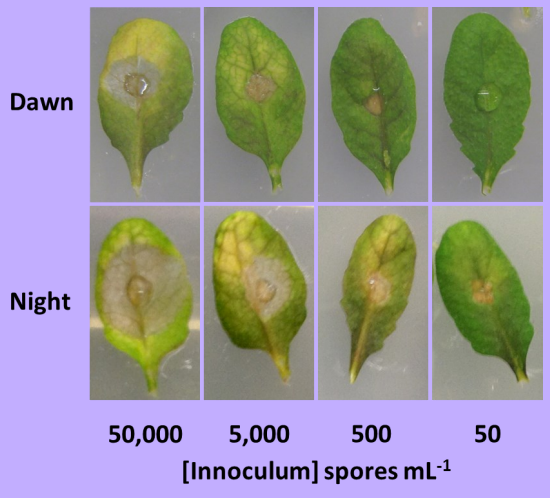
The German - South African coring team that managed to recover the 30.5 m sediment core from Eilandvlei

RAiN
Regional Archives for Integrated iNvestigations

Discovery of temporal regulation of plant defences to infection .

Drs Laura Roden, and **Rob Ingle**, from the Department of Molecular & Cell Biology, have just had a paper published 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 cineream,* 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 as they have a molecular clockwork mechanism called the circadian clock.



Drs Roden and Ingle found that the defence response to *B. 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.

Distinguished Alumni Lecture: Unravelling the Okavango, by Professor Terence McCarthy

Kalahari: Looking like a nerve synapse from the air, the Okavango alluvial fan is controlled by its biota in a unique give and take system.

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 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 WITS University, Terence 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, 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.

Professor Anton le Roex chats to Professor Terence McCarthy

Mostly, sedimentation drives change in the Okavango, says 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." McCarthy 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 bed beneath the water 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 McCarthy. The papyrus vegetation is so dense that water height has a step-wise profile across the delta.

Adapted from an article for UCT Online news by Helen Swingler.

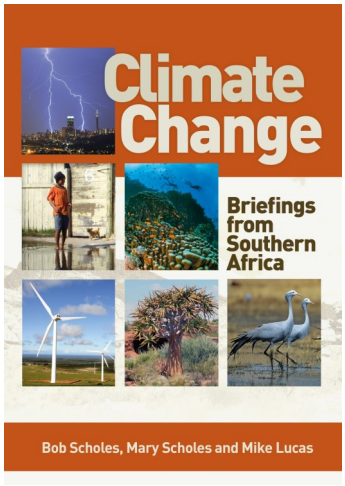
In Memoriam:

The late Emeritus Professor Peter Linder, will be remembered for his many contributions to the Department of Chemistry and as a valued colleague and friend. Peter joined the Department of Chemistry as a senior lecturer in July 1952 after obtaining a PhD at the University of Cambridge and following a brief career at African Explosives and Chemical Industries in Modderfontein. He held the Chair of Physical Chemistry from 1987 to 1994 and was deputy dean of the Faculty of Science for several years.

Peter's research dealt with the fundamentals of gas-solid absorption and later he specialised in solution thermodynamics. He published several articles in the field of metal-ligand speciation and developed models of complex biological systems, such as blood plasma.

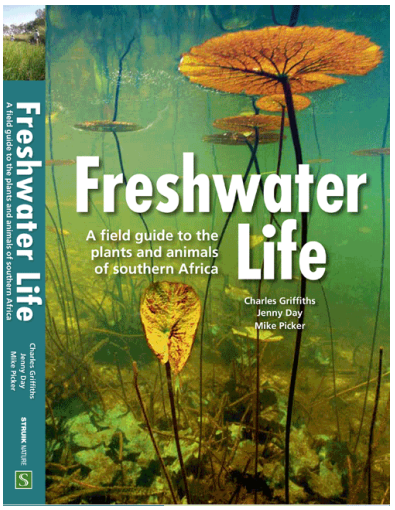
During Linder's tenure, he trained a large number of research students, several of whom have enjoyed significant careers. They include UCT's Professors Allen Rodgers and Graham Jackson, Professor Peter May, who holds the Chair of Hydrometallurgy at Murdoch University, Australia, Dr Kevin Murray of the Council for Scientific and Industrial Research, and UCT's Dr Chris Woolard.

RECENT BOOKS PUBLISHED BY FACULTY MEMBERS



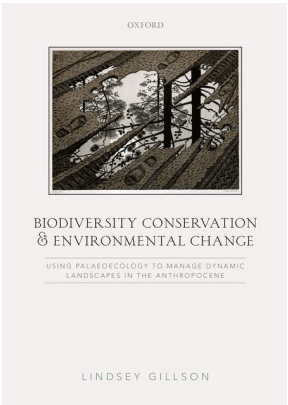
Associate Professor Mike Lucas from the Department of Biological Sciences is one of the authors on a new book: "Climate Change: Briefings from Southern Africa".
The book answers questions such as :

- 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). Freshwater Life is the first comprehensive, illustrated field guide to aquatic life in the southern African region. Certain chapters in the book were also 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.

Last laugh....