

Science Matters

Science Faculty Newsletter



Message from the Dean



Welcome to this mid-year 2014 edition of "Science Matters" - a little late, but better late than never. The first six months of 2014 have, as usual passed rapidly, with many highs and some lows, and we are now about to start the second semester.

The start of the year brought the terrible news of the tragic death of Professor Gary Marsden, who died unexpectedly a few days before the new year started. A moving memorial service, held on campus in late January, paid a fitting tribute to the passing of a wonderful colleague.

With the advent of February, we registered a strong group of new first year students and we were very pleased by the fact that 30% fewer students were academically excluded

at the end of 2013. We have also increased postgraduate registrations significantly. The Faculty thus appears to be on track in regard to our strategy to hold undergraduate numbers, improve retention, and grow slightly with respect to postgraduate student numbers. The new Extended Degree Programme entered its second year, and the mid-semester decant testing ran with very few hitches resulting in a new class who have embarked on the structured extended curriculum under the watchful eye of David Gammon.

June graduation saw a record number of PhDs graduating from the Science Faculty – 42 in all, and we wish them all the very best as they now enter their new careers. The Faculty also did extremely well in the newly launched Career Research Fellowships offered by the NRF – country wide 60 were offered, of which UCT received 23, eight going to the Science Faculty. These are five year NRF funded posts that bring with them running expense funding, and we

look forward to an injection of new and exciting research projects flowing from this initiative. Many of these appointments align well with our newly defined Faculty research impact areas (approved by the Faculty Board in early June as part of the new Faculty Research Strategy), which augers well for the future.

We are proud of the recognition garnered by a number of our staff and postgraduate students who received prestigious national and international awards for their research achievements – some of these are mentioned in the pages that follow. We are particularly proud of the great success of our Computer Science student programmers, who swept the board at the Standard Bank IT Challenge.

I hope you enjoy the many short snippets of news and stories in the following pages.

Anton le Roex

Claude Leon Awards for Young Academics go to Dr Andrew Hamilton, Dr Deena Pillay & Dr Vanessa Mc Bride



Dr Andrew Hamilton (Physics), **Dr Deena Pillay** (Biological Sciences) and **Dr Vanessa Mc Bride** (Astronomy), recently received the Claude Leon Award for excellence in research. P-rated physicist Dr Hamilton is one of the researchers participating in the decade-long experiment to detect the elusive Higgs boson. He will use the award money to build a video-conferencing system to ensure better communication with collaborators at CERN (European Centre for Nuclear Research).

Dr Pillay (*pictured right*) a marine ecologist, intends to continue one of his passions: highlighting the importance of all species in ecosystems. "Often people are unaware of how things are linked in an ecosystem. I am hoping my research will take the information to the public to show them that there have been periods where we have been responsible for mass extinctions of species, which ultimately impact on us," said Pillay.



Dr Mc Bride, (*pictured left*) is an astronomer whose research uses optical, infrared and X-ray observations of neutron stars accreting material from normal stars to learn about the evolution of these systems, and to trace star formation in our galaxy and our neighbouring Magellanic Clouds. The award was used for travel to the Be X-ray binary conference in Valencia, during July 2014, where McBride and her student presented their results.

Ecologist Emma Gray's career soars...as the recipient of a 2014 UNESCO-L'Oréal Award for Women in Science



Emma Gray received the 2014 UNESCO-L'Oréal Women in Science International Fellowship award in Paris in March. With a \$20 000 purse attached to the award, Emma can now expand her work on the determinants of plant growth rates.

Gray completed her Master's degree at UCT, supervised by Professor William Bond, and is currently doing a PhD at Macquarie University, Australia, where she is working on the determinants of plant growth rates. She hopes to return to South Africa for future postdoctoral studies.

As a master's student in South Africa, Emma studied how the forests were creeping into the savanna. 'Bush encroachment' is a global phenomenon caused in large part by climate change, and Emma looked at how it affects biodiversity and the carbon cycle. "I wanted to know what would happen to the ecosystem if we lost Africa's great savannas", says Emma.

"Aside from the impacts on the water cycle, fire regimes, and plant biodiversity, I found that the zebras, lions and other iconic animals will struggle to graze, and tourism will struggle as it becomes more and more difficult for tourists to see the animals they came to see."

For her PhD in Australia, Emma is looking at the basic science that underpins the growth of plants. As a member of Ian Wright's lab at Macquarie University in Sydney, her work will form part of a larger Australian Research Council funded project to understand how plant traits affect plant growth. "This is one of the central questions in ecology, particularly as we try to understand how climate change will affect the distribution of forests, grasslands and other ecosystems," says Emma.

"It's nearly impossible to model 'reality', when there are so many species to account for. To understand the changes we're seeing from climate change, we need to simplify ecosystems." Her research aims to categorise species based on their traits and how fast they grow. For example, how is the growth of a tree affected by the size of its leaves or the density of its wood? "I'm particularly interested in how these factors affect a plant's growth rate differently over its life. A lot of what we know so far is based on seedlings, but trees can live for hundreds of years," says Emma. Emma's work will contribute to models which could help us predict how ecosystems might be affected by climate change, and help us understand how plants interact with each other and the environment.

Emma is one of 15 women from around the world awarded one of this year's \$20,000 UNESCO-L'Oréal For Women in Science International Fellowships, which support talented young women scientists to take up research positions in other countries.

Posthumous Award for Gary Marsden—elected to CHI Academy

SIGCHI is the premier international society for professionals, academics and students who are interested in human-technology and human-computer interactions (HCI). The SIGCHI Award recognises and honours leaders and shapers within the field of human-computer interaction and the criteria for election to the CHI are:



- Cumulative contributions to the field
- Impact on the field through development of new research directions and/or innovations
- Influence on the work of others
- Reasonably active participant in the ACM SIGCHI community

Professor Gary Marsden, was one of 6 receiving the honour this year. His wife Gil Marsden went to Canada to receive the award on this behalf and she said, "Everyone gave him a standing ovation as I went up to receive the award and spoke to me so highly of his influence and impact on the CHI community, both professionally and personally."




Gil Marsden receiving Gary's award, from Loren Terveen – Adjunct Chair for Awards for SIGCHI photo by Ben Schneiderman

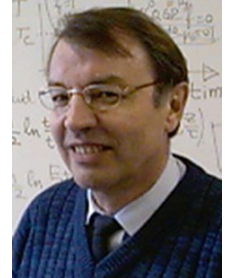

Our Science Stars:

Professor Rene Kraan-Korteweg from the Department of Astronomy, has been elected chair of the newly convened Astronomy Advisory Council. The Council will oversee and advise the NRF's Astronomy sub-Agency. Working through the Deputy CEO: Astronomy and the Directors of the Astronomy National Facilities, the Council is mandated to provide strategic and technical advice to the NRF on Astronomy matters.




Professor Jean Cleymans, Emeritus Professor of Physics and an A-rated researcher, is a finalist in the annual NSTF-BHP Billiton Awards. For the past 30 years Cleymans has dedicated his research to a systematic and thorough analysis of particle production in high energy collisions of particles, including those obtained at the famous Large Hadron Collider located in Geneva, Switzerland. His results have led to unique insights in the description of particle production, ranging from low to the highest beam energies: in particular, the property of chemical equilibrium is now well established at almost all beam energies – thanks to detailed analyses performed by Prof Cleymans and collaborators.

The Google Anita Borg Memorial Scholarship aims to encourage women to excel in computing and technology, and become active role models and leaders. Both of the South African Anita Borg scholarships went to UCT Computer Science students - Congratulations to **Chao Mbogo** (pictured left) (ICT4D) and **Imaculate Moshia** (Computer Science) (pictured right).




Sebastian Bodenstein graduated in June with his PhD. As part of his thesis, Sebastian wrote eight papers in collaboration with his supervisor and colleagues from Mainz, and two on his own, thus ten ISI papers in top journals—an outstanding achievement! Most papers were in Physics Rev. D, two in the Journal of High Energy Physics, and two in Modern Physics Letters. Sebastian has been hired by Wolfram Research Inc., of Mathematica fame, to work in the USA.



The annual meeting of the Igneous and Metamorphic Studies Group (IMSG) was held in Grahamstown from 20-22 Jan 2014. This meeting consisted of 3 days of talks by academics and research students. A number of UCT geology students presented talks on their previous honours projects or current research. Awards were given for the best three presentations, and Master's degree students **Michael Hartnady** and **Teboho Sebetlela** (pictured left) won two of the awards. This is the first time that UCT has had anybody win one of the IMSG best student presenter awards—Well done!!

Graduation Record: Out of a total of 110 PhD students graduating from UCT in June, the Faculty of Science outshone the other faculties, with 42 students graduating with their PhDs. This is a record number of PhD graduates at the June ceremony, for the Faculty and the University.



At the June graduation, **Dr Bernard Lewis Fanaroff** (pictured left) received an honorary doctorate in Science in recognition of his scientific reputation, diplomatic skill, and his enormous commitment and efforts in getting a major part of the SKA to South Africa. Fanaroff has a strong academic background in radio astronomy and theoretical physics, has raised awareness of science in South Africa and the country's ability to contribute to the global scientific community. He helped support the growth of astronomy and the launch of radio astronomy at UCT, through the South African Square Kilometre Array (SKA) Human Capacity Development programme

UCT Computer Programmers Sweep the Board at Standard Bank IT Challenge

UCT programming teams swept the boards at the recent inter-university Standard Bank CIB IT Challenge 2014. Only one non-UCT team, from North-West University, managed to make it into the top 6 positions.

The winning team – **Ashraf Moolla, Dylan Nelson** and **Robert Spencer** – will represent UCT at the finals next semester. In second position were **Kieren Davies, Yaseen Hamdulay, Rosy Sanby** and **Sean Wentzel**; while **Shaylan Laloo** teaming up with **Reneshan** and **Darien Naidoo**, came 3rd. Fourth place was also taken by a UCT team comprising **Aaron Krishna, Guy Paterson-Jones, Herman Pienaar** and **Nicola Vermeulen**, while **Calvin Brizzi, Bryce Billing** and **Jethro Muller** placed 6th among over 60 participating teams from 11 universities. And outstanding achievement. Well done!

News in Brief

Dean's Visitor: Professor Rory Wilson



Professor Rory Wilson, from Swansea University, Wales, UK recently delivered the Dean's Visitor lecture, entitled, "What can trendy transducers, vivid visualisations and fundamental physics tell us about wild animals and people?" Professor Wilson is head of department of Biosciences at Swansea University and is the recipient of multiple awards in recognition of his pioneering research, which takes him to extreme habitats from the Poles to the Equator and from the deep ocean to high mountain ranges. He studies leopards, sharks, albatrosses, elephant seals, armadillos and sloths, using a unique blend of multi-disciplinary science to unravel their remote lifestyles.

In his talk he shared some of his ingenious ways of tracking wild animals and recording their behaviour without directly observing them, utilising his inventions which harness the laws of physics, exploit innovation in electronics and computer science and rely on complex mathematical and statistical approaches to accurately estimating the energy expenditure of animals on land, at sea and in the air.

Over 200 people attended the lecture and were treated to a truly outstanding and captivating presentation! Such was the interest generated, that future collaborations are being planned

A star that keeps on shining...



UCT Astronomer **Michael Feast**, an A-rated scientist, has just published a paper in the science journal *Nature*, at the age of 87 years. This is 66 years after publishing his first paper in this same journal, when he was 21 years old!! His current paper is on Cepheid stars—one of the tools used in studies of the cosmic distance scale.

International Year of Crystallography



In photo: Vaughan Maurel (back row, 3rd from right), Dyanne Cruickshank (back row, far right)

UNESCO has declared 2014 the International Year of Crystallography. The opening ceremony was held in January at UNESCO headquarters in Paris. **Dyanne Cruickshank** (PhD graduate from the Department of Chemistry) and **Vaughan Maurel** (current Chemistry PhD student) of the Centre for Supramolecular Chemistry Research in the Department of Chemistry, were invited by the DST to represent South Africa at the event.

The purpose of this event was to bring together people from various fields who have an interest in crystallography. One of the discussions at the opening ceremony was a panel session for Young Talented Crystallographers of the World. This discussion was moderated by Philip Ball of the UK and was a discussion among young professionals regarding the future of crystallography and the challenges young crystallographers face. This panel included three South Africans: Vaughan Maurel and Dyanne Cruickshank, both from UCT, and Alice Brink of the UFS. Vaughan's contribution to these roundtable talks was to steer the discussion in the direction of what can the developing world offer the developed world, regarding the advancement of crystallography, considering their relative lack of resources.

Chemistry on Ice

Chris Barnett, from the Department of Chemistry, currently skates for personal enjoyment and represents Western Province in the non-national adult section. Adult figure skating is still a relatively young sport in SA, yet the adult skaters are the most keen and persevering skaters!

Chris is part of a group of four adult figure skaters who travelled to Oberstdorf, Germany where they represented South African and competed in the International Skating Union accredited International Adult Figure Skating Competition. This competition took place from 25-31 May 2014 and hosted over 400 skaters from Bronze level through to Master Elite level in solo, pairs and dance. It showcased world renowned skaters, such as Gary Beacom and Jan Calnan, and also provided a competitive platform for adult skaters from across the world. Chris says, "It was wonderful to meet and interact with adults who are also passionate about figure skating. I competed in the bronze solo and pairs categories. For the solo technical section, I skated to "Phantom of the Opera Medley" and was placed 3rd. For the artistic solo section, I skated to "#ThatPower" and placed 2nd. I also skated together with Tatiana Sango in the pairs section, where we skated to "She's like the wind"

from Dirty Dancing. Our programme, which we thoroughly enjoyed, included elements such as lifts, throw jumps and a pivot spiral and we placed 8th in this section ". Well done Chris!



Chris showing perfect form in the solo section and with Tatiana in the pairs section



Chris (2nd from left) with the SA team

Africa Day Celebrations

MOLECULAR AND CELL BIOLOGY COOK UP A FEAST FROM ACROSS AFRICA...

On the 23rd May, the Department of Molecular and Cell Biology celebrated **Africa Day** in truly African style—in both fashion and cuisine. Each research lab represented a different country, and everyone was able to sample delicacies from South Africa, Zimbabwe, Kenya, Egypt, Morocco, Cameroon, DRC, Ethiopia, Mauritius and Mozambique.

Pictures by Madhu Chauhan



Democratic Republic of Congo



Egypt



Morocco



Mozambique

STAFF NEWS

WELCOME TO NEW STAFF

African Climate & Development Initiative

- **Lucia Scodanibbio**—Research Consortium Manager
- **Dr Dian Spear**—Research Officer

Department of Astronomy

- **Professor Russ Taylor**—SKA Chair

Department of Biological Sciences

- **Phelokazi Ndzumo**—Senior Secretary

Department of Chemistry

- **Richard Gessner**— Research Officer
- **Ayesha Banderker**—Senior Finance Officer

Department of Computer Science

- **Dr Maria Keet**—Senior Lecturer

Department of Environmental & Geographical Science

- **Dr Bradley Rink**—Lecturer

Department of Geological Sciences

- **Dr Lynette Greyling**—Lecturer
- **Dr Beth Kahle**—Lecturer

Department of Oceanography

- **Associate Professor Marcello Vichi**

Faculty Office:

- **Louen Kleinsmidt**—Assistant Finance Officer
- **Ayesha Shaik**—Administrative Assistant

FAREWELL TO STAFF

Department of Biological Sciences

- **Ms Tamara Nozewu**

Department of Geological Sciences

- **Ms Shirley Whitmore**

Department of Mathematics & Applied Mathematics

- **Kenny Rafel**
- **Dr Vitali Vougalter**
- **Ms Pearl Tukwayo**

Department of Molecular & Cell Biology

- **Dr Zac Mc Donald**

Department of Physics

- **Margie Maich**

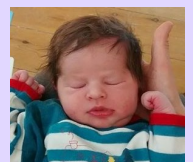
Department of Statistical Sciences

- **Hannah Kroon**

CONGRATULATIONS

Dr Jahanshah Ashkani, Postdoctoral Research Fellow and his wife Dr Zahra Dashti had a baby daughter, Hanna, on 23 April 2014.

Mark Blumenthal, from Physics had a baby girl: Leah Blumenthal who arrived at 00.30 on 18 May 2014 7lbs 10oz



Ayesha Shaik, from the Science Faculty Office, married Ismael Adam on 25th May.

IN MEMORIAM

Professor Gary Marsden, from the Department of Computer Science, died very suddenly on 27th December 2013 at the age of 43. With his passing, the Faculty has lost an exceptional colleague, teacher and friend, who had a huge impact on UCT, ICT4D, the South African and global Computer Science community. Gary constantly strived to make the world a better place through his work and worked hard to be part of the solution, using technology for economic and social empowerment. He was a dedicated and innovative advocate of human computer interaction for development, influential in the development of the profession by focusing on creating technology with people, rather than just for them. Gary cared passionately about his work, his teaching and his students. He was playful, creative and generous and strived to help people learn, make people laugh and empower them through technology. In 2012 Gary was named one of only five academics in South Africa to receive the National Excellence in Teaching and Learning awards, by the Council of Higher Education, as well as being a previous recipient of UCT's Distinguished Teacher Award.



At a memorial service held on campus, moving tributes from staff and students at UCT, as well as international leaders in the field of computer science, hailed Gary as a visionary who understood that the interest of people should inform development of new technology and who cared deeply about the people around him.

Profile on new staff members in the Faculty:

Oceanography:



Associate Professor Marcello Vichi

Areas of Interest: Physical and biogeochemical oceanography, numerical modelling.

Background: Marcello Vichi has a PhD in Marine Ecology and Biogeochemistry, 15 years experience in coupled physical and biogeochemical modelling in regional seas (Adriatic, Baltic, North Sea), in the Mediterranean and in the global ocean. He worked at the Istituto Nazionale di Geofisica e Vulcanologia and Euro-Mediterranean Center on Climate Change (CMCC) after research fellowships in Denmark, Germany and The Netherlands. He participated in several European and Italian research projects dealing with ocean biogeochemical modelling and climate change impacts on the marine ecosystem.

Computer Science



Dr C. Maria Keet—Senior Lecturer

Areas of Interest: Logic-based knowledge representation, Ontology and conceptual data modelling in general and as applied to biological data and knowledge.

Background: Maria Keet has PhD in Computer Science and an MSc in Food Science (Microbiology). Maria was a senior lecturer at the School of Computer Science at UKZN and a member of the UKZN/CSIR-Meraka Centre for Artificial Intelligence Research and before that a non-tenured Assistant Professor at the KRDB Research Centre, Free University of Bozen-Bolzano, Italy. She also has work experience as a systems engineer in the IT industry.

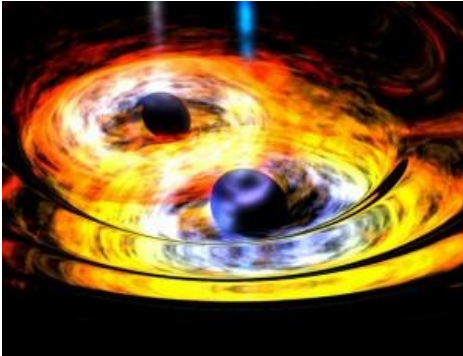
New UCT/UWC SKA Chair appointment

The UCT Astronomy Department and the UWC Physics Department were delighted to have the UCT/UWC SKA Research Chair taken up in January 2014 by Prof Russ Taylor. Prof Taylor has come to UCT from the Department of Physics and Astronomy of the University of Calgary. He has extensive expertise in radio astronomy, in particular wide-field polarization, cosmic magnetism and Big Data, and has played a prominent role in the SKA project since its inception. He was one of the founding international SKA project scientists and co-authored the first SKA science case. He currently represents Canada as one of the national members on the SKA Organization Board. Before that he served as the founding Executive Secretary of the International SKA Steering Committee, the predecessor to the International SKA Science and Engineering Committee. He is interested in using MeerKAT to detect polarized signals from the low luminosity AGN and star forming galaxies as an initial step toward the SKA key science area of the evolution of cosmic magnetism. Both UWC and UCT are extremely pleased that Prof Taylor will start building up this research area in South Africa.



Research Bytes

Galaxies in a Supermassive Tango



A team of international astronomers, led by UCT **Professor Thomas Jarrett**, from the Department of Astronomy and the South Africa Research Chair in Astrophysics and Space Science, has uncovered a rare astrophysical phenomenon that may produce powerful ripples through space. A pair of super-massive blackholes, each over a billion Suns in accumulative mass, are swirling at the center of the galaxy known as WISE J233237.05-505643.5. When two large galaxies collide and merge into one system, their central blackholes are expected to coalesce in a spiralling dance of death. Although galaxy mergers are relatively common, catching them in the act has been elusive for astronomers, with only a handful of such systems currently known, and none as large as the system found by the team of UCT, NASA and CSIRO astronomers.

These energetic events are important to study because when the nuclei merge, effectively swallowing each other and creating a larger central blackhole, they release powerful gravitational waves, sending ripples through space that can be detected on Earth. Gravitational waves, predicted by General Relativity, are the last cornerstone of discovery for the famed theory of gravity first postulated by Albert Einstein. The work was published in the December issue (Vol 779) of the *Astrophysical Journal*.

Burning Renosterveld less often is better for its survival,

Biological Sciences Department researcher **Dr Odette Curtis** has found that for the threatened Renosterveld ecosystem to survive and be properly managed, it should burn less frequently than believed – preferably at intervals of between eight and fifteen years. Previously, ecologists have advised burning it every three years. Renosterveld – literally translated from Afrikaans as “rhinoceros field” – is a term used to describe one of the major and most diverse plant communities and vegetation types of the Cape Floral Kingdom. Human activities such as farming have decimated these fertile fynbos havens, and Dr Curtis is hard at work trying to preserve the critically endangered survivors. She says: “It is estimated that there is less than between four and six percent of the Renosterveld left. Even this is an optimistic estimate; the true figure could be significantly lower, because a large percentage of what remains is not intact, due to mismanagement.”



Dr Curtis recommends that Renosterveld should burn, on average, every 10 years. “One reason being a precautionary approach, another because there are also some slower-maturing plants that need time to develop properly. If you burn it too often, you will turn it into grassland.” Dr Curtis started and directs the Overberg Lowlands Conservation Trust in the Western Cape. Its vision is to work with local farmers to secure the long-term conservation and management of the remaining fragments of threatened natural vegetation in the lowlands of the Overberg.

She says it is a challenging getting farmers to change decade-old habits, but little by little, farmer by farmer, she and her colleagues are changing mind-sets and ensuring the survival of the region’s fynbos. Much of the farmers’ thinking has been based on the fact that Renosterveld is viewed by many as a wasteland – useless to farming.

The conservationist and ecologist, who graduated with a doctorate in botany from UCT in December 2013, has made her home in Napier in the Overberg, about two hours’ drive outside Cape Town. Such is the diversity of the Renosterveld in the region that Dr Curtis discovered three new species of plants in 2012 (and another three, together with colleagues Professor Charles Stirton and Professor Muthama Muasya), of which two were named after her.

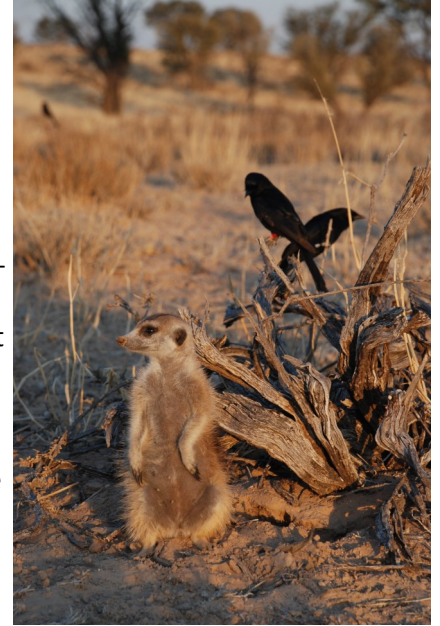
She holds a BTech from the former Cape Technikon and an MSc in Zoology from the Percy FitzPatrick Institute of African Ornithology at UCT. Dr Curtis has also been a committee member of the Fynbos Forum since 2009, a board member on the Breede-Overberg Catchment Management Agency (BOCMA) since 2007, and served as a committee member of the Botanical Society, southern Overberg branch, from 2009 to 2011.

Drongo mimics alarm calls to keep stealing food from other species, finds UCT biologist

TV's *Meerkat Manor* location is setting for study of evolution of deception in the wild

The drongo, an African bird, deceives other species, including meerkats, by mimicking their alarm calls in order to scare them away and steal their abandoned food, according to a new study published in the 2 May 2014 edition of the journal *Science*. However, just as in Aesop's fable about the boy who cried wolf, the drongo can make too many false alarms and cause members of the exploited species to wise up. But when one false alarm call stops working, drongos mimic a different alarm call, keeping up the deception racket and their access to stolen food.

Author **Dr Tom Flower**, a researcher in the Percy Fitzpatrick Institute of African Ornithology, walked 5-15km a day, six days a week for six months every year since 2008, to observe and record drongo behaviour in the Kuruman River Reserve, which is part of the South African Kalahari desert, close to the Botswana border. Temperatures ranged from -11°C on cold winter mornings to 42°C in the summer sun. Dr Flower said: "I dread to think how many sand dunes I've climbed, but it was worth it to get the data I needed."



Meerkat with Drongo

The Kuruman River Reserve is the home of a huge long-term study on meerkats that began in 1993 and was documented in the popular TV series *Meerkat Manor*. The meerkat project studies the behaviour of about 14 meerkat groups all of which are completely habituated to humans walking in and among them. Dr Flower said: "The project has been running for so long that the first thing a baby meerkat is likely to see when it emerges from its birth burrow, is a researcher waiting to watch its behaviour; as far as they're concerned we're part of their environment and little different from a tree. Few people realise that perhaps the world's most important field research project studying the evolution of cooperative societies is located in South Africa."

Other species in the area are also habituated to people watching them at distances of less than five metres, including the drongos and another important species from which they steal food, a bird called the pied babbler. Dr Flower said: "That means that I and other researchers can get right into the thick of the action. We can unravel the interactions between all these animals because different individuals are identifiable by coloured leg bands (in the case of the birds), or L'Oreal hair dye marks on the fur of the meerkats (don't worry, it's been tested on humans)."

In the course of his research on drongos, Dr Flower has habituated and colour-ringed about 200 birds living in 40 territories which overlap with those of the meerkats and babblers. He said: "I've trained the drongos to come to a call. So if I want to find drongo 'Dave', for example, I can walk into his territory, give a call and he'll come flying over to me in return for a mealworm reward. He'll rapidly get back to his natural behaviour, hawking flies or following meerkats and babblers to steal their food, allowing me to tag along and watch what happens."

Dr Flower describes pied babblers as "the bird equivalent of meerkats, with mum and dad doing all the breeding while their offspring stay at home to help raise their younger siblings". A co-author on the Drongo manuscript, Dr Amanda Ridley, began studying babblers on the reserve in 2003, observing as many as 14 groups of babblers that are completely tolerant of people walking with them and watching their behaviour.

Dr Flower (pictured right) worked on the Kuruman meerkat research project in 2003 and became the meerkat research and reserve manager from 2004 to 2007. He started work on the drongo project in 2008. He said: "This kind of access to so many different animals is unrivalled anywhere in the world and was key to the observations and experiments that underpinned my findings." Dr Flower is now following juvenile drongos during their development, to learn more about how they learn the mimicking behaviour.



Life at Sea: Exploring the Oceans on the Agulhas II

Dr Isabelle Ansorge, has just returned from a voyage at sea on the polar research vessel the SA Agulhas II with 5 women from the Oceanography department. This “class afloat” is a training programme for Master’s students and they spent 5 weeks doing hands-on research, having lectures, and examining the ocean dynamics in the Southern Ocean. For many students who have previously worked with the results from cruise data, this is their first time at sea and it brings new perspective on how the process happens, glitches that occur and how to translate the theory into practice. Students run a watch for 12 hours, where they work with technicians, collect samples and work on their own projects.



A hike on Marion Island—glad to be on solid ground !

On this recent trip there was one storm after another, with rough seas and the ship was pushed to the limit. The bad weather meant that the students spent a lot of time working up the data gathered, as well as planning future papers and another Master’s project. Isabelle explained that being on the cruise is an opportunity for postgraduate students to explore future possibilities and where they want to go to with their careers.

Being on the ship can feel like “ground-hog day” where one day can be the same as the next and you can’t escape and retreat from people. This means that the cruise becomes a significant bonding experience and solid friendships are formed. **Katherine Hutchinson**, currently a research assistant and intern working with Isabelle, who assisted with the training of the Master’s students, commented that you see the many sides of people as you work together in close proximity.



King Penguins on Tripot beach, Marion Island



The 5 female Oceanographers on the ship departing Cape Town

The trip was not just about Oceanography but also included a 3 night sojourn on Marion Island, which is a natural laboratory for all natural Earth sciences and where students can see the bigger picture in this sub-Atlantic laboratory. This is a place where everyone works together, brainstorming ideas in the bar and looking at an integrated concept of the entire ecosystem and climate change with geologists and biologists. This was a highlight for the students, who particularly enjoyed heading out (even in the pouring rain) to see the penguins.

Over 17 years Dr Isabelle Ansorge has taken more than 150 students to sea. So what inspires her to head off on a cruise? She explained, “This is a life experience and a golden opportunity: you can teach in class, but unless you experience it in the environment, what works and the complications and difficulties that can occur in getting the data, you don’t get the full picture. You are also removed from everyday life, you don’t get stuck in traffic and there is no need to shop for food or even cook! – you are a few minutes from your work and the gym – there is an ease of life.”

Dr Ansorge is currently working on a proposal to attract Mathematics, Statistics, Engineering and Computer Science students into the Marine Environment. Her proposal for SEAmester entails a classroom at sea onboard the SA Agulhas II for two weeks each year, drawing 30 students from across South African universities and will strive to bring more of the numerical sciences into Marine Science. This will combine traditional class-room lectures with hands-on deck activities, providing students with an opportunity to support specialist scientists in internationally relevant research activities. The aim of SEAmester is to (a) make use of dedicated sea time to train a new generation of numerically proficient students entering the marine sciences, and (b) to undertake research in a region that has been identified by both the national and international community as critical to climate change.

125-Million-year-old *Changyuraptor* Sheds Light on Dinosaur Flight

An international team of experts, including **Professor Anusuya Chinsamy-Turan**, from the Department of Biological Sciences, has discovered a new predatory dinosaur with very long feathers, that sheds light on how dinosaurs flew. The animal has a long-feathered tail that is believed to have been useful in decreasing descent speed and assuring safe landings.



Illustration of *Changyuraptor yangi* (S. Abramowicz, Dinosaur Institute, NHM)

The findings of the international research team, led by Dr Luis Chiappe, a palaeontologist from the Natural History Museum, Los Angeles County, USA, who that with a weight of four kilograms, the 122cm-long *Changyuraptor* was the biggest of all four-winged dinosaurs. Analysing the bone microstructure of the *Changyuraptor*, Professor Chinsamy-Turan said, "It shows that the animal was fully grown and that it had experienced at least five years of growth."

The fossil of the 125-million-year-old dinosaur, named *Changyuraptor yangi*, was found in the Liaoning Province of north eastern China. The newly discovered dinosaur has a full set of feathers cloaking its entire body, including the extra-long tail feathers. According to Professor Chinsamy-Turan these microraptorine dinosaurs are known as the "four-winged" dinosaurs, because the long feathers attached to the legs have the appearance of a second set of wings.

"As we know birds have wings on their forelimbs. However, about 10 years ago predatory dinosaurs were discovered with wings on both their forelimbs, and hind-limbs," said Professor Chinsamy-Turan. "These recent discoveries pose an enigma as to how these microraptorine dinosaurs used their four wings to fly. Our new microraptor, *Changyuraptor*, is quite large, and we propose that its unusually long tail (30cm in length) helped to keep it airborne and could have assisted with landing."

The long feathers attached to both legs and arms of these ancient predators have led researchers to conclude that the four-winged dinosaurs were capable of flying. Dr Alan Turner from Stony Brook University in New York, one of the paper's co-authors, said: "Numerous features that we have long associated with birds in fact evolved in dinosaurs long before the first birds arrived on the scene. This includes things such as hollow bones, nesting behaviour, feathers and possibly flight."

Although it remains uncertain how well these creatures flew, the discovery does explain the role that the tail feathers played during flight control. For larger flyers, safe landings are of particular importance. "It makes sense that the largest microraptorines had especially large tail feathers — they would have needed the additional control," added Dr Michael Habib, a researcher at the University of Southern California, USA, and another co-author of the paper.

The discovery of the *Changyuraptor* consolidates the notion that flight preceded the origin of birds, being inherited by the latter from their dinosaurian predecessors. "The new fossil documents that dinosaur flight was not limited to very small animals but to dinosaurs of more substantial size," said Dr Chiappe. "Clearly far more evidence is needed to understand the nuances of dinosaur flight, but the *Changyuraptor* is a major leap in the right direction."

OUTREACH IN THE FACULTY

The Department of Physics hosts an International Masterclass on Particle Physics



Dr Andrew Hamilton, UCT representative in the ATLAS Collaboration at CERN, briefs local high school pupils taking part in the Masterclasses

After a day of gaining insight into topics and methods of basic research at the fundamentals of matter and forces and performing measurements on real data from particle physics experiments at CERN, local high school pupils joined more than 10,000 of their peers from 40 countries in a video conference to combine and discuss their findings .

Physics department post-graduate students were on hand to assist the local high school pupils taking part in the 10th edition of the International Masterclasses in Particle Physics.

Computer Science Hosts General Purpose Graphical Processing Unit (GPGPU) Workshop

GPGPU programming is gaining in popularity as an inexpensive way to achieve high performance computing solutions for scientific software. This workshop was the second in a series of such workshops organised by **Dr Michelle Kuttel** and **Chris Laidler**, from the Department of Computer Science.

The principal lecturers on the course were Nvidia fellows John Stone (University of Illinois, Urbana Champaign) and Manuel Ujaldón (University of Malaga). Additional speakers were Computer Science postdocs Dr Bruce Merry and Dr Simon Perkins and PhD student Chris Laidler.

The workshop was attended by 30 delegates, comprising postgraduates students (Honours/4th year, MSc and PhD) and researchers from academia and industry. The workshop covered more advanced methods and techniques suitable for programmers already familiar with NVIDIA's CUDA programming environment to enable effective general purpose computing with GPUs."



The Last Word....

Annually, the **Department of Molecular and Cell Biology** hosts an essay competition for their honours students. This consists of the popular writing section and a young investigators essay section (more formal research topics). On the actual research day, there are oral research presentations (postgraduates) and a poster competition. The competition creates quite a "buzz" in the department and reveals some talented writers with creative ideas... We will showcase some of these essays in every edition of Science Matters.

Godzilla inspires hope for a saviour borne from the sea by Karis Moxley



"What utter nonsense," I thought as I forged my way through a large popcorn and the latest Godzilla movie. It seemed hardly plausible that a creature of such magnitude could completely escape the history books and then conveniently emerge at the eleventh hour as humanity's greatest saviour.

But somehow, Legendary Pictures got it right and the movie played on my mind long after the rolling credits marked my liberation. You see, as a marine scientist I am well aware that the ocean depths have remained well beyond man's reach for the most part of human existence. But the 21st century has brought with it revolutionary technologies for undersea exploration and, finally, we can begin to unravel "the mysteries of the deep". The oceans are home to a unique collection of life forms and new species of marine plants, animals and microorganisms are being discovered as quickly as money is rolling in for the next piece of apocalyptic cinema.

Suddenly, the existence of Godzilla doesn't seem so unrealistic! But scientists believe that, rather than a fire-breathing reptile to save humanity, the oceans may yield a saviour of a different kind.



According to the World Health Organization, the resistance of certain disease-causing microbes to antibiotic treatment has become a “major global threat” to public health. For example, resurging levels of tuberculosis have been attributed the ability of the bacterium, *Mycobacterium tuberculosis*, to overcome the toxic effects of the drugs commonly administered to fight the disease. Other nefarious microbes, such as those responsible for wound infections, gonorrhoea and pneumonia, have also become remarkably resistant to drug therapy. Experts fear we may reach a point where previously manageable diseases will become untreatable, as in the days before the golden age of antibiotics.



As the “antibiotic apocalypse” looms, there is an urgent need to discover new antimicrobial drugs. Mounting evidence suggests that our salvation may be lying in wait at the bottom of the sea. The oceans are an untapped treasury of novel chemical compounds which could be used to develop the next generation of life-saving pharmaceuticals. In particular, a number of marine invertebrates and microorganisms have gained recognition as prolific sources of natural bioactive chemicals and offer an exciting opportunity for pharmacological exploration. For example, the Pompeii worm (*Alvinella pompejana*—pictured left) has recently caused a stir in the scientific community. This marine animal inhabits deep ocean hydrothermal vents and has been the subject of great interest for its exceptional heat tolerance. Recently, a group of researchers reported on their remarkable discovery that this worm produces a novel antimicrobial compound. Dubbed “alvinellacin”, this unique peptide appears to defend the Pompeii worm against invasion by potentially disease-causing bacteria. Could this be the miracle drug we have been searching for?

Or perhaps the compound we need is a novel derivative of pyridine produced by a marine fungus. Although members of the fungal genus *Trichoderma* are widespread inhabitants of both terrestrial and ocean habitats, a marine representative currently holds the spotlight for its ability to produce a wide variety of bioactive metabolites. One of these, an unusual pyridone compound designated “trichodin A”, shows antimicrobial activity against common infection-causing bacteria of the genus *Staphylococcus*.

In addition, certain species of marine bacteria have also proved fruitful sources of new bioactive compounds. In particular, the microbial communities associated with marine sponges display massive metabolic diversity and numerous research groups have set out to explore the antimicrobial potential of compounds produced by the resident bacteria. Recently, *Shewanella algae* VCDDB was isolated from the sponge, *Callyspongia diffusa*, and shown to display high activity against a number of clinically relevant bacteria, including those responsible for certain blood, urinary tract and gastrointestinal infections.

Unfortunately, the use of these compounds in the development of new therapeutic drugs will be a costly and lengthy process, and it will take years before their true benefits can be established. Nevertheless, scientists continue to scour the ocean resources in the hope that they might stumble across a giant discovery that could inevitably help us win the war against microbial drug resistance.

In the meantime, the world waits – desperate for salvation from the war with microorganisms but occasionally distracted by far-fetched entertainment. But now I’ll admit it: While the concept of Godzilla himself might seem absurd, the new movie left me with a sense of hope. Perhaps our oceans will indeed yield an unlikely “hero for humanity” but I suspect it won’t be in the form of a pre historic lizard.

Last laugh...

