CONTACT

FACULTY OF SCIENCE NEWSLETTER – NO.8 – NOVEMBER 2010

Connect with UCT Alumni and what is happening at UCT on Facebook, Linked in, YouTube and Flickr

MESSAGE FROM THE DEAN

A highlight of 2009 was the record number of PhD graduates in Science with 67 doctorates being awarded in our two graduation ceremonies.

Our focus on quality research gathered further momentum with a significant rise in international citations of our publications. More than 75% of our academic staff are National Research Foundation rated researchers, with 64 of our scientists in the A or B category.

Six new chairs in the Faculty of Science, funded by the South African Research Chairs Initiative, have provided additional capacity for supervising postgraduate students and hosting postdoctoral fellows.

The faculty's researchers attracted significant external funding for their exciting projects. Professor Kelly Chibale (Chemistry), whose group is using plants to find novel compounds for antimalarial drugs, received a R3.6-million grant from the Medicines for Malaria Venture.

The Hassno Plattner Institute in Germany funded the development and launch of the Information Communication Technologies for Development Centre at UCT. The newly accredited Centre for Astrophysics, Cosmology and Gravitation, will promote stimulating interdisciplinary research.

A pilot intervention, ACHIEVE, provided out-of-hours academic assistance in mathematics and physics for first-year students at risk, many of whom are from disadvantaged backgrounds.

The Faculty has strong transformational leadership which finds expression through our Faculty Transformation Forum. Staff demography has changed significantly in recent years although we still face challenges in achieving our desired representivity and diversity.

Thank you for your interest and valuable support.

Kathy Driver
Professor of Mathematics
Dean, Faculty of Science

OUTSTANDING ACHIEVEMENTS IN 2009

Staff:

- Prof Jill Farrant (Molecular and Cell Biology) was awarded the Harry Oppenheimer Fellowship Award to fund her research on "resurrection plants".
- Prof Johann Lutjeharms received the Order of Mapungubwe for his exceptional work in oceanographic science.
- Prof Mino Caira, Director of the Centre for Supramolecular Chemistry Research, was awarded the South African Chemical Institute's Gold Medal for 2009.
- Prof Linda Haines (Statistical Science) won the 2009 Sichel Medal for the best paper by a South African author in a statistical journal.
- Dr Amanda Weltman (Mathematics and Applied Mathematics) was named Best Emerging Scientist at the annual Department of Science and Technology's South African Women in Science Awards
- Honorary doctorates were awarded by UCT to Emeritus Professors Brian Warner(Astronomy) and George Ellis (Cosmology).
- Prof Brian Warner was elected a fellow of his alma mater, University College London.
- Prof Gary Marsden (Computer Science) received a Distinguished Teacher Award
- Profs Kelly Chibale, Susan Bourne and Jill Farrant were elected Fellows of UCT.

Students:

- Grace Mugumbate won a prize for her poster presentation at the International Union of Pure and Applied Chemistry conference in Glasgow.
- Renee Hlozek won the 2009 S2A3 Medal for the best Masters by Dissertation thesis from the South African Association for the Advancement of Science. Her work relates to dark energy, the mysterious form of anti-gravity believed to be responsible for the acceleration of the Universe.
- Shikoh Gitau won the prestigious 2010 Anita Borg Award Google Scholarship awarded to a female student with an excellent academic record in Computer Science.
- Batsirai Magunje, Wole Solana and Stanley Walton, scooped three out of four applied physics prizes at the 54th Annual conference of the South African Institute of Physics.

Shoreline

Eleanor Yeld, in action on site

Two UCT researchers, historian Nomalanga Mkhize and marine biologist Eleanor Yeld, co-presented the highly rated, 13-part environmental documentary series *Shoreline*, which aired on SABC2 in February 2009. This documentary explores the approximately 3000 kilometres of South African coastline, stretching from the desert border with Namibia on the Atlantic coast, southwards around the tip of Africa and then north to the border with Mozambique on the Indian Ocean. Combining scenic photography with background on the communities and previously unseen natural riches, the series explores how the environment and historic events have shaped the lives of coastal communities.

New Chair in Astronomy

The Department of Astronomy was awarded the South African Research Chair in Extragalactic Multi-Wavelength Astronomy in collaboration with the South African Square Kilometre Array (SKA) office. The new Chair will focus on galaxy formation, evolution and cosmology through radio observations and will be 'embedded' in the Faculty of Science's Astrophysics, Cosmology and Gravitation Research Centre.

Positron Emission Particle Tracking Facility

The world's second positron emission particle tracking facility, PEPT Cape Town, has opened at the iThemba LABS national cyclotron centre near Faure. Associate Professor Andy Buffler and Dr Indresan Govender of UCT's Department of Physics will provide essential research capability for the facility.

MATHEMATICAL CONTEST IN MODELLING

The MCM is hosted each year by the Consortium for Mathematics and Its Applications (COMAP), based in the United States, and is open to teams of three undergraduates from any university across the world. This year 2254 teams entered from fourteen countries as far afield as China, Germany, Indonesia and Pakistan.

In February 2010 twelve students (in four teams of three) from the Department of Mathematics and Applied Mathematics and the Department of Physics entered the international Mathematical Contest in Modelling (MCM). Three of the teams earned the second highest award and were declared Meritorious Winners, while the fourth team was placed as Successful Participants. The teams were advised by Dr Henri Laurie.

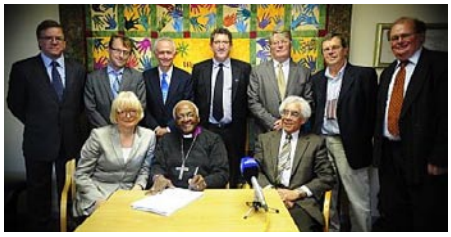
This year the choice of problems in the event was between designing protocols for the prediction of the next attack site of a serial criminal, or an analysis of the dynamics of baseball bats and their "Sweet Spots". Our teams drew on techniques from the standard toolbox of applied mathematics as well as a handful of unexpected approaches from mathematical physics, computer science and statistics. The teams selected an open problem and spent ninety six hours proposing, simulating and calibrating mathematical models. Competitors were judged on the quality of a scientific report summarising their findings and the creativity of their solutions.

The success of the teams attests to the vibrancy of applied mathematics at UCT, and suggests an exciting opportunity for further interdisciplinary research amongst undergraduates.

***MCM Competition Winners:* Back row from left: Anthea Field, Stefaan Conradie, Pieter Slabbert, Subhaan Brey, Tariq Desai, Timothy Povall, Thomas Mbewu, Andy Ramnath. Front Row: Bianca Bohmer, Azhar Desai, Laura Hayward. Absent: Priscilla Chauke**

NANSEN-TUTU CENTRE FOR ENVIRONMENTAL MARINE RESEARCH

The Marine Research Institute (Ma-Re) and the Nansen Environmental & Remote Sensing Centre (NERSC) have established the Nansen-Tutu Centre in Cape Town. The vision of the centre is to serve Africa through advancing knowledge of the marine environment and climate system in the spirit of Nobel Peace Laureates Desmond Tutu and Fridtjof Nansen, Norwegian explorer, scientist, diplomat and humanitarian. The goal of the Centre will be to improve the capacity to observe, understand and predict marine ecosystem variability on timescales from days to decades in support of scientific and societal needs including fisheries, coastal management, maritime security, recreation and tourism.



The signing of the agreement at Archbishop Desmond Tutu's offices. Front Row (L-R): Prof. Berit Rokne, Archbishop Desmond Tutu and Prof George Philander. Back Row (L-R): Ambassador Tor Christian Hildan, Prof. Johnny A. Johannessen, Prof Frank Shillington, Dr Neville Sweijd, Mr. Hans Erstad, Prof John Field and Dr. Lasse H. Pettersson. *Photo: Katherine Traut.*

AFRICAN CENTRE FOR CITIES LAUCHES NEW URBAN ECOLOGY CITYLAB

The African Centre for Cities' CityLab programme facilitates engagement between researchers and practitioners on a number of key themes: namely the central city, Philippi, climate change, healthy cities and urban flooding. A new CityLab on urban ecology was launched in January 2010, with Dr Pippin Anderson, from the Department of Environmental and Geographical Science, as co-ordinator. This initiative aims to explore the challenges facing urban ecology in the City of Cape Town through addressing issues such as conservation, ecosystem services, and environment and governance systems. Dr Anderson explains that the new Citylab has met and discussed issues such as: (a) the management of large mammals in the urban context (grappling with the interface of biology and policy); (b) how to monitor fresh water quality and ensure its effective management in the urban setting, and (c) a detailed review of the air pollution status of Cape Town, what this means for the city, and what interventions are possible. These first few sessions have included input from staff of the City working for Cape Town, academics at UCT and independent consultants working in the field, reflecting the broad community that participates in Citylab.

MOBILE PHONE TECHNOLOGY AND TRADITIONAL MEDICINE

Computer Science PhD student Shikoh Gitau won the prestigious 2010 Anita Borg Award Google Scholarship which is awarded to a female student with an excellent academic record in Computer Science.

Shikoh is a Kenyan PhD student in the Computer Science Department at UCT. Her PhD dissertation looks at how the use of mobile internet and its related applications (web 2.0, social media) can be used as tools for service delivery in a South African and Kenyan urban collective. Through incorporating Africa inspired interaction techniques such as 'Ubuntu', where technology use is communal, and 'mediation' where technology use is through a capable other, she aims at overcoming some of the challenges facing first-time mobile only internet users.

Shikoh's submission

Inspired by research on the design of modern medicine by extracting compounds from medicinal plants, Shikoh wrote a proposal on a mobile phone based system that will record, catalogue and map-out traditional medicine and knowledge for both archival purposes as well as a way of passing the knowledge on to the next generation.

Traditional Medicine is a practice that is ingrained in many African cultures with up to 80% of the population said to have utilised traditional medicine. As an art that is passed down from one generation to another through apprenticeship and oral tradition, there is a threat to its sustainability as many young people take up mainstream career choices and when the elders who are

the custodians of the art die, the knowledge also dies. The nature and practice of traditional medicine relies heavily on an in-depth understanding of local plants and herbs and their medicinal value. Furthermore, the increased degradation of the environment as well as urbanization may lead to the diminishing and in some cases the extinction of medicinal plants. Hence, there is need to preserve knowledge of the medicinal plants

The system developed by Shikoh has been named M-Ganga (Mobile-Healer) and is a two part system that will include:

a.) The Apprentice: A web-based application that will 'apprentice' Traditional Healers during various healing sessions, recording both audio and video through mobile phones. This will result in a collaboratively authored database on how to handle various ailments traditionally. The searchable catalogue will act as a repository for persons interested in traditional medicine as well as for people researching drug design.

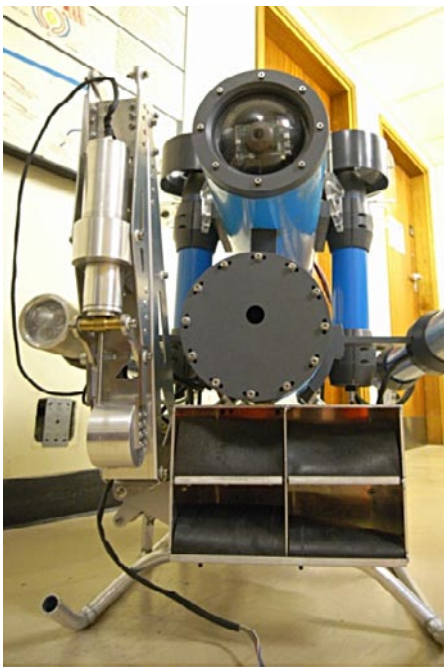
b.) The Biodiversity Map: A web-based mapping of various medicinal plants will show where they are available, how they should be prepared for healing purposes, and whether they are endangered or not.

M-Ganga can be accessed through the mobile internet as well as from a computer.

Working with First-time Mobile Internet Users in Khayelitsha

Over the past 18 months Shikoh has conducted an extensive study on the use of mobile internet by illiterate and semi-literate users in urban Cape Town and its surrounding townships. A key finding of the study is that although many women had mobile handsets with internet capability, they did not use the service. However, many of the women interviewed are interested in learning about the internet as they believe it could be a useful tool in securing better employment.

A REMOTE OPERATED UNDERWATER VEHICLE FOR THE DEPARTMENT OF ZOOLOGY



Cross faculty collaboration between Zoology's Andrea Plos and Stephen Marais of Mechanical Engineering, has given birth to a prototype Remote Operated Underwater Vehicle (ROV) affectionately called "The Baby". The ROV is a tethered underwater robot, which is unoccupied, highly manoeuvrable and operated by a person aboard a vessel via an onboard camera. Used extensively by the science community to study the ocean, these robots can cost millions of rands. However with UCT ingenuity, students from the Engineering Faculty built "Baby" for R25 000. The students commented that the budget constraints challenged them to think of different solutions while staying focused on their original design requirements. "Baby" has been pressure-tested to 50m, weighs 80kg and can collect water, sediment and organic samples at depth. UCT marine research divers often have to spend considerable time investigating various sites, but now they can put the ROV overboard, find what they are looking for and thereafter send in the divers. Although the current ROV is still a research prototype, it points the way towards future collaboration in which smart, compact robotics could be used at UCT in one department as a research tool and in another as a teaching design project for robotic and engineering students. Andrea Plos, the inspiration behind this project, says that creating the prototype has been a steep learning curve and that she and Stephen are thinking of the next ROV which will be made of stainless steel and will need to be outfitted with high-output lightning systems and "broadcast-quality" cameras.

STUDYING THE EFFECTS OF VOLCANIC ASH ON MARINE LIFE

In May 2010, marine scientists from Britain, European countries, and South Africa (UCT's Mike Lucas), were aboard the UK's Natural Environment Research Council (NERC) vessel RRS Discovery while iron-rich volcanic ash rained down onto the decks of the ship from Iceland's Eyjafjallajökull volcano, which first erupted beneath a glacier in April. The reason for their presence was to study the effects of volcanic ash deposition on marine life in the surface of the ocean as part of the International climate change programme; Surface Ocean Lower Atmosphere Study (SOLAS).

Phytoplankton and the Global Carbon Cycle

Although microscopic, total phytoplankton productivity in all the world's oceans is almost exactly the same as that of all terrestrial plants on Earth. Both terrestrial plants and phytoplankton play a unique and important role in the global carbon cycle, where variation affects climate change and global warming.

When phytoplankton cells die and sink to the deep ocean floor (perhaps three to five kilometres below the sea surface), they take this fixed carbon with them, which helps to remove CO_2 from the atmosphere for periods of hundreds to thousands of years. Scientists believe that this process helps to reduce the concentration of the "green-house gas", CO_2. The sub-polar region in the North Atlantic is the most important region of any of the world's oceans in terms of removing atmospheric CO_2 due to phytoplankton growth and the biological carbon pump.

Many mechanisms introduce iron into the oceans, including desert dust storms and volcanic ash deposition, which is very rich in iron and other elements such as aluminium. Since surface waters of the sub-polar oceanic region south of Greenland and Iceland are deficient in iron, they hypothesised that the volcanic ash cloud would add vast amounts of iron to the ocean and that this in turn would stimulate phytoplankton growth. If correct, this would also remove more CO_2 from the atmosphere.

What did they find?

The Icelandic volcanic ash cloud that disrupted international flights in April and May covered a vast area of the North Atlantic as well as Europe, even extending as far south as North Africa. Beneath the ash cloud, dissolved iron concentrations in the surface ocean increased 10,000-fold relative to nearby ocean regions that were unaffected by the ash cloud. Phytoplankton biomass in the water increased 3-fold, and the efficiency with which they photosynthesised, also increased substantially. The quantity of CO_2 removed from the atmosphere due to photosynthesis increased in response to increased phytoplankton growth rates.

Increased phytoplankton biomass and growth rates also meant that there was, temporarily at least, more food for herbivorous zooplankton that are a vital part of the food chain, providing the link between phytoplankton and commercially important fish such as Cod, as well as piscivorous sea-birds, seals and some whales.

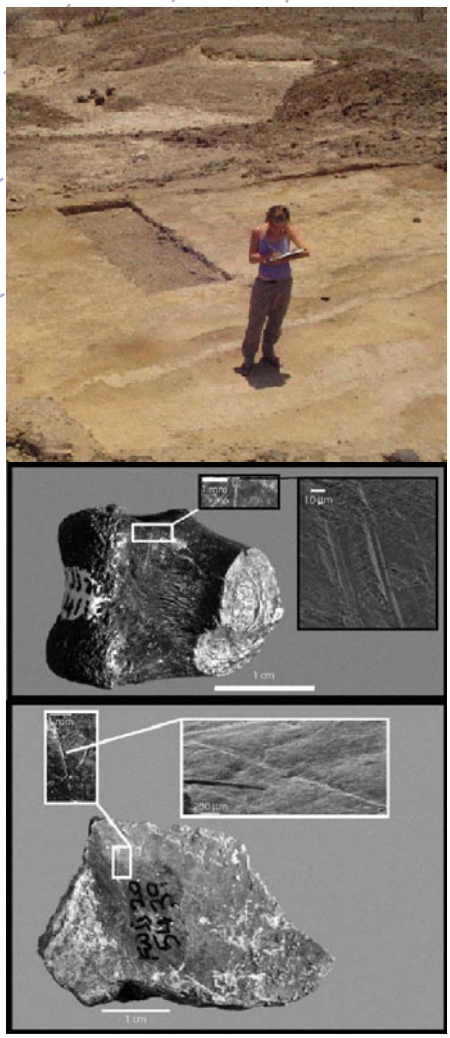
AQUATIC FOOD IN EARLY HUMAN DIET

Almost 2 million years ago, our ancestors incorporated a far wider variety of foods in their diet than previously suspected, including animals rich in brain-growing nutrients. Incorporating these lake and river animals - including fish, turtles, and crocodiles - into their diets could have played a critical role in fuelling the development of a larger, more human-like brain in our early ancestors.

A team of scientists from Kenya, U.S.A., U.K., Australia, and South Africa discovered the 1.95 million year old site in northern Kenya in 2004. Four years of excavation yielded literally thousands of fossilized bones and stone tools. The team of archaeologists was lucky to find a locality that had just the right local conditions to preserve ancient bones and tools.

"At sites of this age we often consider ourselves lucky if we find any bone associated with stone tools, but here we found everything from small bird bones to hippopotamus leg bones" remarked David Braun, of the University of Cape Town, who was the lead author on the article published in the proceedings of the National Academy of Science. Preservation was so remarkable that the team was able to develop a detailed reconstruction of the environment. Paleontologists Prof. Marion Bamford (University of Witswatersrand, South Africa) and Dr. Laura Bishop (Liverpool John Moores University) identified fossilized plant remains and numerous extinct species that indicated the wet and possibly marshy environment these early humans were living in.

Using a variety of techniques the team of archaeologists was able to determine that at least ten animals were butchered by early humans at this site. Lead zooarchaeologist Dr. Jack McCoy of Rutgers University (U.S.A.) identified bones of animals including turtles, fish, crocodiles and large



antelopes that ended up as the meals of these early humans. The discovery of such a diverse animal diet is especially important because, after 2 million years ago, brain size increased dramatically in early human ancestors. Growing a large brain requires an enormous investment in calories and nutrients, and places considerable costs on the mother and developing infant. While anthropologists have hypothesized that adding meat to the diet was key to the evolution of a larger brain, it came as a surprise that human ancestors this long ago had incorporated animal foods from lakes and rivers rich in brain nutrients. "These aquatic foods are really important sources of the long-chain polyunsaturated fatty acids and docosahexaenoic acid (DHA) that are so critical to human brain growth, so finding these foods in the diets of our early ancestors suggests they may have helped to lift constraints on brain size and fuel the evolution of a larger brain" said co-author Brian Richmond of George Washington University (U.S.A.).

The team that excavated the site is jointly directed by Jack Harris of Rutgers University (U.S.A.) and David Braun, collaborating with Mzalendo Kibunjia of the National Museums of Kenya and a host of international institutions. This research was supported by the United States National Science Foundation and the Emergency Research Program at the University of Cape Town.

SALT – ASTRONOMY

Two UCT staff members, Professor Bruce Bassett and Dr Kurt van der Heyden are members of the international Sloan Digital Sky (SDSS) cosmology survey which has found 500 new type Ia supernovae, which are the death explosions of stars. These are very useful in cosmology since they allow astronomers to measure distances to the edge of the observable universe and lead to the realisation that the cosmos is not only expanding but doing so at an accelerating rate. This has been hailed as one of the biggest discoveries in science in the past decade and understanding it more deeply is one of the main goals of the SDSS survey.

The SDSS supernova survey is lead by Chicago University. Bruce and Kurt used the South African Large Telescope (SALT) facility in Sutherland to study some of the supernova and personally discovered tens of the ~500 Supernovae, thereby contributing significantly to the effort. UCT and SAAO are two of only four non-US institutions taking part in the SDSS survey.

• Baboon Research Unit

MAPPING HUMAN-BABOON BORDERS

One of the most significant research outputs to come from the Baboon Research Unit since its inception in 2007, are digital baboon home range maps. Using these maps, the chronic problem of human-baboon conflict in the Cape Peninsula can be addressed, since the landscape requirements of the Cape Peninsula baboon population can now be officially incorporated into development plans for Cape Town. The maps, which were based on 25 000 GPS points of baboon locations, collected during thousands of hours of data collection in the field and with the use of GPS-tracking collars, have been accepted by Strategic Environmental Management Department of Environmental Affairs and Development Planning (DEAD&P) in the Western Cape and the City of Cape Town. This means that both of the authorities responsible for land use and development in the Cape Peninsula will proceed with the knowledge of which baboons will be affected by further development.

This exciting product forms part of a PhD study conducted by UCT's Tali Hoffman under the supervision of Dr Justin O'Riain (Department of Zoology) who heads up the BRU. Funded by the World Wide Fund for Nature (WWF) through its associated trust, the Table Mountain Fund (TMF) and the South African National Parks, this is the first population-level study of primates to be conducted at such a fine-scale and has important conservation implications for all wildlife populations that are being displaced through habitat loss and fragmentation.

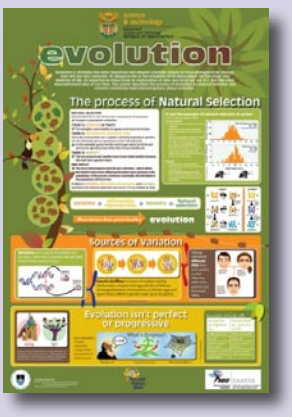
For too long it has been assumed that baboons will be content as long as there are mountains for them to hide in. The home range maps tell a very different story and warn that failure to protect suitable low lying habitat within areas currently exploited by baboons will result in elevated human-baboon conflict. The home range maps may not prevent further erosion of natural habitats ecologically suitable for baboons, but they do allow all interested and affected parties to have their say on future transformation of baboon home ranges and will force planners to factor in the consequences of any habitat transformation on the existing troops. The involvement of land authorities at this level of baboon management could be the single most important piece of the baboon conservation puzzle on the Cape Peninsula.

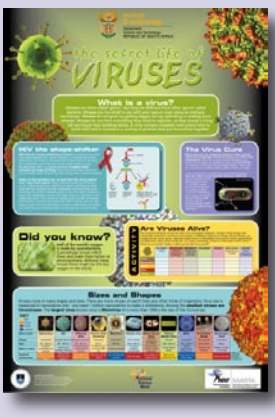
But BRU is not stopping there. With several other long-term research projects approaching finality, and data analyses reaching fruition, BRU is rapidly developing a thorough and comprehensive dataset about baboons and their requirements. As soon as they are analysed, the data is relayed directly to the authorities and service providers charged with baboon management, to assist their management and conservation efforts. This wealth of information will be made officially available to management authorities and interested and affected parties during 2011 through the WWF South Africa Report Series.

This project of working with the zoning plan for Cape Town will work towards ensuring that baboon home ranges will not be further eroded by development without both the officials and the developers having to grapple with consequences of future developments beyond existing urban edges. Thus conflict should no longer escalate in the Peninsula and together with current research on innovative ways to keep baboons in natural areas but away from houses promises to provide welcome reprieve for both Capetonians and baboons alike.

POSTERS TO STIMULATE CURIOSITY IN SCIENCE IN PRIMARY LEARNERS

Science Faculty academics developed a new set of three stimulating and topical posters for distribution to primary schools, during National Science Week, adding to the eleven already in circulation. The topics this year are: Evolution, Making Metals in the Past and Viruses. SAASTA, who funds the production costs of the posters, also sponsored the cost of 35 000 flyers of previous posters, for distribution to the general public. The posters are available for free download from the Science Faculty website at: www.science.uct.ac.za.





• 2010: the year of Biodiversity

THE FITZPATRICK INSTITUTE CELEBRATES 50 YEARS OF CONTRIBUTING TO BIODIVERSITY CONSERVATION

The Percy FitzPatrick Institute of African Ornithology (PFIAO) at UCT was founded in 1960 through the vision and drive of Cecily Niven, daughter of Sir Percy FitzPatrick (of Jock of the Bushveld fame), after whom the Institute is named. It is the only ornithological research institute in the southern hemisphere, and one of only a handful in the world.

In 1992, the Institute introduced a taught MSc course in Conservation Biology, and in 2004, the Institute was awarded the prestigious status of Centre of Excellence (CoE) in Science and Technology by the Department of Science and Technology and the National Research Foundation. The theme of the CoE is "birds as keys to biodiversity conservation".

The Conservation Biology Course

Conservation Biology and the FitzPatrick Institute pursue the scientific study of how best to sustain and manage linked systems of people and nature. The sense of urgency is particularly apparent in Africa, where a dazzling array of plants and animals are under severe threat. Africa has a relatively high proportion of the world's biodiversity and many of the world's most intact ecosystems, while at the same time facing a wide range of pressures and problems, including increasing human population growth rates, high levels of HIV infection, and low literacy levels. Global climate change is also a factor with a large impact. There is thus a pressing need for the development and application of conservation knowledge and skills in Africa. The FitzPatrick Institute is an African organization that seeks to meet this need by building conservation capacity and conservation knowledge in Africa, and by raising global awareness of African biodiversity conservation needs.

The Conservation Biology course is the most successful course of its kind in Africa, having graduated more than 200 students from almost 40 countries worldwide, including 18 African countries. Some 85% of the graduates are employed in the conservation field, emphasising the need for well-trained people with these skills. Many of them occupy influential positions, including the Director of Policy for Protected Areas at The Nature Conservancy in Washington, USA; Director of the Rwanda Wildlife Conservation Agency; Director of the Southern Africa Hotspots Programme of Conservation International; and Project Manager of the Tropical Biology Association based in Kenya & UK.

Our field research programmes

A key challenge of the 21st Century is to balance human needs and aspirations with the conservation of biodiversity and the maintenance of robust, functioning ecosystems. Our mission is to promote and undertake scientific studies involving birds, and contribute to the theory and practice of maintaining biological diversity and the sustained use of biological resources.

Studies of birds have been pivotal in developing much biological theory, and it is scientific research and its publication that form the Institute's core business. Because of their mobility and conspicuousness, birds have been used successfully as indicators of environmental change. Their high public profile makes them excellent vehicles for increasing awareness among politicians, decision makers and the public on environmental issues.

With a well-developed and recognized track record in seabird and shorebird research the institute has recently taken a deliberate decision to expand its research activities into population and community ecology and conservation biology of terrestrial systems. Four recently started projects will focus on Ludwig's Bustards, Cape Parrots, Southern Ground-Hornbills and bird responses to climate change in the arid western parts of South Africa. Visit their website www.fitzpatrick.uct.ac.za for more information.

The Second Southern African Bird Atlas Project run by the Institute is a rare example of a successful "citizen science" project. It is estimated that for each R1 million they get from SANBI, they produce R21 million worth of data, because the citizen scientists pay their own petrol and travel costs, and donate their time to the project. SABAP2 atlasers have collected nearly two million records of bird distribution from 72% of the quarter degree grid cells in the SABAP2 region.

KEEP CONNECTED • KEEP CONNECTED • KEEP CONNECTED • KEEP CONNECTED

We value regular contact with our alumni so please email us on: katherine.thomson@uct.ac.za. We would like to hear what you are doing with your Science degree to enable us to build career profiles of opportunities for Science graduates as part of our drive to ignite fascination with Science in junior and senior school learners. We would also like to cover interesting initiatives you are involved in in future *Contact* newsletters.

Contact is published by the Faculty of Science at the University of Cape Town ~ www.uct.ac.za ~ **Editor:** Katherine Thomsom ~ +27 (0)21 650 2574
Art & design: *the earth is round* ~ karien@theearthisround.co.za ~ www.theearthisround.co.za ~ +27 (0)21 781 0415