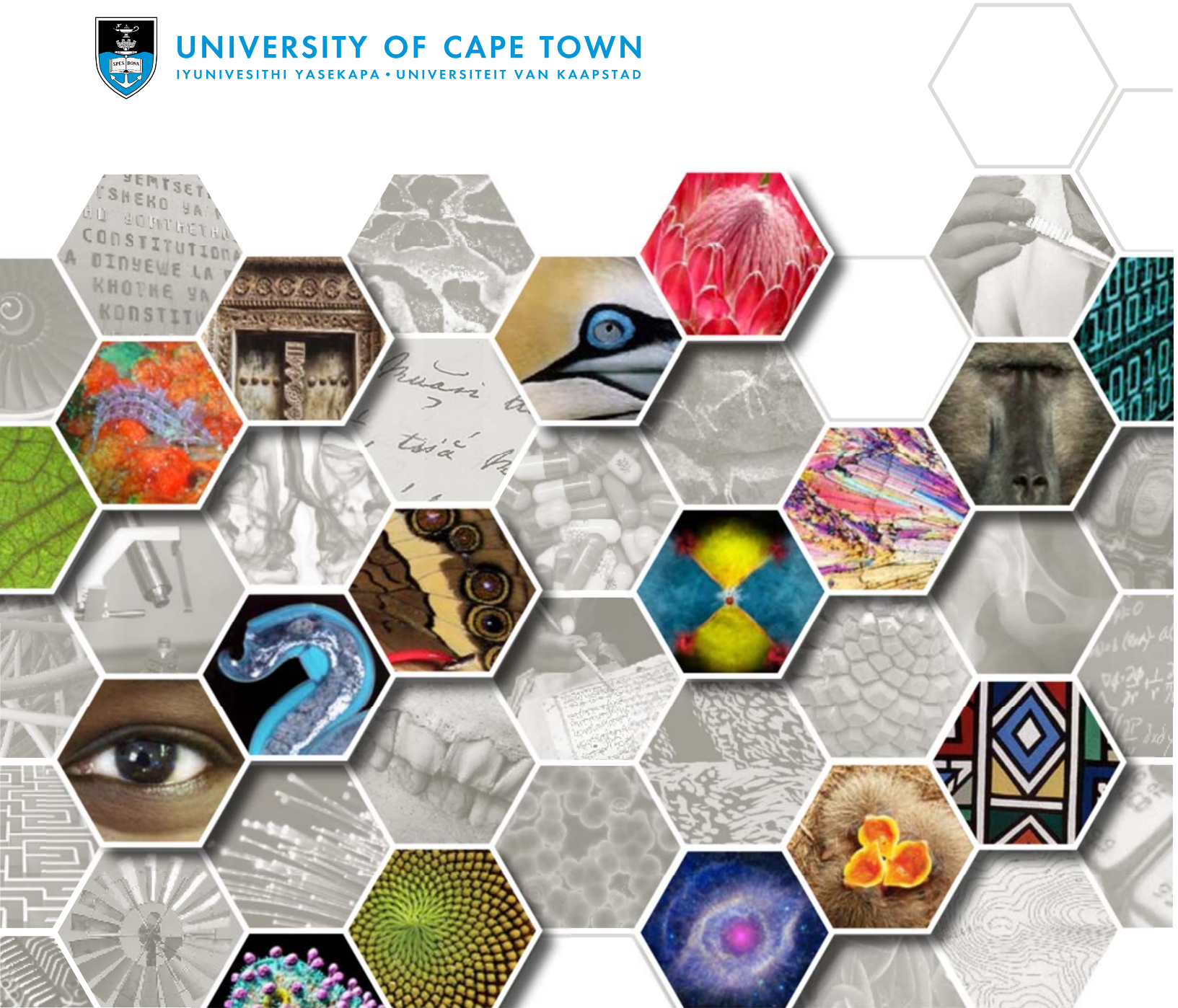
UNIVERSITY OF CAPE TOWN

IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD



UNIVERSITY OF CAPE TOWN

RESEARCH

2014-15

1. **The Constitutional Court of South Africa**
2. **Timbuktu doorway**
13. **Female Nematode Worm:** Dr Claire Hoving, SA Science Lens 2007 competition

CONTENTS

RESEARCH STORIES

FACULTY HIGHLIGHTS

MESSAGE FROM THE VICE-CHANCELLOR

DR MAX PRICE

Research is, at its best, profoundly transformative. This is true the world over; however, it is a particular imperative for the University of Cape Town, located as we are in a country, and on a continent, of vast wealth and deprivation – and the opportunity to make a difference.

Research can make a difference in a number of ways; we must certainly ensure that the difference we make answers the most pressing needs of our local communities and environment, but we must also do research that changes the wider world, stretches the limits of human imagination and adds to humankind's understanding of our natural and social worlds.

So what does 'making a difference' look like at UCT?

> We have a particular imperative to ¿nd Africa-speci¿c solutions, such as developing low-cost solutions to our health problems ... In doing so, we solve local problems not generally addressed by other global research universities.

At the very smallest scale, research transforms the individual who conducts it. It is often as they embark on their first research project that people discover the passion for their subject in

that may turn out to be revolutionary: hunting for vaccines for diseases that decimate our communities (p34 and p46); tracking the patterns in poverty and employment (p60); and challenging myths about immigrants (p58), to name just a few.

We have a particular imperative to find Africa-specific solutions, such as developing low-cost solutions to our health problems (p72). In doing so, we solve local problems not generally addressed by other global research universities. Moreover,

UMYALEZO OLUVELA KUSEKELA NGQONYELA

Uphando, ngokokugqwesa kwalo, luzisa iinguqulelo. Oku kuyinyani kwihlabathi jikelele; nakuba kunjalo, lubaluleke nangakumbi kwiYunivesiti yaseKapa, ezinze kwilizwe esikulo, nakwilizwekazi elinendyebo kunye nobuhlwempu – lukwanika nethuba lokwenza umahluko.

Uphando lunokwenza umahluko ngeendlela ezininzi; kufuneka siqinisekise ukuba umahluko esiwenzayo uphendula ezona mfuno zingamandla zoluntu lweengingqi zethu zasekuhlaleni kunye nokusingqongileyo, kodwa kusafuneka senze uphando oluzisa iinguqulelo kwihlabathi ngokubanzi, olunabela ngaphaya kweengcinga zoluntu, kwaye olongeza ukuqonda kwethu ngendalo nentlalo yoluntu.

Ngoko ke kubonakala njani "ukwenza umahluko" e-UCT?

Ngokwesona sikeyile sincinane, uphando luguqula lo mntu uluqhubayo. Ixesha elininzi xa abantu beqalisa iprojekthi yabo yokuqala yophando, baye bazifumanise bevutha nangakumbi lulangazelelo olungazenzisiyo kwisifundo sabo, oku kuquka nophando ngokubanzi. Iba lolu langazelelo ke oluthi lubaqhubele ekubeni babe ziinkokeli kwimimandla yabo. Kufuneka sibabonise lamathuba abafundi bethu abaninzi, besebatsha. Yiyo lonto esinye sezizathu esinazo ikukujolisa, ngezinga eliphakamileyo, ekwandiseni amathuba ophando ngakumbi kwabo bangekabi nazo izidanga (iphepha 55) kunye nokwandisa iqela lethu labo sebenazo izidanga (iphepha 22). Oku kubaluleke nangakumbi ukuba sinokusabela kwimfuno enkulu yokufaka abemi boMzantsi Afrika abaninzi abamnyama (abaNtsundu, abeBala nama-Indiya) kwisimo esiphathelene nophando nemfundo kuluntu.

Ekupheleni kwelinye icala lesikeyile, uphando lunokwenza umahluko ekuhlaleni, kwilizwekazi kunye nakwihlabathi. Olu luphando olunokuvela nenguqu: ukuzingela izitofu zokugonya izifo ezibulala uluntu lwethu (umzekelo iphepha 34 no iphepha 46); ukulandela imizila yobuhlwempu kunye nengqesho (iphepha 60); kunye neentsomi eziyimiceli mngeni malunga nabafuduki (iphepha 58), ukukhankanya nje imizekelo embalwa.

Sinako okubalulekileyo okuthile ekufumaneni izisombululo ezithile ezingqalene ne-Afrika, njengokuphuhlisa izisombululo zamaxabiso asezantsi kwiingxaki zethu zempilo (iphepha 72). Ngokwenza njalo, sisombulula iingxaki zasekuhlaleni ezingajongwanga zezinye iidyunivesi ezijongene nezophando ehlabathini jikelele. Ngaphaya koko, siphuhlisa ulwazi oluphuma nolungqamene ne-Africa, ngokwenza njalo sifaka isandla kumacandelo abasebenza kuwo abaphandi bethu – sitshintsha indlela elisebenza ngayo ihlabathi kunye nendlela abacinga ngayo abantu (umzekelo iphepha 6 no iphepha 14).

Okokugqibela, uphando lunamandla okutshintsha nabo bathi beve kwaye bafunde ngalo. Ukubona into esikwaziyo ukuyiphumeza ngophando kunye nobuchwepheshe

BOODSKAP VAN DIE VISEKANSELIER

Navorsing is iets wat diepgaande transformeer. Hoewel dit wêreldwyd die geval is, bemoei die Universiteit van Kaapstad sigself ten sterkste hiermee. Ons is in 'n land en op 'n kontinent geleë met ontsaglike welvaart, maar ook met nypende tekorte, wat ons dan juis die geleentheid bied om 'n verskil te kan maak.

Navorsing kan op verskeie maniere 'n verskil maak – ons moet egter verseker dat die verskil wat ons maak wel aan die dringendste behoeftes van ons plaaslike gemeenskappe en omgewing voldoen. Terselfdertyd moet ons onsself ook met navorsing bemoei wat 'n verandering in die wêreld op 'n groter skaal teweegbring. Dit moet die grense van die menslike verbeelding uitdaag en tot die mensdom se begrip van ons natuurlike en sosiale omgewings bydra.

Hoe vergestalt ons "om 'n verskil te maak" aan die UK?

In die kleine transformeer navorsing die individu wat dit uitvoer. Dit is dikwels juis wanneer iemand hul eerste navorsingsprojek aanpak dat die passie vir die vakgebied en vir navorsing in die algemeen ontdek word. Dit is hierdie passie wat hulle sal dryf om leiers in hul veld te word. Ons moet soveel as moontlik van ons studente so vroeg as moontlik aan hierdie geleenthede blootstel. Dit is een van die redes waarom ons toenemend daarop fokus om meer geleenthede vir voorgraadse navorsing (p55) te skep en om ons nagraadse studentekorps uit te brei (p22). Dit is veral belangrik as ons wil voldoen aan die dringende behoefte om groter getalle swart (insluitende Afrikane, bruin en Indiër) Suid-Afrikaners by die akademie in te sluit.

Op 'n groter skaal kan navorsing ook 'n verskil maak binne gemeenskappe in die wêreld. Dit is die tipe navorsing wat uiteindelik revolusionêr van aard kan wees: om te soek na entstowwe vir siektes wat ons gemeenskappe afmaai (bv. p34 en p46); om die patrone van armoede en indiensneming bloot te lê (p60) en om mites oor immigrante uit te daag (p58) – en dit is om slegs 'n paar voorbeelde te noem.

Ons het 'n besliste opdrag om Afrika-spesifieke antwoorde te vind deur byvoorbeeld bekostigbare oplossings vir ons gesondheidsprobleme te ontwikkel (p72). Deur dit te doen, vind ons antwoorde op plaaslike uitdagings waaraan ander globale universiteite nie juis aandag in die algemeen gee nie. Sodoende ontwikkel ons 'n spesifiek Afrika-geïnspireerde kennisraamwerk wat bydra tot die dissiplines waarbinne ons navorsers werk. Daardeur verander ons die manier waarop die wêreld funksioneer en mense dink (p6 en p14).

Laastens kan navorsing diegene transformeer wat selfs net daarvan te hore kom of daaroor lees . Ons word aangemoedig om selfs groter probleme en uitdagings aan te spreek wanneer ons bewus raak van wat ons deur navorsing en tegnologie kan bereik. Ek hoop dat wanneer u oor die jongste deurbrake aan die UK in hierdie publikasie lees, dat u, net soos ek, opgewonde sal word oor watter groter prestasies daar nog in die toekoms voorlê.

GLOBAL PARTNERSHIPS
ARE NEEDED FOR GLOBAL CHALLENGES

INTRODUCTION BY PROFESSOR DANIE VISSER
DEPUTY VICE-CHANCELLOR

Many solutions to global research challenges critically depend on perspectives that are unique to Africa, often because the challenges are – at least partially – geographically embedded in the continent, or because the way they manifest in Africa is different from elsewhere (for instance, infectious

The regional, national and continental context within which UCT operates therefore brings a uniqueness to our research. With this in mind, UCT aims both to 'bring Africa to the world' and to draw international expertise to Africa.

One of the best mechanisms for enabling this international exchange of knowledge and ideas is through collaboration with academic and scholarly communities on the rest of the continent and across the world.

Most productive international collaborations are created 'from the ground up': by the academics themselves. From this already flourishing field, UCT offers focused support to a number of preferred partners: in competing for collaborative research bids to funders, to encourage them to produce joint and/or co-badged degrees, to increase their visibility through co-authored publications, to increase mobility (of both staff and students) and to increase their access to international research funds.

POSTGRADUATES DRIVING PARTNERSHIPS

The foundation for all of this can be laid through global partnerships that enable PhD training to be embedded in research collaboration, including research collaborations that have another African partner. Students are exposed to different facilities and institutional environments, as well as having the opportunity to forge links with their counterparts and integrate themselves into a community of scholars in their field. Not only does this enrich their learning, it also provides

very nature of science have meant that the creation of new knowledge has become a global project: common challenges are addressed through inter- and transdisciplinary research teams that work together to combine perspectives and often massive data-sets from both developed and developing economies to find innovative solutions. Globally, this is also where the most significant funding opportunities are, requiring a partnership-based, interdisciplinary and problem-focused approach. Such collaborative projects not only ensure the global competitiveness of research itself, but also provide the best training ground for postgraduate students. Embedded into such partnerships, students gain entry into international communities of scholars on which their ongoing development can depend.

AFRICAN ALLIANCES

Our most important partnerships, however, remain those in Africa, and we have long striven to network more closely with strong research universities on our continent. This imperative was made real with the recent formation of the African Research Universities Alliance (ARUA) and the Global Partnerships Project.

Universities in Africa have in recent decades experienced massive increases in enrolments. However, the rate at which public funding has been made available has not matched these increases. As a result, research from sub-Saharan Africa lags behind that from both developed and developing regions elsewhere on the globe. This has serious implications for our contributions to global knowledge systems, as well as our ability to shape our own economic and social destinies. In other countries, such as Australia, self-differentiating subsets of universities have formed themselves into networks to promote the strengthening of research in the higher education system and in the country or continent. They clearly recognise that universities are essential for a country or continent's economic success.

The move towards an African Research Universities Alliance was informed by these global factors, but also a number of challenges that are felt by African universities in particular. The complex economic, social and development problems of the continent today cannot be addressed by institutions working in isolation. There is also a need for Africa to boost its internal research capacity to address transnational public policy and developmental strategies. Africa's success in the global knowledge economy depends on competing in the innovation and technology stakes driven by research institutions. This, in turn, depends on training PhD graduates locally. We therefore need to develop universities that can retain the best students. Lastly, there is a need to recognise that Africa must share its skills, equipment and resources to compete effectively with the global north.

Strong research universities must therefore form a core that supports centres of excellence in many other universities on the continent. They will do this through advocacy for research, joint research projects, postgraduate training, providing access to research facilities, and linkages to research universities globally.

Af r icAn r eseAr ch Univer sit ies Al l iAn c e (Ar UA)

ARUA, a partnership of research universities in Africa, was launched in early 2015 as a response to the growing challenges faced by African universities. The alliance will form a hub that supports centres of excellence in many other universities across the continent. The focus is on building indigenous research excellence to enable the continent to take control of its future and assert itself as a powerful global force.

Ar UA u□□□□□□□□□□□□

Ghana South Africa

ARUA's primary focus is to build indigenous research excellence, which is vital if the continent is to take control of its future and assert itself as a powerful global force.

The binding factor among the members of the alliance is a commitment to the value of partnership. Research infrastructure – equipment and people – at each of the alliance universities is not strong enough on its own; together, it could be. The driving force is therefore the will to share resources, draw on complementary strengths and jointly train the next generation of African academics.

THREE-WAY PARTNERSHIPS

ARUA will form a crucial part of another pillar of our research strategy. Launched in 2014, the three-way Global Partnerships Project builds on productive, existing research collaborations and strengthens them with executive-level agreements, mobility funds and three-way PhD bursary packages. This achieves a triangular relationship between UCT, a partner in the global north and another from the global south (most likely institutions in Africa, Latin America and China). The project will not only strengthen internationalisation, and thereby increase the visibility and impact of UCT's research; it will also provide co-supervision resources for joint degrees, enhance the student experience and help to leverage third-party research funding through collaborative bids. An attractive aspect of the partnership is the embedding of postgraduate students or postdoctoral fellows in the project, so that they become part of an international community of scholars, which adds considerable value beyond that of the research training itself.

HISTORIC SA-SWISS INITIATIVES

In June 2015, UCT and the Swiss Tropical Institute/ University of Basel launched an historic South African-Swiss Bilateral Research Chair, aimed at advancing the voices of African experts in global environmental health research.

This is the first time in South Africa that another country has been involved in co-founding a research chair under the umbrella of the Department of Science and Technology/National Research Foundation SA Research Chairs Initiative (SARChI).

In addition to this, UCT and the University of Basel have collaborated to establish a new Institute for Urban and Landscape Studies at the University of Basel. This is a completely new programme in urban studies with a mission to educate postgraduates in this field. The focus will be on Africa and the partnership with the African Centre for Cities (ACC) at UCT is a key structural feature.

WOr l DWiDe Univer sit ies net WOr K (WUn)

AUstrAliA AfricA Universities net WOrK (AAUn)

AUstrAliA
- Curtin University
- Grif¿th University
- Monash University
- Murdoch University
- The University of Melbourne
- The University of Newcastle
- The University of Sydney
- The University of Western Australia
- The University of Wollongong

AfricA
- Makerere University
- University of Cape Town
- University of Ghana
- University of Ibadan
- University of Malawi
- University of Mauritius
- University of Nairobi
- University of Pretoria
- University of Zambia

WORLDWIDE UNIVERSITIES NETWORK

The Worldwide Universities Network (WUN) is a leading global higher education and research network made up of 19 universities across the globe. Together they work to drive international research collaboration and address issues of global significance.

WUN is the most active global higher education and research network with 90 active research initiatives, engaging over 2,000 researchers and students collaborating on a diverse range of projects. These initiatives are committed to addressing some of the world's most urgent challenges and are supported by prolific partners such as the United Nations Foundation, the World Bank, the Organisation for Economic Co-operation and Development, and the World Health Organisation.

their work. UCT has been an active WUN member through establishing a number of high-impact research collaborations.

AUSTRALIA AFRICA UNIVERSITIES NETWORK

The AAUN is a group of leading universities in Australia and Africa, connecting researchers and academics through institutional partnerships in order to address challenges facing both continents. The objectives of the network are to develop institutional research partnerships to address issues facing both continents, to develop capacity-building and training programmes – for example in governance, public-sector reform, education, mining, agriculture and health – and to produce innovative policy solutions through position papers with key academics, non-government organisations, business and political representatives.

Partnerships – across the continent and the world – are

A SNAPSHOT
OF RESEARCH AT UCT

Our vision

UCT aspires to become a premier academic meeting point between South Africa, the rest of Africa and the world. Taking advantage of expanding global networks and our distinct vantage point in Africa, we are committed, through innovative research and scholarship, to grapple with the key issues of our natural and social worlds. We are committed both to protecting and encouraging 'curiosity driven research' and research that has a real impact on our communities and environment.

2014 WOr l D Univer sit y r AnKing s

1 in Af r icA

- 124 Times Higher Education
- **141** Quacquarelli Symonds
- **Top** 300 Shanghai Jiao Tong

t OP 10 Br ics n At iOn s (2014)

- Quacquarelli Symonds (9=)
- Times Higher Education (4=)

sUBj ect Ar eA

Times Higher Education 2014-15

t OP 50

- Clinical, pre-clinical and health (48) 1 A a

t OP 100

- Arts and humanities (80) 1 A a
- Life sciences (68) 1 A a
- Social sciences (52) 1 A a

Quacquarelli Symonds 2014

t OP 50

- Education (32)
- Geography (34)
- Law (40)

Research income

1
Bil l iOn (ZAr)
in external research income in 2014

IN 2014
UCT received more funding in direct grants from the US National Institutes of Health (NIH) than any other research institution outside the US

t Ot Al Acc r eDit eD PUBl ic At iOn s

2011	2012	2013
2 516	2 640	2 873

NRF-rated

The National Research Foundation allocates ratings based on a researcher's recent research outputs and impact, as perceived by international peer reviewers.

Nationally, UCT has more NRF-rated researchers (15 percent) than any other university in

A-rated

A-rated researchers are international leaders in their field.

A third of the country's A-rated researchers are at UCT.

Dst /nrf sArc ic a

Department of Science and Technology/National Research Foundation South African Research Chairs are designed to strengthen the ability of the country's universities to produce high-quality research, innovation and students.

Over a fifth of the country's SARChI Chairs are held

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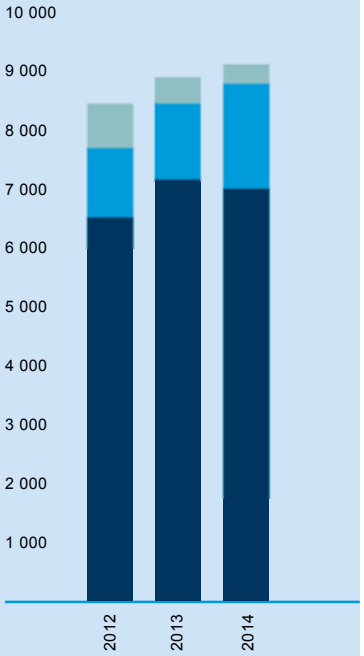


International: rest of the world

International: rest of Africa

South African

POst DOc t Or Al f el l OWs

2014 INNOVATION
DASHBOARD

research

2 113
Research contracts signed
(2013: 1719 research contracts)

R 1.18
billion
Research contract value
(2013: R978 million)

R 1.23
billion
Total research income
(2013: R957 million)

R 684
million
Value of foreign research contracts signed
(2013: R644 million)

R 496
million
Value of local research contracts signed
(2013: R344 million)

1549.12
Publications in 2013
(2012: 1390.89)

intellectual property (IP) protection

41
Invention disclosures

88
Patent applications

16
Patents granted

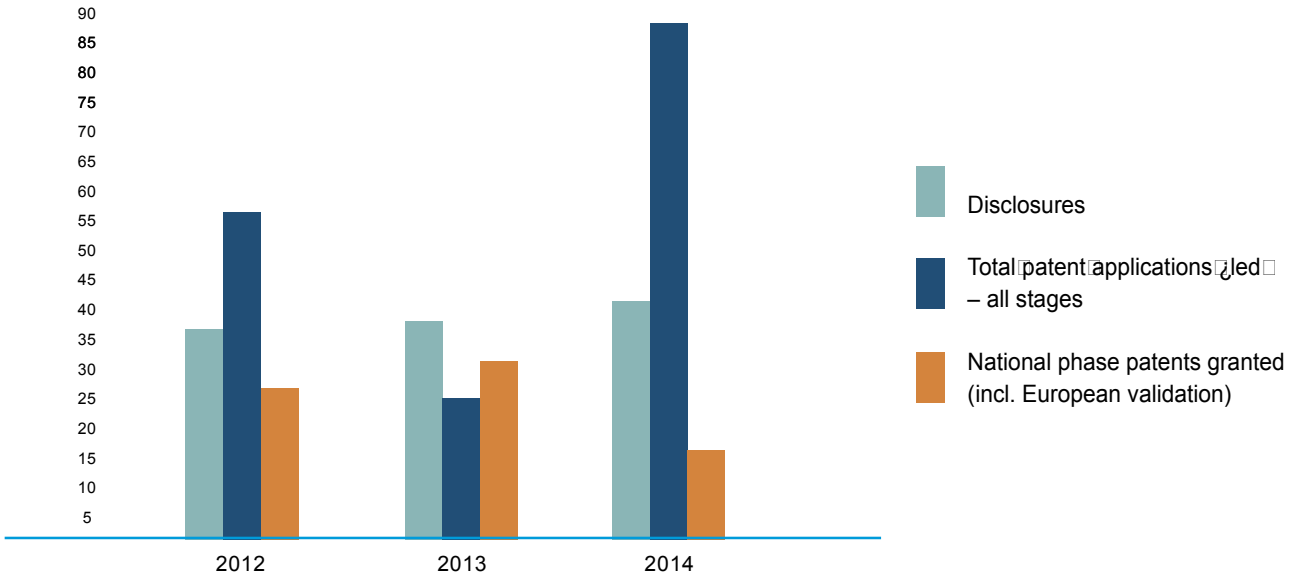
innovation

39

19

3

AnnUAl Uct PAtent POrtf Ol iO st At ist ics



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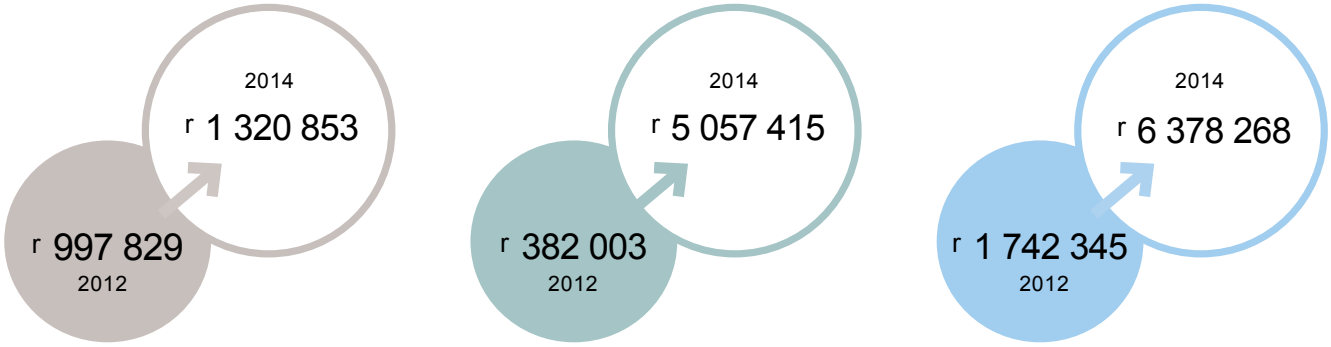

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Sale of IP

Total

OVERVIEW

OF SOME KEY RESEARCH AREAS AT UCT

In its drive to expand and enhance its contribution to South Africa's development challenges and indigenous knowledge base, UCT provides focused support to areas of research that address these critical challenges.

Urban Africa

In South Africa, more than 63 percent of the population already live in urban centres. Rapid urbanisation raises issues of adequate food supply, affordable shelter, employment opportunities, water and waste management, environmental degradation and climate change. Achieving well-governed and sustainable cities is becoming increasingly important to the future health of the planet. The African Centre for Cities (ACC) at UCT is an interdisciplinary research and teaching programme that seeks to facilitate critical urban research and policy discourses for the promotion of vibrant, democratic and sustainable urban development in the global South from an African perspective.

Water for socio-economic development

In the context of rapid urbanisation and climate change, water security and consumption are extremely important issues to address. UCT gives focused attention to these areas through its wastewater treatment research in order to develop innovative solutions to enhancing and improving wastewater treatment. Studies conducted at UCT also seek solutions to ensure that the quality and access to water is maintained.

Mining

South Africa's economic growth is dependent on the efficiency and sustainability of its mining industry. Mining research at UCT explores ways to address these challenges and also investigates the role of policy and law in South African mining. Here, the focus has primarily been on the competing demands of nationalisation and private ownership of the country's natural resources and how it has had an impact on relations between government

Climate and development

The African Climate and Development Initiative (ACDI) conducts interdisciplinary, innovative research across a wide range of disciplines to inform its teachings. This initiative brings together academics with NGOs, business and government in a knowledge factory that co-produces and tests new insights, evidence and innovations that will help to solve Africa's climate and development challenges.

Poverty and inequality

South Africa is a country with enormous untapped potential but it also has a history of oppression and unevenly shared development. Twenty years into the post-apartheid period, high levels of poverty and inequality persist. Through its Poverty and Inequality Initiative (PII), UCT aims to provide solutions for tackling these challenges. This initiative has become a national venture and works on cross-cutting themes that have been identified as key issues in tackling the

Preserving our African heritage

Globalisation presents many challenges involved in preserving Africa's identity. It is the topic of ongoing debate; however, one thing remains clear: during this time of rapid development, it is essential that Africans are empowered to shape their own identity. Since narrative shapes identity, UCT supports a variety of projects that give voice to the different histories of South Africa and the continent. In this way, UCT aims to contribute to a process of respect, growth and healing.

Data-intensive research

With UCT's close proximity to MeerKAT and the Square Kilometre Array (SKA) – an international enterprise to build the largest and most sensitive radio telescope in the world – it is rapidly becoming a hub for astronomical and astrophysics research in Africa. In order to address the shortage of skills required for dealing with this emerging field of research, UCT – in collaboration with the University of the Western Cape – is taking the lead in creating the framework to introduce African researchers to research-intensive data and turn it into actionable knowledge. While astronomy and astrophysics are the main focus areas for developing and transferring these skills, other areas such as bioinformatics and statistical sciences will be included.

Infectious diseases and molecular medicine

At a time when increasing attention is focused on many of the emerging infections and re-emerging infectious diseases, the work at the UCT Institute of Infectious Disease and Molecular Medicine (IDM) is crucial. It has become a major training hub for Africa for the development of independent researchers. Research in the IDM focuses on infectious diseases, particularly HIV/AIDS and TB; non-communicable diseases, such as cancers; and genetic medicine and molecular medicine, including drug discovery.

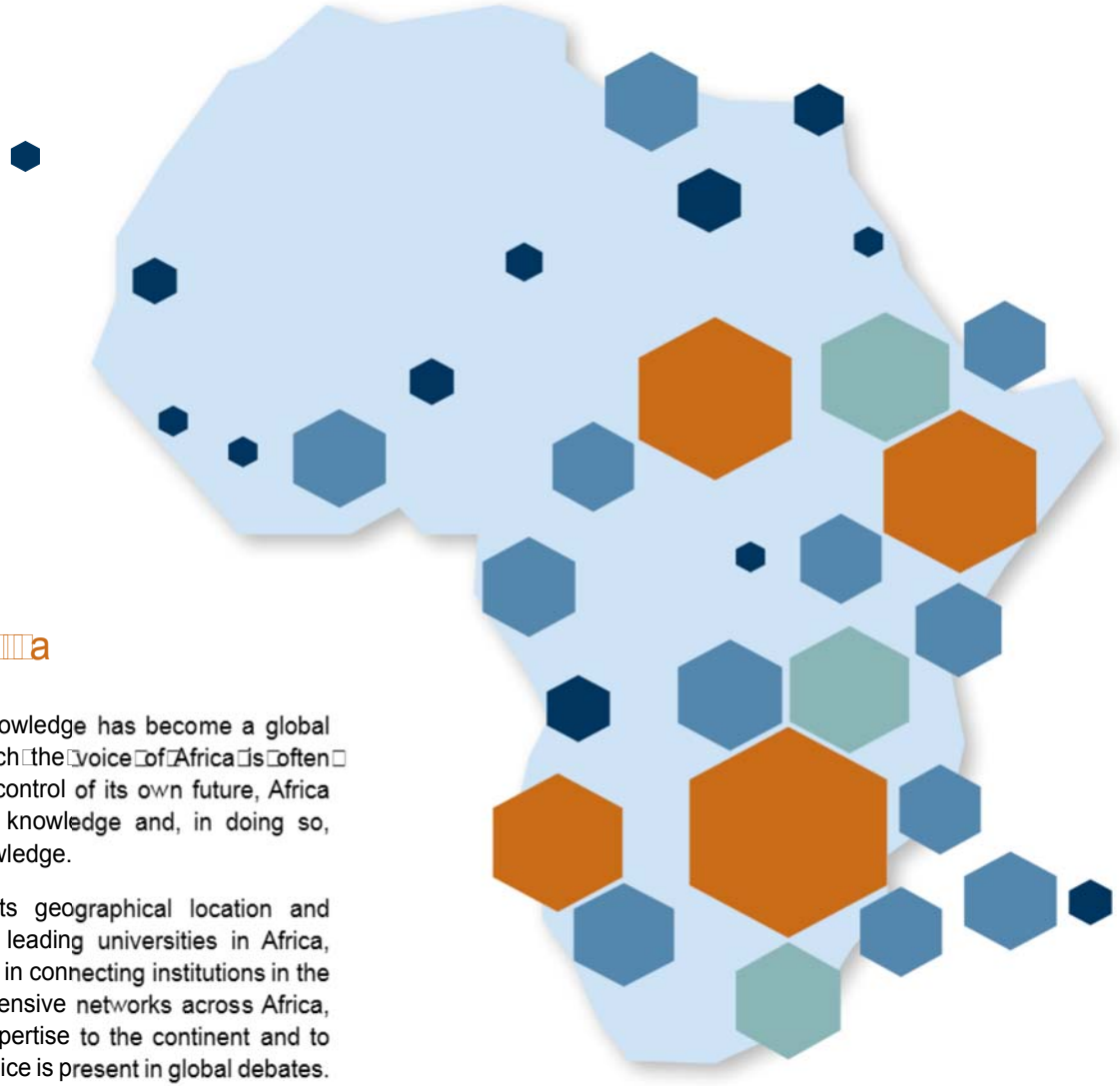
Drug discovery

The Drug Discovery and Development Centre (H3-D) at UCT was established to close the gap that exists between the institution's research – from basic science and clinical studies – and the development of new medicines. By adopting a multidisciplinary approach and the use of modern technology platforms, the H3-D has become the leading drug-discovery organisation on the African continent. It focuses on developing drugs targeted for treatment of both communicable and non-communicable diseases. It has been particularly active in malaria and tuberculosis drug discovery. The centre is also committed to training a new generation of African scientists with the key skills needed for integrated drug discovery and development.

Medical humanities

Through the introduction of an inter-disciplinary understanding of health and medicine in Africa, UCT seeks to provide medical practitioners with a more holistic view of healthcare and thus a better patient experience. Medical humanities reframes medical studies in a way that integrates critical philosophy, history, literature, art and political sociology. In doing so, UCT seeks to reimagine the way in which medical studies have traditionally been taught.

A SNAPSHOT
OF RESEARCH IN AFRICA



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The creation of new knowledge has become a global project, □but □one □in □which □the □voice □of □Africa □is □often □ missing. If it is to take control of its own future, Africa must generate its own knowledge and, in doing so, contribute to global knowledge.

Taking advantage of its geographical location and position as one of the leading universities in Africa, UCT can play a vital role in connecting institutions in the global north with its extensive networks across Africa, to draw international expertise to the continent and to ensure that an African voice is present in global debates.

The □three-way □Global □Partnership □Project, □launched □in □ 2014, is one way in which these aims will be realised. The

POst g r ADUAt e st UDent s f r OM t h e r est Of Af r icA c Ur r ent l y At Uct

r □□a□□ across Africa

UCT's research is centred on and grounded in Africa. We are committed to the mission of enabling Africa to solve our own, □Africa-speci¿c □problems. □To □achieve □this, □many □of □our □researchers □have □established □extensive □networks □across □Africa. □Here □are □just □a □few.

8
African partners

1
International partner

Human Heredity Health in Africa (H3Africa)

Despite both the high disease burden and genetic diversity on the continent, genomic research is limited in Africa. H3Africa seeks to: increase the number of African scientists in □genomics □and □population-based research; establish collaborative networks of African investigators; and grow the infrastructure to facilitate genomics research across the continent.

7
African partners

Heart of Africa Study

The Heart of Africa Study consists of a number of collaborative □projects □that □examine the emergence of heart disease in African communities. □The □project's □origin lies in the Heart of Soweto □project, □which □investigated the prevalence, presentation and management of cardiac disease in an urban African population.

36
African partners

130 000
African citizens surveyed

Afrobarometer

The Afrobarometer is an African-led, □non-partisan □research network that conducts regular public attitude surveys on democracy, governance and wellbeing in Africa. Five rounds of surveys with more than □130 □000 □African □citizens □in □36 African countries have been conducted. The data will soon be used to contribute to the Index of African Governance compiled by the Mo Ibrahim Foundation.

7
African partners

3
International partners

Hungry Cities Research Programme

This □¿ve-year □international □research programme comprises a comparative multi-city □inquiry □to □promote □inclusive growth in the informal food sector. It is led from the African Centre for Cities (ACC) and aims to create enabling policy environments and support for entrepreneurship, as well as decent formal and informal employment.

12
African partners

The African Mining Legislation Atlas (AMLA)

The AMLA is an initiative of the Mineral Law in Africa (MLiA)

7
African partners

3
International partners

Adaptation □at □Scale □in □Semi-Arid Regions (ASSAR)

The □semi-arid □regions □of □Africa and Asia are particularly

9
African partners

10
International partners

Square □Kilometre □Array □(SKA)

The □SKA □project □is □an □international effort to build

7
African partners

3
International partners

The TomboUCTou Manuscripts □Project

This □project □researches □and documents manuscript

Developing capacity □□ A □□□□a

There is a need in Africa to increase its research capacity so that it can hold its own in the global knowledge economy and solve its own, Africa-specific problems. UCT is host to a number of programmes that address this need.

Carnegie Project: Growing the Next Generation of Academics for Africa

This extensive programme runs at UCT, the University of the Witwatersrand, Makerere University (Uganda) and the University of Ghana and aims to train a demographically diverse community of academics.

44 Carnegie scholars hosted at UCT in 2014:

- 32 postgraduate students, 12 postdoctoral fellows
- 37 black, 7 white
- 31 from the rest of Africa, 13 from South Africa

LSE–Africa Consortium

In 2013 and 2014, the London School of Economics and UCT have run an intensive two-week summer school at UCT on social issues in the 21st century, with specific relevance to Africa's role in the global world.

144 students from Africa, Asia, Europe and America have attended the courses

MasterCard Foundation Scholars Program

The MasterCard Foundation (MCF) Scholars Program allows UCT to seek out, recruit, educate and mentor talented students from economically disadvantaged backgrounds in Africa.

300 students will enroll at UCT over 10 years:

- 60 undergraduates and 240 postgraduates

H3ABioNet

H3ABioNet is a Pan-African Bioinformatics network, led by Professor Nicky Mulder at the Computational Biology Group, that supports H3Africa researchers and their projects while developing bioinformatics capacity within Africa.

- **34** research groups
- **15** African countries
- **416** participants trained at workshops across Africa

The Africa Regional International Staff/Student Exchange (ARISE)

ARISE aims to increase access to quality education in Africa, the Caribbean and the Paci¿c (the ACP regions), promoting postgraduate studies, student retention in the region and staff mobility, while increasing the competitiveness and attractiveness of the institutions themselves.

ARISE will offer **100** mobility opportunities

Structured Training for African Researchers (st Ar s)

Universities Science, Humanities, Law and Engineering Partnerships in Africa

POSTDOCTORAL
PERSPECTIVES

Dr Rebecca Tadokera
Institute of Infectious Disease and Molecular Medicine

"TB treatment response: searching for biomarkers in urine"

Despite intensive research efforts in recent years, TB remains a major public health problem worldwide. South Africa has one of the highest rates of TB in the world. The current six-month directly observed TB treatment has no way of assessing whether or not patients are responding to treatment. It is for these reasons that Dr Rebecca Tadokera, decided to focus her research on the potential role of urinary lipids (fat molecules in urine) in assessing whether or not TB patients are responding to treatment.

"There is no sure way of knowing if patients are responding to treatment," she explains. "Such markers could therefore facilitate shortened TB treatment and could also be useful in assessing the ef□cacy of new drugs coming onto the market".

Dr Alexandra Müller
School of Public Health and Family Medicine

"Facing homophobia in health care"

Dr Alexandra Müller is a quali□ed physician and holds a PhD equivalent in medical sociology. Her current research explores the experiences of gay, lesbian, bisexual, transgender and intersex (LGBTI) people in the South

Dr Sheena Shah
Centre for African Language Diversity, Linguistics Section

"N|uu language documentation and revitalisation"

With only three known remaining speakers, all in their eighties, N|uu is the most endangered still-spoken language of Southern Africa. N|uu is the last related language to the extinct |Xam language, which features prominently on the South African coat of arms. Dr Sheena Shah, director of the N|uu Language Project, works to collect and compile N|uu language data from previous and ongoing linguistic research. The team also supports efforts to revitalise N|uu in the community.

"Documenting an endangered language such as N|uu is not only of the greatest value for linguistic research," says Shah, "but also of cultural importance for |Khomani community members and of historical signi□cance for South Africa."

Dr Memory Biwa
Department of Social Anthropology, Archives and Public Culture Research Initiative

"Afterlives of genocide in Namibia"

In the years 1903 to 1908, Namibia, then the German colony of South-West Africa, witnessed a war in the central and southern parts of the country that resulted in a genocide carried out by the German government, widely considered to be the first genocide of the 20th century. Dr Memory Biwa's research looks at the discourses of memory around this history of colonialism, war and genocide in southern Namibia.

Her research focus is on the case of the bodies exported to Germany during the war and the repatriation processes of those bodies between 2011 and 2014. "This process," says Biwa, "sparked debates and discussion around legacies of colonialism and genocide, particularly on how and why this history was silenced and how it has re-emerged in the public discourse at different moments, both in Namibia and Germany."

Dr Emma Rocke
Biological Sciences

"Understanding the effects of climate change on the marine microbial food web"

Dr Emma Rocke grew up in the Canadian countryside, surrounded by pristine lakes and natural beauty. During her own lifetime, however, she has witnessed the deterioration of the quality of these lakes due to a process called eutrophication, which is when a high level of nutrients enters the water system (often due to fertilisers used in nearby farming), causing excessive algae. This prompted her to dedicate her research to this process of eutrophication and its effect on ecosystems. "Marine microbes are responsible for fixing up to 50 percent of the world's carbon," explains Rocke. "So understanding how this community of species is changing in the face of climate change and eutrophication is critical."

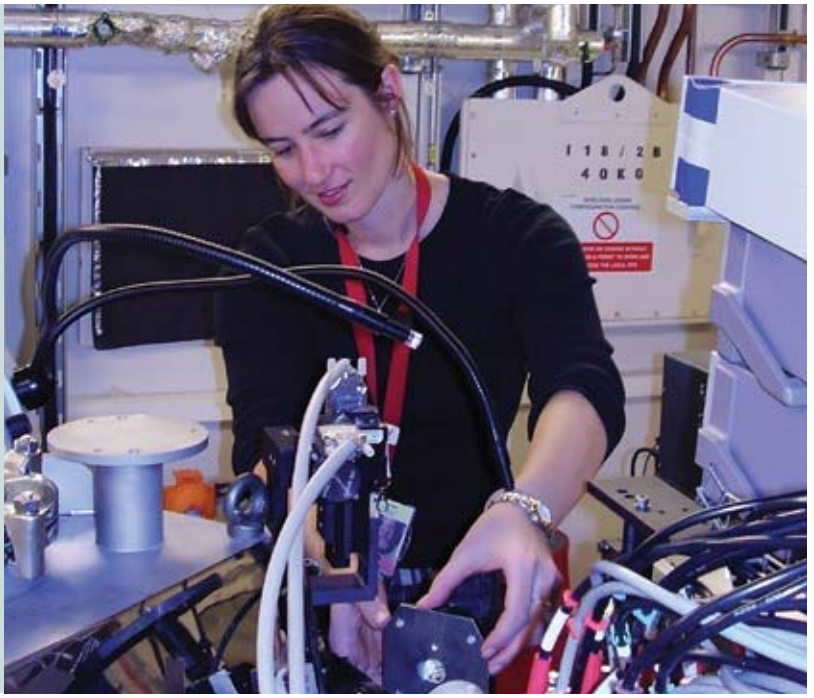
As part of her research, Rocke collects and analyses seawater from the southern Benguela current to better understand the impact of phenomena such as climate change on food web dynamics.

Dr Issufo Halo
Department of Oceanography, Nansen-Tutu Centre for Marine Environmental

Dr Patricia Doyle
Department of Geological Sciences

"Investigating the birth of our solar system"

The universe is filled with patterns, from the electronic transitions of the atomic clock that help us to schedule our day to the layering of majestic cliffs of Table Mountain. But within those patterns lie valuable insights into the makeup of our world and even our universe. Dr Patricia Doyle uses special analytical techniques to study the chemical components of rocks and minerals. This offers insights into early solar system processes. "For example," she explains, "measurements of a mineral formed on primitive asteroids has revealed that liquid water was present on those bodies a few million years after the solar system formed." Doyle chose to be based at UCT, as analytical capability has traditionally been a strength here. Indeed, in the early 1970s, the Geochemistry Department had one of the few laboratories entrusted with samples returned to the Earth from the NASA missions to the Moon.



Dr Marcel Tongo Passo
Division of Immunology

"The origins and evolution of HIV"

Globally, an estimated 35 million people are living with HIV/AIDS and about 39 million have died from the virus. Yet little is known about the early history of the HIV pandemic. Dr Marcel Tongo Passo is looking

Dr Nashied Peton
Institute of Infectious Disease and Molecular Medicine

"Understanding the role of vitamin D and the drug Phenylbutyrate (PBA) in combating TB and HIV"

Numerous studies have reported that TB is associated with a vitamin D deficiency, and even more so when co-infected with HIV. The exact mechanism by which vitamin D may help prevent TB and HIV progression remains controversial. Recent studies have also shown that the drug 4-Phenylbutyrate (PBA) enhances the immune system's response to controlling the TB infection. Dr Nashied Peton is therefore investigating the combined use of vitamin D and the drug PBA as adjunctive therapy, to see if they are effective against both the TB and HIV pathogens. "This work is significant," explains Peton, "because we are in desperate need of new therapies to reduce treatment time and improve recovery for those co-infected with TB and HIV."

POSTGRADUATES
FOR AFRICA

1 ICT as a tool for development

Maletsabisa Tsabi Molapo (Lesotho) *

(PhD, Computer Science)

Maletsabisa Molapo specialises in the use of information and communication technologies (ICT) for development. Her PhD research explores how the training of community health workers and the health education of rural communities in Lesotho can be improved through a multimedia learning platform that supports the local creation, distribution and consumption of digital health content.

* 2014 WOMen in science AWAr D Winner *

2 The impact of drug resistant E. coli bacteria at the Red Cross War Memorial Children's Hospital in CapeTown

Omb□□a O□□□□Ma□a□d□ (K□□□a)

(MPhil, Paediatrics and Child Health)

Malande's research focus is the prevalence of drug-resistant E. coli at the Red Cross War Memorial Children's Hospital. This is important to understand, as bacteria can share information and genetic material. Therefore any emergence of these drug-resistant bacteria must be documented and addressed in order to minimise the impact across Africa, and in fact globally.

3 Investigating strategies to lower the cost of producing environmentally friendly biodegradable plastics

Shilpa Rumjeet (Mau□□□u□)

(Master's, Chemical Engineering)

As part of the country's attempt to reduce the global emission of greenhouse gases and slow the effects of global warming, the Mauritian

4 Benefits of genomic research in Africa: a qua□□a□□□□ □□ud□

Syntia Nchangwi (Cameroon)

(Master's, Medicine)

Genomic research has proved a game changer in the health sciences, with huge potential to improve global health. It is important that Africa, as the continent with the highest disease burden, joins the genomic revolution. Nchangwi's research will focus on the practical problems faced in this ¿eld in Africa, in the hope that the results of the study will inform best practice to ensure equity, fairness and justice in genomic research.

5 Mining crime data for safer, smarter cities

Omowunmi Isafiade (n□□□□a) *

(PhD, Computer Science)

Omowumni Isa¿ade is working to create 'smart cities' across the African continent. A smart city is based on the idea that information and communication technology can improve citizens' wellbeing. Isa¿ade's research uses statistical techniques in order to mine crime data. "For example, we were able to actually highlight the locations of hotspots where crime is more prevalent," says Isa¿ade. "... safety is a key issue, because it's only when a city is safe that it can actually be smart – my research is on the public-safety approach to the idea of the smart city."

* 2014 L'OREAL UNESCO WOMEN IN SCIENCE FELLOW *

6 ICT, the Somali diaspora and the stabilisation of a failed state

Mohamed Elmi (Somalia)

(PhD, Information Systems)

Embroiled in a decades-long civil war, Somalia

7 Investigation of the applicability of a cleaner production approach to informal catering

□□u□ba□A□□□a

Rissa Niyobuhungiro (Rwanda)

(PhD, Chemical Engineering)

Informal trading is a major source of provisioning for poor households across Africa and forms a vital part of any emerging economy. However, informal catering is also a high source of pollution, including solid waste and air pollution through wood fires. Niyobuhungiro's research focuses on Nyanga in Cape Town. Her research includes pollution prevention strategies and how a cleaner production approach can be applied in the informal sector.

8 Working towards personalised medicine for b□□a□□□a□□□□□□a□m□□□

Horacia Naidoo (South Africa)

(PhD, Human Genetics)

9 Trials in the age of new media – a study of the Oscar Pistorius saga

c□a□□l □□d□ **(South Africa)**

(PhD, Languages and Literature)

The murder trial of paralympian athlete Oscar Pistorius captured the attention of the global media. PhD student Charl Linde's research examines media representations of the Oscar Pistorius trial. "The trial laid bare many important issues in South African society, such as patriarchy, violence, money, power, celebrity, justice and the role of the media. My PhD project comprises a collection of essays that broadly focus on these issues, how they intersect, and how they were presented by the media," says Linde.

10 Using hair as a biomarker in medical testing

Kwezikazi Mkentane (South Africa) *

(PhD, Medicine)

Kwezikazi Mkentane has collaborated on a range of research by the Division of Dermatology. This includes a study that showed evidence of bleeding in the locally popular clean-shaven haircut called the chiskop. Her PhD research aims to holistically characterise human scalp hair by using geometric, biochemical, ultra-structural and genetic approaches. This is crucial in establishing the characteristics of 'normal' hair, given the increasing use of hair as a testing substrate for drugs, forensics and medical purposes.

* 2014 WOMen in science AWAr D Winner *

11 The position of women and children in Zimbabwe's inheritance law

s a□d□a Ka□□□□ka **(Zimbabwe)**

(LLM, Private Law)

LEADERS IN SCIENCE

Women are still under-represented in the Àeld of science and technology. The Minister of **Science and Technology has urged South Africa to be innovative in encouraging girls and women to take up careers in science. Here are a few of the women scientists at UCT who** have been recognised for their contribution to scientiÀc research in the past year.

Dr Tolu Oni

Physician/epidemiologist Dr Tolu Oni has been awarded the Next Einstein Forum (NEF) Fellowship. The NEF Fellowship is a flagship programme of the Next Einstein Forum (NEF), which unites more than 500 outstanding thinkers and distinguished stakeholders from around the world in Africa. Dr Oni's broad research focus is on population health transition; and her current research activities include the investigation of the spatial and temporal epidemiology, and health-systems impact, of the interaction between HIV, TB, and also emerging non-communicable diseases such as type 2 diabetes in South Africa.

Professor Heather Zar

Paediatric pulmonologist Professor Heather Zar received the 2014 World Lung Health Award – given out every year by the American Thoracic Society – in recognition of work that has "the potential to eliminate gender, racial, ethnic, or economic health disparities worldwide". This is the first time that the award has been given to someone from Africa and someone specialising in childhood health.

"This award was given to me, but it reflects a lot of work done by a lot of people, and strong collaborations with excellent colleagues," says Zar, head of the Department of Paediatrics and Child Health at the Red Cross War Memorial Children's Hospital. "My hope is that it helps shine a spotlight on this relatively under-resourced area of research. Children are so seldom prioritised on the health agenda. There's a lack of knowledge about the burden of childhood illnesses – even though children make up 37 percent of the population in South Africa, and 50 to 60 percent in other African countries."

After finishing her postgraduate training in the United States, specialising in paediatric pulmonology, Zar returned home and applied for the only available position at Red Cross – as a medical officer. "Day after day, I saw children and mothers coming for asthma, and they were being given oral treatment, theophylline," recalls Zar, "which is really not great and has lots of side-effects.

However, asthma spacers [the chamber you attach to an asthma inhaler, allowing children to breathe in their medication more easily over a number of breaths] were too expensive, and the hospital couldn't afford it. That's how I got started, thinking about a homemade spacer."

Zar and her team pioneered the use of what others might think of as waste: an empty 500 ml plastic cold-drink bottle. "It's a good example of using the sophisticated resources of institutions like these [UCT and the Red Cross War Memorial Children's Hospital] to improve care, to do something that is low-cost and impactful on child health." Thanks to their low-budget solution and rigorous testing, theophylline and its side-effects are a thing of the past, and the use of cold-drink bottles as asthma spacers is now included in guidelines from the Global Initiative for Asthma and the World Health Organisation.

Zar was awarded a Medical Research Council Extramural Research Unit in December 2014. This award allows her to further develop her research on childhood respiratory disease.

Dr Keren Middelkoop

The Academy of Science of South Africa (ASSAf), on behalf of

is the ability to provide a link between the laboratory and clinical worlds: combining her clinical background, extensive research experience, public health training, and good grasp of the laboratory component of molecular epidemiology to help meld the disciplines to provide a comprehensive approach to these dual public health problems".

Prior to winning this national award, Middelkoop won the 2010 UCT Best Publication in Public Health Prize and the Ethne Jacke Prize for the best Master of Public Health dissertation in 2013. She was also the 2011 International Union against TB and Lung Disease's Young Investigator of the Year.

Professor Genevieve Langdon

Professor Genevieve Langdon of the Department of Mechanical Engineering was recently presented with one of the highest awards in South Africa for original scientific research – a silver medal from the Southern African Association for the Advancement of Science. Langdon studies how structures such as aircraft, train stations and landmine-protected vehicles respond to the high temperatures and high pressure of explosions, which could occur due to terrorism, landmine

across the globe. It's a very challenging and exciting field to work in, and one that I really enjoy. After all, blowing things up for a living is a pretty cool way to spend the day, especially when I'm doing it to try to make the world a safer place."

At the age of 36, Professor Langdon has co-authored more than 50 journal articles, five book chapters and numerous conference papers. She is well recognised internationally and is also involved nationally in South African science, as a founder member of the South African Young Academy of Science.

Associate Professor Coleen Moloney

Coleen Moloney is the first woman marine scientist to win the Gilchrist medal in 27 years. The South African Network for Coastal and Oceanic Research awards it triennially. The medal recognises her research into the variability of marine food webs and ecosystems under global change. This includes the impact of climate change and the influences of fishing and pollution on marine systems. These research areas relate to the development and use of computer models in marine systems, which cover a range of living marine organisms, from microbes to top predators. "These systems help us understand how energy

to face. I'm frustrated by poor and poorly informed leadership that is making little impact in tackling large environmental and, ultimately social issues, especially related to climate change, but also to sustainability of the Earth's limited resources."

The Gilchrist Memorial Medal was awarded to Moloney at the 15th South African Marine Science Symposium. Professor Mark Gibbons, head of biodiversity and conservation biology, University of the Western Cape, was joint winner. The friends graduated from UCT (PhD) in 1988.

Professor Jill Farrant

Professor Jill Farrant of the Department of Molecular and Cellular Biology is this year's recipient of the Erna Hamburger prize. This is awarded by the EPFL (Swiss Federal Institute of Technology) WISH Foundation (Women in Science and Humanities) to leading women in science, engineering and architecture worldwide.

It is predicted that much of Africa will be rendered a desert by 2060 owing to the predicted effects of climate change. An NRF A-Rated researcher, Farrant is a leader in the field of plant responses to water-deficit stress (drought/desiccation tolerance), receiving international recognition for her research. Her research encompasses physiology, biochemistry and molecular biology, and focuses on several different species of the resurrection plant, making comparisons among them. In 2007, after serving as head of the Molecular and Cell Biology Department for the previous three years, she was awarded the research chair of plant physiology and molecular biology. She also currently serves on the scientific board of the Agropolis Foundation, Montpellier, France, and the TWAS Award Committee, and is the panel chair of the ASSAf Committee assessing biosafety and biosecurity in South Africa.

NSTF AWARDS

UCT AWARD WINNERS

Four UCT researchers and innovators were recognised for their great work and contribution to South African society at the 17th annual National Science and Technology Forum (NSTF) Awards, in partnership with South32. 2015 is the UNESCO International Year of Light and Light Technologies, and this was the theme of this year's NSTF Awards, with a special focus on light and optical technologies in our lives.

Professor Jennifer Jelsma, of the Department of Health and Rehabilitation Sciences, was honoured in the research capacity development category. Jelsma, one of the first physiotherapists in South Africa to obtain her PhD, has been at the forefront of developing a culture of research in the rehabilitation sciences. Jelsma's work includes developing postgraduate courses and running research workshops in South Africa, Africa and Europe. She has also supervised or co-supervised 23 master's students and seven PhD students to completion.

Ms Khilona Radia, of the UCT spin-out company, Antrum Biotech, was awarded the prize for research leading to innovation. Antrum Biotech developed an accurate rapid test for extra-pulmonary tuberculosis (TB that occurs outside the lungs). While diagnostics for conventional TB through DNA-based sputum tests are very effective, this is not the case in extra-pulmonary TB. The technology developed by Antrum Biotech fills an unmet need in TB diagnostics and will save lives as well as healthcare costs.

Professor Dan Stein, head of the Department of Psychiatry and Mental Health, and director of the Brain and Behaviour Initiative and of the MRC Unit on Anxiety and Stress Disorders, was awarded the TW Kambule Award for research. Stein's research ranges from laboratory research on animal models

GROUNDBREAKING CLINICAL TRIAL

SETTLES QUESTION ON TREATMENT OF TB PERICARDITIS

A large-scale clinical trial of the use of steroids in treating TB pericarditis was already halfway through before it found funding. Even then, it was

The Investigation of the Management of Pericarditis (IMPI) trial found that the prescription of steroids to patients with TB pericarditis – a dangerous form of TB that can cause fluid build-up and compression of the heart, and kills a quarter of those who contract it – made no difference to their eventual mortality

the use of steroids, and some were not. "When you were on intake, whether you – the trainee – gave the patient steroids depended on who the specialist was the next day. I reasoned that surely, if steroids worked, that should not depend on the whim of the specialist who was on call."

However, IMPI settles the question. It is the first multi-national trial on TB pericarditis, and the largest trial of corticosteroids in HIV-associated TB. "Findings from the study suggest it may be reasonable to add steroids to regular treatment in TB pericarditis patients who don't have HIV infection, to prevent constriction and reduce hospitalisation; but this strategy should be avoided in HIV-infected individuals, because of the increased risk of malignancy," says Mayosi.

The study, which was presented at the European Society of Cardiology congress (and published simultaneously in the **New England Journal of Medicine**), enrolled 1 400 patients with pericarditis from 19 hospitals in eight countries in Africa.

FUNDING OBSTACLES

The road from idea to findings turned out to be strewn with obstacles, most of them financial. Mayosi, together with colleagues from seven other countries in Africa, began applying for funding, but drew a blank every time. The reason they were most often given was that no-one in the team had the required experience of conducting a large, multi-centre, clinical trial on the scale they were proposing.

> "We are named after the Zulu battalions – the Impi – who vanquished the great armies of Queen Victoria at Isandlwana. By that, we're saying that we are putting together a team that will solve this problem by whatever

Professor Bongani Mayosi, lead investigator of the African-led multi-country study.

Two years later, the group finally received funding from the Canadian Institutes of Health Research (CIHR). By then, they were already halfway through the trial. However, the CIHR enabled them to leverage further funding to expand and complete the trial.

"This was an African-led study with no initial funding that went to places that had never conducted trials before and established capacity there," says Mayosi. "Yet we set new

> "I go to many meetings where people do global studies," says Mayosi, "and Africa is the black box – it is often missing, and yet people have the audacity to call those studies 'global'. There is no longer an excuse now. IMPI has created the railroad – the infrastructure – for doing research studies throughout the sub-Saharan African regions.

THE EFFECT OF STEROIDS ON HIV

By far the most significant finding of the study was the effect of steroids on patients with HIV. The majority of patients (67.1 percent) in the study were HIV-positive. According to the World Health Organisation, the risk of developing TB is estimated to be 12 to 20 times greater in people living with HIV than in those without HIV.

The increase in HIV-associated cancers is consistent with the results of two previous studies on HIV-associated TB.

"The immune system keeps cancer cells in check to a certain degree, and HIV reduces this protection, which is why HIV-associated cancers occur. Steroids further depress the immune system, thus promoting the occurrence of HIV-associated cancers such as Kaposi sarcoma and non-Hodgkin lymphoma, which occurred in this study."

WHERE TO NEXT?

Given the implications of these findings, it is perhaps surprising that the study only happened because of the determination

"Africa is open for business when it comes to health research," says Mayosi. "We are ready to engage with the world on the highest level of quality required by science. We are looking for collaborators so that we can work together to solve some of the major health problems that are confronting us."

PARTNERS AND SOURCES OF FUNDING

Key local partners were UCT, Groote Schuur Hospital, the South African Medical Research Council, the Walter Sisulu University/Nelson Mandela Academic Hospital (in Mthatha in the Eastern Cape) and other South African medical schools, and collaborators from Sierra Leone, Nigeria, Kenya, Uganda, Malawi, Mozambique and Zimbabwe.

The key international partner was Professor Salim Yusuf and team from the Population Health Research Institute at Hamilton Health Sciences and McMaster University in Canada. Supported by grants from the Canadian Institutes of Health Research, CANNeCTIN

HOW CAN WE PREPARE NURSES

TO DEAL WITH DEATH AND DYING?

A new course is needed in the nursing curriculum to help nurses prepare for the reality of patients who die under their care, recent research reveals.

Nurses, particularly those working in critical-care units, are under considerable pressure. Despite critical-care staff being highly trained and skilled, there is high staff turnover, particularly in paediatric critical-care units. Nicola Fouché, an experienced critical-care nurse who completed a PhD in 2014, supervised by Dr Kerin Williams, investigated the reasons why.

"Departing staff often give, as reasons for leaving, the emotional burnout they suffer as a result of the clash of priorities they face, the concern of critical-care units to preserve life at all costs, and the personal need of nurses to manage their human contact with dying patients," says Fouché.

Fouché says students studying towards the Postgraduate Diploma in Nursing (Critical Care Adult and Child) at UCT express considerable unease when confronted with discussions about death.

"Often, in ICU, you don't have time to say goodbye to a baby. A course won't stop the burnout and stress, but it may allow nurses the space to

"Come, little one, ¿ght, ¿ght! You can do it. Then I saw the breath leave the body." Fouché asked nurses to draw pictures of their experiences

WHY PROPERTY OWNERSHIP

IS NOT A PATH OUT OF POVERTY

Home ownership is associated with a sense of security in an unpredictable world. But recent research suggests that property ownership in and of itself provides no real poverty alleviation, either direct or indirect. This finding holds very **real implications for policy in countries such as South Africa, where government**

As part of his PhD research, based at UCT's Centre for Social Science Research (CSSR) and Sociology Department, Dr Singumbe Muyeba investigated the effects of real property rights on urban poverty in Cape Town's Khayelitsha township and in Matero township in Lusaka, Zambia. His particular interest was in the economic, social and human capital effects of property titling (real property ownership through the possession of a title deed) and social upliftment projects such as informal settlement upgrading, which claim to be a conduit to poverty reduction.

upgrade their houses to increase value. In the meantime, the costs of property rates and other municipality fees, and the accompanying threat of dispossession – particularly in Lusaka – put financial pressure on those who can least afford it."

However, Muyeba did find a number of positive effects resulting from property ownership. Better housing environments resulted in better physical health, higher levels of political awareness, and greater neighbourhood satisfaction. His most surprising finding, however, was an increase in the number of teenage pregnancies among the beneficiaries of these housing programmes.

"The best explanation I could find was that houses built of brick and mortar provide more privacy for intimate relationships than shacks do," says Muyeba.

Muyeba is often asked about the policy consequences of his research, but he says there is no straightforward answer. His research clearly shows that housing cannot alleviate poverty if there are no jobs and no means to make a living. Providing employment opportunities for people with unskilled labour in an economy that demands skilled labour – such as South Africa's – is therefore essential.

"We need to see real opportunities that offer people financial stability," stresses Muyeba.

Better housing environments resulted in better physical health, higher levels of political awareness, and greater neighbourhood satisfaction.

He also argues for the establishment of a state fund to provide low-interest credit to beneficiaries of subsidised housing programmes. He points to research in Peru and Indonesia that demonstrates the success of such programmes.

"Not all situations warrant the provision of freehold title," says Muyeba. "Policymakers in developing countries such as South Africa and Zambia need to go beyond the dichotomy of legal ownership versus non-ownership. In some cases, pre-existing tenure arrangements may be the best option for residents."

Story by Natalie Simon. Images courtesy of Singumbe Muyeba.

Privatised homes like this one in Matero, Lusaka, can actually increase ¿nancial insecurity.

FIGHTING TB

SOUTH AFRICA'S 'INSIDIOUS EPIDEMIC'

South Africa stands at the centre of a global TB epidemic that is devastating the health of millions and their communities. Researchers at UCT are working with colleagues at the University of Oxford, health workers, and community volunteers

Brewelskloof Hospital, built as a sanatorium in 1948, rests in secluded grounds on the outskirts of the town of Worcester, in the Western Cape. Its 199 beds treat just one disease: tuberculosis (TB).

In many parts of the world, including South Africa, the fight against TB is far from won. In Worcester and its surrounding area, a semi-rural region with a population of around 350 000,

Associate Professor Mark Hatherill, director of the South African Tuberculosis Vaccine Initiative (SATVI).

escalated the problem. Across South Africa as a whole, HIV is now a complicating factor in some 62 percent of TB cases.

According to Associate Professor Mark Hatherill, "In Worcester, every family knows someone – a relative, a neighbour, a friend – who has or has had TB. While mortality is lower when not associated with HIV and when patients access treatment early, people are still sick for a long time. They can't work, they lose their jobs – it's what makes TB a social ill as well as a physical one."

Hatherill is director of the South African Tuberculosis Vaccine Initiative (SATVI) at UCT, the largest dedicated TB vaccine research group on the African continent. The most commonly used TB vaccine, BCG, has been around since 1921, and has limits. It does not guarantee lifetime protection and is not effective against the major form of pulmonary TB in adults who transmit the disease. A successor vaccine is needed – urgently.

is critical that the trials are conducted well, and to the appropriate ethical and regulatory standards. The reputation SATVI has built up over years within the Worcester community is invaluable in this regard."

For one of those volunteers, Belinda Ameterra, chairperson of Worcester's community advisory board for SATVI, the trials have an important social role. A sales executive for a local furniture company, she brings commitment and compassion to her recruitment work. Ameterra explains: "People are usually very afraid of their health status. We have to comfort them and tell them it's not that serious to get themselves tested.

"We are talking about some of the most vulnerable people in the most rural areas, who are jobless and most insecure about their status. You have to explain to them that there is life after you have accepted your health status. You almost have to hug that person and make them feel it is worth it. It makes a huge difference in that person's life; it makes them feel wanted."

Each trial's principal investigator gives a monthly update on progress to the advisory board, which has grown to 30 members. Ameterra says: "We are supposed to have just 20, but what can you do if people are eager to help?"

Linda van der Merwe, SATVI's resource manager and a nurse at Worcester, shares that motivation. She was working as a nurse in the impoverished Eastern Cape in the early 1990s when HIV triggered an explosion in TB cases.

"We are talking about some of the most vulnerable people in the most rural areas, who are jobless and most insecure about their status. You have to explain to them that there is life after you have accepted your health status."

Brewelskloof Hospital in Worcester, which is at the epicentre of the TB epidemic in South Africa.

Professor Valerie Mizrahi, director of UCT's Institute for Infectious Disease and Molecular Medicine (IDM), which includes SATVI, says: "We had some extremely important results. We know that the induction of a T-Cell response is necessary, but not sufficient, for protective immunity. We now need to think outside the box for a different approach."

> "SATVI has led the world in TB vaccine research. Its methods are now being copied in Kenya, Senegal and Uganda."

So the hunt continues, with results from SATVI feeding into McShane's laboratory work in Oxford. SATVI is developing

McShane describes South Africa as "the epicentre of the global TB epidemic". India, Indonesia, Nigeria, China and many other countries are struggling with the disease as well. South Africa is the ideal location for research partnerships, says McShane. It has infrastructure at developed-world levels, including liquid nitrogen for freezing vaccines, and other resources necessary to meet 21st-century regulatory standards.

Above all, there is SATVI, and the expertise it has built in conducting trials. "SATVI has led the world in TB vaccine research," says McShane. "Its methods are now being copied in Kenya, Senegal and Uganda. We have gained so much momentum and learned so much together. As a field, we have made enormous progress in the last 10 years. But there is much more work to be done."

Hatherill is also conscious of the task still facing the team. "Tuberculosis was one of the first microbes to be identified, yet there is so much we don't understand about it. How does it develop? What puts people at risk from it? How can we

ANCIENT DNA

OF MARINE HUNTER-GATHERER SHEDS LIGHT ON OUR COMMON ANCESTRY

A man who lived 2 330 years ago on the southernmost tip of Africa belonged to the earliest group of humans to diverge from 'Mitochondrial Eve', our common ancestor.

The skeleton found at St Helena Bay in 2010 by Andrew Smith.

When archaeologist Andrew Smith, an emeritus associate professor at UCT, discovered a skeleton at St Helena Bay in 2010, he immediately recognised the significance of his finding. He contacted Professor Vanessa Hayes, a world-renowned expert in African genomes now at Australia's Garvan Institute of Medical Research in Sydney.

Hayes assembled a team of experts to help her analyse the genetics of the skeleton. Using DNA extracted from a tooth and a rib, the genetics team generated a complete mitochondrial genome. Mitochondrial DNA is passed from mother to child, and provided the first evidence that we all come from Africa and share a common ancestor, known as 'Mitochondrial Eve', who lived around 200 000 years ago in Africa. The DNA profile of the St Helena skeleton revealed that he belonged to one of the earliest groups of humans to diverge from this common ancestor and lived 2 330 years ago.

UCT biological anthropologist Professor Alan Morris undertook to analyse the skeleton. "Part of any analysis is the reconstruction of events at death, but also the life history of the person. In forensics, it is used to establish the identity of the individual, but in archaeology it helps to tell us

surf zone, or tidal pools," says Morris. Shells found near his grave were carbon-dated to the same period.

The identification of the man as a marine hunter-gatherer – in contrast to the contemporary inland hunter-gatherers from the Kalahari Desert – raised questions about how the two were related. The St Helena skeleton carried a different maternal lineage from that of the pastoralists who migrated down the coast from Angola 2 000 years ago, and probably represents the indigenous genome in the Cape region. "It contains a DNA

UNEASE REIGNS

AS CULTURE AND THE CONSTITUTION COLLIDE IN SOUTH AFRICA

The debate is not new and usually emerges in two distinct clusters of emphasis. The Àrst cluster encompasses all those **skirmishes which underlie the belief by many South Africans that the country is too westernised and that the space for cultural expression is rapidly diminishing.**

Recent reports of spats over breastfeeding in public belong firmly in this category, as do tensions over institutional culture at the workplace. For example, should an employee who wants to heed a call by the ancestors to practise as a healer, or sangoma (diviner), be given time off to do so, in the same way as her colleagues are allowed to go on career-development training fellowships?

THE ROLE CLAIMED BY TRADITIONAL LEADERS

The second cluster shows itself in more overtly political hostilities. These include the charge that African cultural institutions, whether they be traditional leadership or virginity testing, are under siege in the current social and political dispensation, from a constitution hell-bent on obliterating all traces of African identity.

The Constitution recognises the institution of traditional leadership in accordance with customary law.

Comments by Goodwill Zwelithini, King of the Zulus, the largest traditional grouping in South Africa, dropped him feet-first into this version of the debate. His call on nationals from other

to polygamy, especially the requirement of consent from the first wife before a man can marry another. He claimed that traditional leaders were never consulted during the development of the legislation.

> For anybody who understands isiZulu, the king clearly identi¿ed a particular group of people and labelled them as unwelcome. This has dented South Africa's image on the continent and fuelled anti-traditionalist sentiment at home.

The king's advisers appear to have missed the fact that the consent requirement is not found in the Act, but rather developed from a constitutional court decision.

These two outbursts are significant. The king's comments about foreigners raise the question of limitations on traditional governance and its role in a constitutional democracy.

It strengthens the hand of critics of hereditary leadership who argue that a parallel system of rule by unelected incumbents is incompatible with democracy, especially where such rule is not subject to orthodox forms of political accountability.

Obliquely, it also raises the spectre of tribalism, at least in the sense that the dynamics of parallel governance imply an ability to mobilise along ethnic lines in ways that may be inimical to the national good.

The king's comments about the Marriages Act is more directly about culture and the role claimed by traditional leaders as its gatekeepers.

CROSS-CULTURAL DEBATE

The clash-of-cultures issue requires more far-reaching debate to help develop a level of public understanding of at least three underlying difficulties in promoting cross-cultural

the greatest obstacle to the cultural accommodation required to embed genuine cultural diversity in South Africa.

Secondly, as a result there is growing scepticism on the part of many supporters of African culture that the Constitution can ever be a fair referee in the contest between the cultures.

The recent skirmishes about culture in the public space represent the tip of an iceberg that can be properly characterised as a cultural backlash.

King Zwelithini's rant against the Customary Marriages statute and his assertion that the time has come for African culture to draw the line should be seen as part of this backlash. It illustrates a noticeable hardening of attitudes and a discarding of whatever restraints might have existed in the past to keep the cultural debate muted and cordial.

Thirdly, while one can imagine the approval of this development by many South Africans who are fed up with what they perceive as enforced westernisation, traditional leaders stepping into the breach to reclaim their mandate as champions of culture could turn out to be a double-edged sword.

Doubts persist about the commitment of traditional leadership to human rights, especially the rights of women. Civil society organisations which thought they had won a famous victory last year by halting the Traditional Courts Bill in its tracks are carefully watching developments. The Minister of Justice and Constitutional Affairs recently announced that he intends to re-introduce an amended version of the Bill.

CULTURE AND THE PROBLEM WITH GATEKEEPERS

It should be possible for people to make the distinction between traditional leaders on the one hand and culture on the other.

While traditional leaders are usually cast in the role of spokesmen for culture, culture in fact grows and develops in communities quite independently of any chiefly supervision.

In the end, different versions of culture are served up to the

GENETIC DIVERSITY OF THE CHACMA BABOON

KEY TO UNDERSTANDING CONSERVATION IN A TIME OF CLIMATE CHANGE

The Chacma Baboon (Papio ursinus) **is one of the best-known characters of the Southern African landscape. What we have not known until recently, however, is that South Africa may be home to two distinct baboon species, separated around 1.5 million years ago during a time of immense environmental change. This has important implications for the conservation of biodiversity in the future.**

As part of her PhD research, Dr Riashna Sithaldeen of the Department of Archaeology investigated the evolutionary history of the Chacma Baboon during times of large-scale environmental change that occurred during past glacial periods. Her findings were published in **Plos One** in a paper co-authored with her joint supervisors, Professor Rebecca Ackermann (Department of Archaeology), who has a particular interest in primate evolution, and Dr Jacqueline Bishop

cover like that seen in the northern hemisphere, it did get colder and drier, with large tracts of land – including the Kalahari – becoming increasingly arid and uninhabitable for baboons and many other animals.

In response, baboon populations fragmented, seeking out ecological 'safe zones', referred to as refugia, where they could still access food and water. During these periods, genetically similar groups of baboons became isolated from each other, and the genetic composition of these groups changed over time. Today, these two main groups differ markedly in their mitochondrial genetic make-up, and where they now meet we see clear genetic signals of secondary contact.

The wide variation within Chacma Baboons when it comes to properties such as size and coat colour prompted speculation about the amount of genetic diversity among the baboons and was important in developing the main hypothesis for this research, says Sithaldeen.

To test this hypothesis, she collected fresh faecal material from free-living baboons in 29 localities across Southern Africa. Faecal material contains epithelial (skin) cells from the intestines of baboons. These epithelial cells are then used to extract DNA and create a mitochondrial genetic dataset.

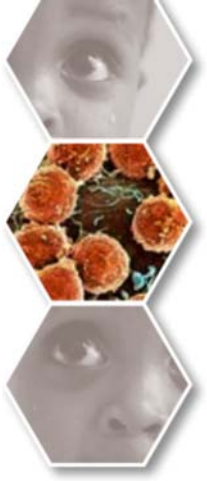
A greater understanding of environmental changes and adaptation to phenomena such as deserti¿cation is increasingly important as we face a future of substantial climate change.

"The mitochondrial genome is housed within the energy-producing part of the cell known as the mitochondria. This genome is inherited directly from the mother, so it tells the evolutionary story of the maternal line," explains Sithaldeen. "The information contained in this genome – extracted from

Adult ursinus male, Cape Point, South Africa.

The findings have important implications for our understanding of the evolution of our rich biodiversity heritage in southern Africa, she notes. In particular, the shared patterns of genetic variation we see across a range of animal species reflect cycles of environmental change. This study in particular highlights the impact of desertification on shaping mammal biodiversity in southern Africa, adds Sithaldeen.

A greater understanding of environmental changes and adaptation to phenomena such as desertification is increasingly important as we face a future of substantial climate change.



THE DEVASTATING CONDITION

THAT CAN CAUSE CANCER IN CHILDREN

Doctoral candidate Lindiwe Lamola has had a grudge against cancer ever since it caused the death of her much-loved grandmother. She is channelling her energies into examining a rare genetic syndrome that puts people at risk of developing cancer in childhood.

In her dreams, health sciences postgraduate student Lindiwe Lamola sees a four-year-old child playing, dressed in pink and with pigtails in her hair. But in her daily research job, Lamola knows this child only by her DNA case number.

"I often see her in my mind's eye, riding a bicycle; but she probably had headaches too bad to allow her to play like other children," says Lamola.

The child in question died from a rare genetic cancer syndrome, Constitutional Mismatch Repair Deficiency (CMMR-D), which caused an aggressive tumour in the brain. She had inherited the genetic defect from both mother and father.

To date, fewer than 200 cases of this syndrome have been described worldwide, says Lamola. As with many cancer

"We may not have been able to save this child, but maybe we can save others," says Lamola. "We understand so little about CMMR-D syndrome. We want to see if there is a better method of surveillance or to diagnose it earlier. For instance, are there any markers we can identify before it gets to that fatal stage? We're just starting with the basics, such as: what makes this disease?

"We have started with one family, and we hope we can find something and expand the study. The more we understand about the different types of cancers, the more we get to understand about cancer. It could be that something from this study will help us understand more about other cancers," says Lamola.

Her research stems from a larger Division of Human Genetics study, which aims at investigating the genetics of inherited cancers in South Africa.

The Division of Human Genetics and the Surgical Gastroenterology Unit at Groote Schuur Hospital initiated the parent project to investigate the molecular basis of hereditary colorectal cancers in local populations. As a result of this project, the genetic determinants of Lynch syndrome in different families in South Africa have been described. "Lynch syndrome is an autosomal-dominant inherited disorder (a disorder in which each affected person usually has one affected parent, and the chance a child will inherit the mutated gene is 50 percent), and is associated with the early onset of colorectal cancer," says Lamola.

"It's caused by a defect in one of the four mismatch-repair genes – when patients are diagnosed with this, they have an increased risk of developing colorectal cancer.

"Because of the burden of cancer – particularly colorectal cancer – in our population (it has grown exponentially in South Africa over the past few decades), methods were put in place for creating a registry and surveillance programme. Currently, communities are being managed pre-symptomatically via genetic testing, genetic counselling, and colonoscopies. We have shown what a difference a surveillance programme can make in this population."

defect in our registry, this family was tested and later included in the surveillance programme – the parents and the child.

"This particular cancer syndrome is so aggressive and takes lives so fast, and, unlike colon cancer, it hits people much younger, from ages two to 15. It is extremely rare; but if we knew more about it, we could at least arrest it – give more years to victims' lives."

Lamola's grandmother, Elizabeth Lamola, died of cancer when she was 14. "She practically raised me. She was only in her 60s. We were very close to my mother's parents growing up in Qwa Qwa, in the rural Free State.

"I've had a grudge against cancer ever since. I'm not looking for a cure; I just want to understand: who are you, cancer – why do you think you have the right to take a life? Why do you do what you do?"

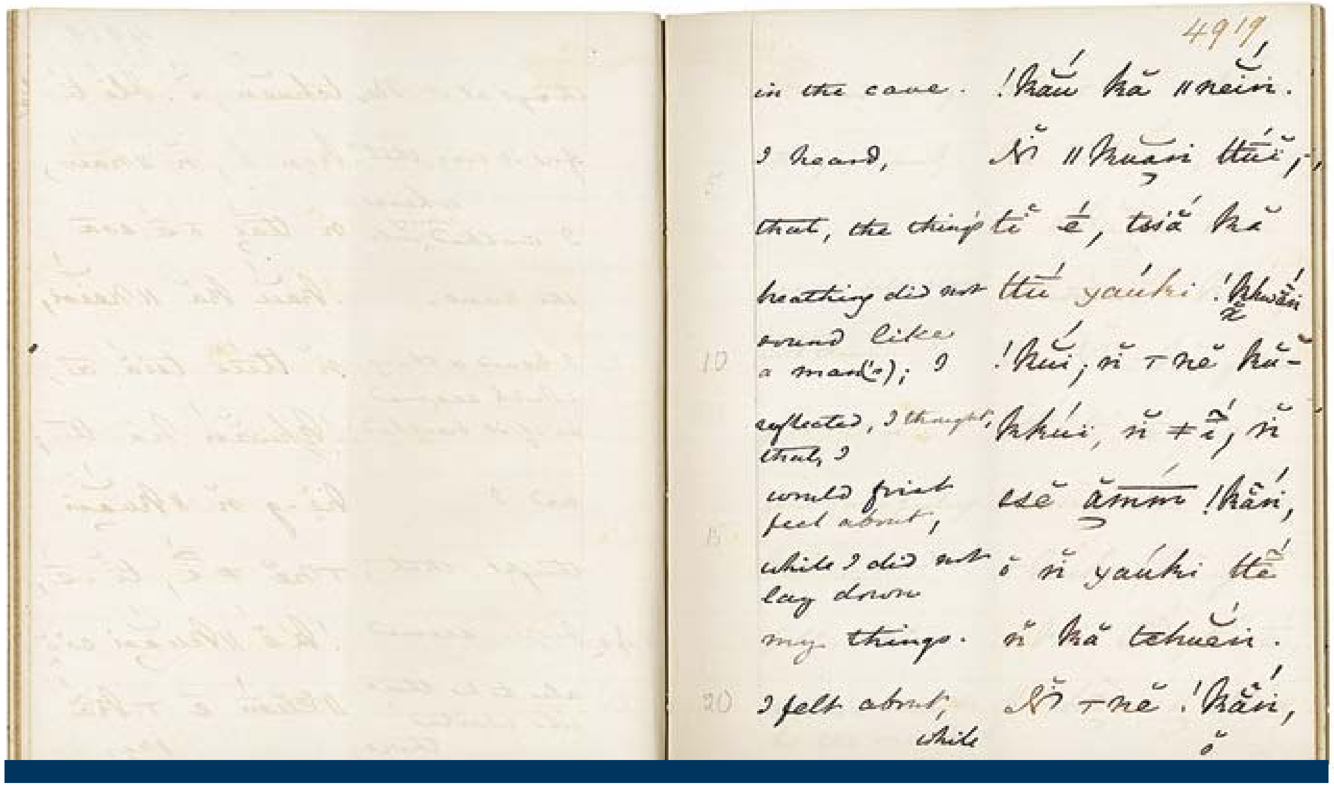
"This particular cancer syndrome is so aggressive and takes lives so fast, and, unlike colon cancer, it hits people much younger, from ages two to 15. It is extremely rare; but if we knew more about it, we could at least arrest it – give more years to victims' lives."

"My gran was normal one day, and the next she had a cough. They discovered inflammation in the lungs, and then diagnosed lung cancer. Just like that, this tough, resilient woman became someone who couldn't even get out of bed. This woman who had raised me, who was normally out of bed at the crack of dawn ... in a few months, she was unable to talk, to walk. Everything I had identified her by, she was none of that any more. Hence my grudge against cancer."

When Lamola was growing up, at first she wanted to become a doctor. "I could see the need in the rural area I grew up in; but then I decided rather to work on things that could show doctors what caused disease. My grandparents and parents

REVIVING EXTINCT LANGUAGES

THE MOBILE WAY



Above: a hand-written record of the |Xam language from the Bleek and Lloyd Collection. Top: image courtesy of Survival International.

A desire to preserve languages and pay tribute to the rich San culture is at the heart of

Sunkanmi Olaleye – a master's student in computer science – is investigating how novel mobile technology can interface with African digital heritage documents as a way of preserving the extinct |Xam language.

Olaleye had to construct a Unicode mapping for each of the unique characters in the language. Special symbols were included for clicks.

He composed the codes with the help of the highly respected Bleek and Lloyd Collection – rich, hand-written records of |Xam language, culture and heritage from the late 1800s. Records of the language currently exist in these handwritten notebooks, as well as in a digitised dictionary.

Olaleye pays much credit to his supervisor, Associate Professor Hussein Suleman of the Department of Computer Science, who he said had been "a wonderful guide".

"The Bleek and Lloyd Collection, with more than 20 000 pages of text, is arguably the most significant record of the history, language and culture of the original inhabitants of the Western Cape and Southern Africa in general," comments Suleman. "It was scanned by the Centre for Curating the Archive almost 10 years ago, but the scanned images cannot be processed by computer. Without a machine-readable transcription, we cannot use software to generate a dictionary, study linguistic styles, automatically translate the text, synthesise a voice for the stories, and so on. A complete and accurate transcription of the text is therefore a short-term goal."

Olaleye chose to use mobile technology for the |Xam project. He's programmed his solution so that users are able to access the technology on a basic and affordable cellphone.

"In recent years, we had volunteers transcribing the text using Web browsers, but most volunteers preferred to use a mobile device," Suleman says. "This has led us to Sunkanmi's work to find the best possible way for people to enter text in |Xam on a mobile device."

Olaleye agrees. "Many descendants of the San people may not have computers at home. But most people have a mobile phone. It's a great way for San descendants to become familiar with the language, and to learn it," he said.

Olaleye says he has been very encouraged by the way students have taken to his idea, particularly San descendants studying at UCT: "So many of them were keen, and interested in finding out more. Others wanted to help."

time be downloaded from an app store and used anywhere in the world.

Olaleye, who grew up in Lagos, Nigeria, said he was acutely aware of the languages in his own home country that were dying out, including the Urhobo language spoken in the south of Nigeria.

He's hoping that the |Xam model could be used in other countries, including his own. "There are so many extinct languages in the world, even in Europe. Africa is taking the lead on this, which is great. If we can start from here, we can make a difference."

His interest in the San was sparked at an early age; however, it wasn't any serious academic leaning that directed his curiosity towards the rich and deeply layered culture of the San people: "I watched the South African movie **The Gods Must Be Crazy** as a kid, and I loved it. I became interested in the San people. I wanted to find out more.

"I'm interested in doing something for the San people to make sure the culture doesn't go away. Preserving languages – emblems of identity – is vital in saving cultural wealth and important ancestral knowledge."

TWO RESEARCHERS' JOURNEY

FROM AIDS DESPAIR TO AN AGE OF HOPE

First there was Aviwe "Catmeister" Ntongana, the boy from Masiphumelele who rapped for Obama. Aviwe was 14 and attending a session at the Desmond Tutu Youth Centre when President Obama was being shown around. He looked bored, and Obama engaged him in conversation. "What do you like to do?" asked the president. "I like to rap," said the boy, and after some persuasion he stood up and rapped about poverty in front of 40 international journalists. A video of that moment went viral, and today Aviwe is on a mission to create a music career and is a central member of the centre's music academy.

Then there is Phakama Cofa, who started volunteering at the centre as a cleaner. "I'll do anything," she said – at the time she was unemployed, and desperate to fill her days. The centre raised the money to pay her. After 18 months she was ready for a new challenge, and was appointed to run the youth centre's cafeteria, Eyethu Café. Today, she still has oversight of the café administration, and has taken on the reception, too.

These stories represent the heart of the work of professors Robin Wood and Linda-Gail Bekker, founders and directors of the Desmond Tutu HIV Centre (which focuses on research) and Foundation (a non-academic vehicle focused on community development). Together, Wood and Bekker are world leaders in cutting-edge research that tackles South Africa's most intractable health problems; that science, however, would not be possible if they had not invested heavily in the communities in which they work.

It was this research that won them UCT's prestigious Alan Pifer Award in 2014, awarded for research with social impact. "The remarkable work of Linda-Gail Bekker and Robin Wood to fight the HIV epidemic has shown visionary and responsive leadership," says Vice-Chancellor Dr Max Price. "Their work in the communities of Cape Town has made a difference in the lives of countless South Africans and their commitment to social justice and responsive research is commendable."

It has, says Bekker, been a thrilling ride, "all the way from a place of AIDS despair and suffering through to an age that presents hope and optimism."

changed from a certain death sentence to an almost normal quality and length of life. South Africa now has the largest ART programme in the world, with almost two million patients on therapy."

Their work brought them face to face with the plight of the people they were helping: "Once you engage with the community," says Bekker, "you realise there are many other pressing issues."

This realisation – that they had to grapple with the full spectrum of issues faced by communities – has meant that the spaces in which Wood and Bekker run their clinical trials look entirely different from most in the developed world.

The youth centre at Masiphumelele, for example, provides education support, computer literacy and recreational activities alongside youth-friendly reproductive health services. It stands opposite the local high school. The young people who attend the centre can "earn and burn Tutus" – tokens that reward healthy behaviours, such as taking part in a clinical trial, and can be exchanged for healthy food at the cafeteria, for instance.

"... HIV has been changed from a certain death sentence to an almost normal quality and length of life. South Africa now has the largest ART programme in the world, with almost two million patients on therapy."

Another example is the Emavundleni Prevention Centre, which provides health counselling and sexual and reproductive health services to people living in Crossroads and its surrounds. With a large outreach team, they have led an education campaign since 2004, ensuring that community members are well informed about medical research in general, how medical products are clinically developed, what

has implemented seven HIV vaccine trials to date, and will participate in the newly-launched Uhambo Project in 2015.

This is partly possible because of the high burden of HIV carried by the South African population – it is difficult to recruit large enough HIV-infected populations in the developed world. However, it is also because of community members' willingness to participate – the reward for the years of painstaking work Bekker and Wood have put into building trust and educating people about the importance of research. As a result, says Bekker, they never struggle for willing, enthusiastic and engaged participants.

"It is abundantly clear to me that the communities we work in and societies we serve have their critical role to play," says Bekker. "We can and must continue to partner with them in ways that are meaningful to achieve the best outomes."

Wood, meanwhile, has more recently turned his focus to TB, which he believes is an even greater scourge in the South African context than HIV. "Both HIV and TB similarly exploit the fractures, weaknesses and inequalities in our society and health systems," says Wood.

The statistics are sobering: there is as much TB in Cape Town alone as there is in the USA, Canada, France and Germany put together. Between 10 and 15 percent of children in South Africa aged between 12 and 18 are newly infected with TB every year. The rate of TB infection among HIV-negative South Africans has not improved in 100 years (the sixfold increase that has occurred over the last 10 years is driven by the HIV epidemic).

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This is partly because we know so little about it, says Wood. For instance, we don't know where the bulk of transmissions are happening – whether it is in schools, or on public transport, or somewhere else. We also don't know what the transmissible particle looks like when it is airborne. Wood has developed a gadget he calls "the Tardis". It is, indeed, about the size of Dr Who's travelling police callbox, just big enough to hold a seated TB-infected subject. Devices within the box capture air particles as the occupant breathes and try to isolate the TB particle. This is no easy task. "We call it 'hunting the boson'," says Wood.

The work of Wood and Bekker is a living embodiment of the idea that people come first and excellent science follows, setting up a virtuous circle in which the one feeds the other. "You can't do this kind of research without strong community

MOVING ALGAE

THE KEY TO RENEWABLE OIL PRODUCTION?

There are 15 torso-long cylinders, each suspended vertically on a steel frame. Thin black tubes running underneath like cables connect the cylinders to an automated control panel that measures the precise amount of air and carbon dioxide sent to each. Fluorescent lights shine from behind the row of tanks, giving them an ethereal glow. These algae growth tanks are known as airlift photobioreactors, a high-tech tool for producing renewable energy products from algae.

The use of algae as food is an ancient concept. However, with today's global energy concerns, there is renewed interest in algal biotechnology, with algal oil a possible weapon in the battle against climate change. Algal oil has reached commercial-scale production in the United States, where the company Sapphire Energy produces 'Green Crude' (from micro-algae and grown in large, shallow open-air ponds), later refined to petrol, diesel or jet fuel.

Yusuf Chisti, a professor of biochemical engineering at Massey University in New Zealand, has shown that photobioreactors produce algae faster than ponds because the reactors are less susceptible to contamination and weather changes. However, as photobioreactors tend to be energy-intensive, this method increases the costs and carbon footprint.

Researchers at UCT's Centre for Bioprocess Engineering are working on improving these green vessels to make the algae

The second is a horizontal cylinder containing oscillating half-moon shaped paddles. As the paddles move back and forth, the liquid algae flow over the top. Both designs require less bubbling of compressed gas, because the motions of the waves and oscillations keep the nutrients circulating. These ways of mixing might be more energy-efficient.

Another way to improve efficiency is to increase the amount of oil that the algae produce. A common freshwater micro-algae species called *Scenedesmus* is used for this. Altering the nutrient mix can cause the biological processes in the algae to favour oil production rather than cell growth. The researchers are trying to determine at which point oil production is the most efficient.

The first peer-reviewed output from this work explores the bubble rate and carbon dioxide ratio in the airlift photobioreactor. The energy efficiency of the airlift photobioreactor has for

MYSTERIOUS DEATH

OF OSCAR WILDE'S WIFE FINALLY EXPLAINED

Above: Constance Wilde with her son Cyril.
Right: Oscar Wilde.

For more than a century the sudden death of Constance Wilde, wife of the famous author and playwright Oscar Wilde, has remained a mystery

Constance Wilde died suddenly in Genoa, Italy, on 7 April 1898 from complications following surgery for the removal of a uterine fibroid. She was 40 years old. These facts, however, describe only a small part of the circumstances that surrounded her death

Enter the urbane and seemingly knowledgeable Italian gynaecologist, Luigi Maria Bossi, who claimed that he might provide a cure.

Reviewing old documentation, Dr Ashley Robins, a retired UCT academic and psychiatrist, posits that Constance gave her consent to undergo surgery, believing a cure was possible. "Bossi believed that some patients' neurological illness stemmed from women's reproductive organs (pelvic madness), even though at the time such ideas were already discredited. It is likely that Constance died of paralytic ileus (bowel paralysis) brought about by the operation."

Although at the time Bossi did not suffer any consequences over the botched surgery, he was suspended many years later from his professorship at Genoa University because of professional misconduct, before being fatally shot by the jealous husband of one of his patients.

NINE-YEAR ILLNESS

According to Robins' and Holland's re-examination of the correspondence between Constance and her brother, she first started displaying symptoms almost a decade before her death. Their recently published **Lancet** study states: "Her nine-year illness was characterised by widespread pains, right leg weakness, tremor of the right arm, profound fatigue and a left facial paralysis. For the first seven years, the clinical picture was dominated by intermittent acute episodes followed by extended periods of recovery; in the last two years her disability became permanent with gradual deterioration. A likely diagnosis is multiple sclerosis of the relapsing-remitting type that subsequently developed into secondary progressive multiple sclerosis."

This debilitating neurological disorder is thought to be an auto-immune condition leading to a degeneration of myelin, the substance that protects nerve fibres from damage. Although the illness was first described by Jean-Martin Charcot in 1868, physicians of those times may not have associated Constance's symptoms with this fairly recently discovered disease.

What prompted Robins and Holland to re-examine these

PREMATURE DEATHS

Merlin Holland, Oscar and Constance's grandson, has mentioned in a previous interview that while his mother was alive she had worried that revealing the contents of the letters would encourage people to sensationalise Constance's life and death. With this new discovery, however, previous ideas that her death had been caused by a fall or syphilis (contracted from Oscar) have all been proven untrue. In Holland's words: "I rather feel this will put Constance to rest, poor thing."

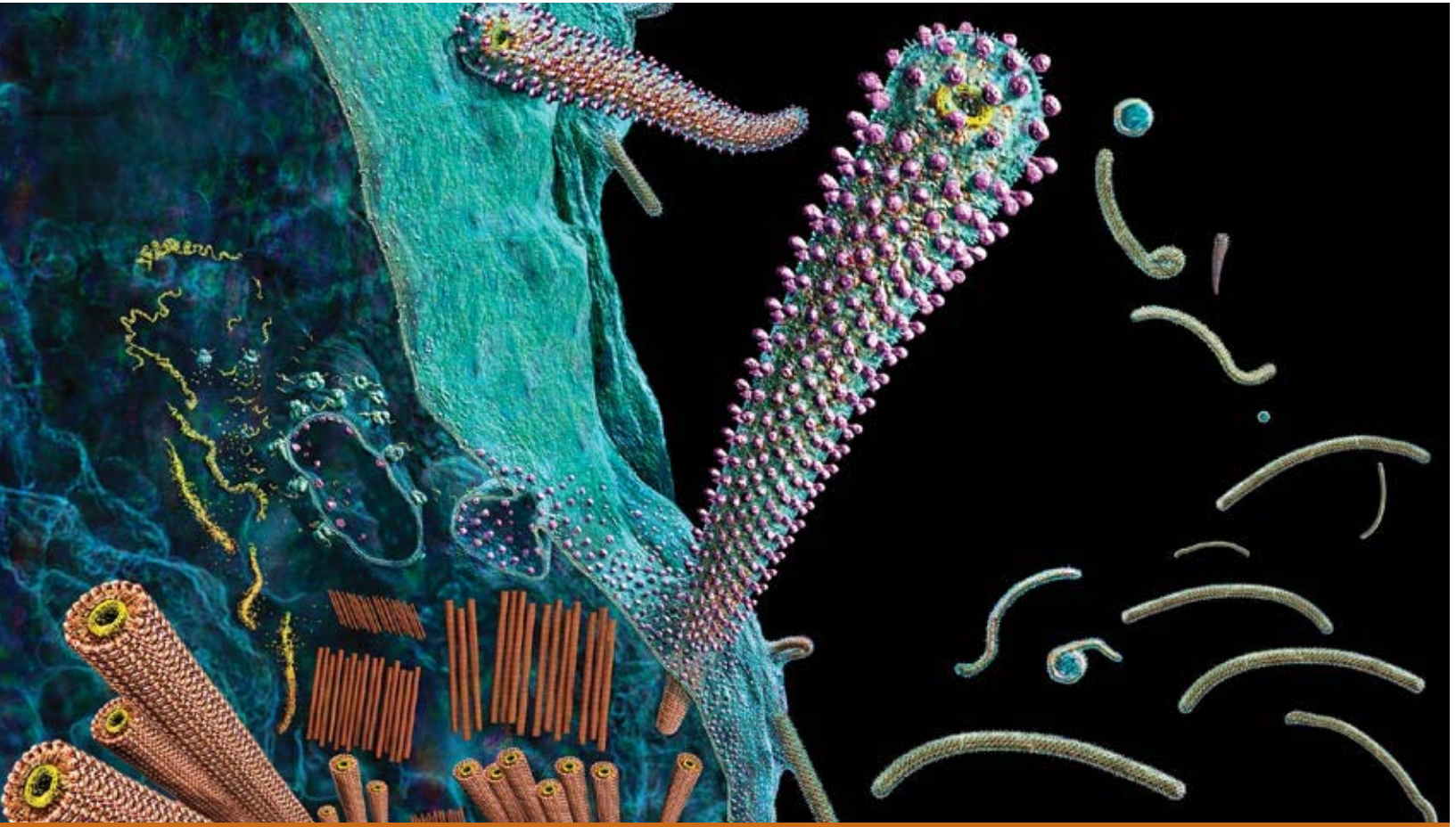
Almost 120 years after they died, it has now been shown that Oscar and Constance died from completely unrelated medical conditions. Nonetheless their deaths share common, and tragic, elements. Not only did they both die young, and from medical conditions that today might be successfully treated, but in both cases the more indirect causes of their premature demise can be related to the prevailing social attitudes of the day.

Almost 120 years after they died, it has now been shown that Oscar and Constance died from completely unrelated medical conditions. Nonetheless their deaths share common, and tragic, elements. Not only did they both die young, and from medical conditions that today might be successfully treated, but in both cases the more indirect causes of their premature demise can be related to the prevailing social attitudes of the day.

Prejudice against homosexuality led to Oscar's incarceration and subsequent physical decline. Constance suffered the

GENETICALLY ENGINEERED

'PLANTIBODIES' TO HALT EBOLA



Mimicking nature: UCT's Biopharming Research Unit,

Earlier this year, the BBC reported the World Health Organisation (WHO) as saying that a serum made from the blood of Ebola survivors

And plants like tobacco are key.

Vaccine antigens, substances that provoke an adaptive immune response, can be made in plants. These antigens treat a host of diseases and cancers by mimicking proteins and other molecules found in disease-causing organisms, and eliciting protective antibodies in the human body. It's also possible to make therapeutics to treat rare genetic diseases: for example, the now-licenced biologic Elelyso, used to treat Gaucher's disease, is made in carrot cells.

However, recent attention worldwide has focused on making therapeutic monoclonal antibodies in plants. These plant-made antibodies, or 'plantibodies', are completely safe for humans and will pave the way for low-cost therapeutics and change the way we treat viral and other diseases, adds Rybicki.

> "We've succeeded in establishing a first-world technology in a developing country, where many of the proponents of the technology claim to want to see it used."

"You can make a complex vaccine in plants that's as good as a conventional vaccine," he said in a recent TEDxCapeTown talk.

It's technology that's been incubating at UCT since the 1980s. UCT's Biopharming Research Unit was founded from the Subunit Vaccine Group that developed from the plant virology laboratory started in the 1970s. Rybicki has been at the helm since 1985.

Since then, he and his team have collaborated with organisations inside and outside the country on mainly human viruses of 'vaccine interest'. In 1999 they became part of two big local vaccine-development consortia, the South African AIDS Vaccine Initiative (HIV-1 subtype C) and a project on novel vaccines against human papillomavirus, the cause of

Charles Arntzen of Arizona State University, the plant biologist who helped establish the 'plantibodies' technology, points out that it takes 30 to 50 kg of tobacco leaves for a single course of ZMapp, the US–Canadian experimental therapy antibody-based drug for the Ebolavirus, and four to six months to get clinical-grade medicine.

The clinical grade batch of ZMapp, manufactured by San Diego-based Mapp Biopharmaceutical, was tested on macaque monkeys. A recent article in **Nature** reported that, of the 21 macaque monkeys infected with the Ebolavirus, the 18 that got three doses of ZMapp lived.

There's promise and hope.

"But we don't know whether it works for humans because we haven't had a full-scale human trial," says Rybicki.

Ebola haemorrhagic fever, assumed to be carried by bats, first appeared in the Democratic Republic of Congo (DRC) and Sudan in 1976, in DRC again in 1995, and several times since; however, these outbreaks have all been small compared to the current West African epidemic.

It was the 1995 Kikwit epidemic in the DRC that grabbed Rybicki's attention and fuelled his interest in the field – largely because he was able to use an honours student's essay on emerging diseases, plus daily updating from various sources, to provide some of the only reliable information on Ebola on the then very new World Wide Web.

"It kills up to 90 percent of people it infects and is highly unpredictable, popping up wherever it feels like it, from West Africa to the southern Congo to Uganda, and it also hits healthcare workers."

A recent news report said that ZMapp could be made somewhere in Africa and that South African officials had been in talks with US officials and the manufacturers of ZMapp to develop a facility here.

"We most certainly have the expertise and research infrastructure to support a facility," Rybicki was quoted. "Trouble is, it needs to be built."

While the technology produces drugs faster and more cheaply

based biopharmaceutical company, Medicago to develop a vaccine against human papillomaviruses (HPV), which cause cervical cancer.

Having perfected their 'biofarming' process over many years, the UCT unit was the first group worldwide to produce significant amounts of human papillomavirus protein in plants, Rybicki added.

In fact, the unit's new name reflects this shift from basic virology and vaccine research towards more applicable research to produce 'farmed' human and animal therapeutics in plants.

Aside from HPV, BRU has also worked on HIV and avian and human influenza, as well as on animal viruses such as bluetongue virus, and beak-and-feather-disease virus of parrots, and enzymes of interest to diagnostic kit makers.

"Because the main advantages vaccine farming has over conventional production are the speed of response and the extreme scalability of production, it should initially be used for 'niche' products such as emergency response vaccines and bioterror response vaccines."

"Because the main advantages vaccine farming has over conventional production are the speed of response and the extreme scalability of production, it should initially be used for 'niche' products such as emergency response vaccines and bioterror response vaccines," says Rybicki. "This is because a short response time is vital in responding to unexpected outbreaks or incidents, and scale of production essentially depends only on how many plants are available, or needed – rather than on expensive and hard-to-expand fermentation facilities.

would become a major factor in determining economic viability," he wrote in a co-authored **Human Vaccines** paper in 2011.

Since Ebola has been on the radar since the 1970s, why has it taken so long to produce vaccine and medicines?

"It's worth remembering that in the years between the first outbreak of Ebola in 1976 and the next in 1995, only a few labs worldwide were working on Ebola," Rybicki explains. "And they were mainly in the Soviet Union and the USA, and they were doing it because of the bioterror or biowarfare potential of viruses like this."

Recently Russia announced it was working on three new Ebolavirus vaccines, hoping to produce these in the next six months.

And, while Ebola dominated headlines, perspective is needed, says Rybicki.

"The number of people who've died through the recorded history of Ebola is less than the number who die of influenza every year: up to 400 000 worldwide, 40 000 of them in the USA alone... It is as necessary to have cheap vaccines for influenza and other diseases of low-income populations as it is

UNDERGRADUATE RESEARCH:
FROM THE BOTTOM UP

"Once the research bug bites you, it will never let you go," says the deputy vice-chancellor for teaching and learning, Professor Sandra Klopper. She is leading a campaign to encourage research-led teaching at UCT and increase the visibility of undergraduate research.

The purpose, she explains, is to instil in students a love of research from the very start of their studies. "Once this love of research has been awakened, and students go onto postgraduate studies and continue to be researchers, the chances are that they will remain academics."

Klopper was speaking at the launch of UCT's first undergraduate research journal at the Libraries' Research Week 2015. Titled UR@UCT, the journal is part of an institution-wide focus on identifying good practice in undergraduate research and growing capacity for undergraduates to get involved in research projects previously restricted to postgraduate students.

This feeds into the institution's strategy to grow the next generation of academics for South Africa.

Undergraduate research is of value to students, even if they have no intention of continuing on to an academic career, says the quality assurance manager in the Institutional Planning Department, Lisa Cloete, whose department led the campaign to put undergraduate research on the map. "Students exposed

Undergraduate students collecting specimens at Wolfgat Nature Reserve in Cape Town.

percent decided to pursue a PhD because of their experience in undergraduate research.

Considering South Africa's shortage of PhD students and up-and-coming academics, this finding in the USA is not insignificant.

It may be particularly important for encouraging black South Africans into academia. "Many people who are in academia are not necessarily there because they planned it that way, but because they discovered the joys of doing research while doing a master's degree," says Dr Nelleke Bak, the former

WHY WE SHOULD CARE ABOUT DUST

AND THE CRUCIAL ROLE IT PLAYS IN OUR CLIMATE

Dust doesn't get a lot of attention until it collects in dark corners, or blows up in dramatic storms. However, that is beginning to change. While carbon dioxide is the main driver of climate change,

The role of airborne particles (collectively known as aerosols) in the atmosphere is far from straightforward: one of their most significant impacts is that they contribute directly to the cooling of the earth, as they reflect the sun's rays away from the earth. But they also play a role in heating the earth, by absorbing outgoing radiation from the earth and other objects that emit heat, which then contributes

emission zones, such as the Bodele depression in Chad, or Owens Lake in California.

While scientists have identified the major global point sources around the globe, they do not yet understand what controls the dust-release process, or indeed the dust supply to these source points and regions.

THE DIFFICULTIES OF MODELLING DUST

This has become a crucial weakness in creating numerical models, but skilful simulation of the dust cycle depends on realistic representations of the sources of dust. However, these areas are discrete, very remote, and not systematically monitored. Until recently, measurements of African dust have been carried out at locations remote from dust-source regions, such as over the Atlantic and North America.

One important project that aims to rectify our lack of knowledge about dust is the Dust Observation for Models Programme (DO4), a £1.5-million project funded by the Natural Environment Research Council (NERC) in the UK. Richard Washington, professor of climate science at Oxford and principal investigator of the project, leads it in collaboration with other research institutions, including UCT.

The project has been monitoring dust-emission hotspots in the Makgadikgadi Pans in Botswana, the west coast of Namibia, and the Etosha pans.

"These areas are particularly suitable," explains Dr Frank Eckardt of the Department of Geographical and Environmental Science, who is leading UCT's input into the project, "as they are typical and representative of major dust-source regions and processes worldwide."

UCT's role has mainly been to identify the dust sources – how dust becomes airborne – through the use of a variety of satellite images. Of the £1.5 million, around £800 000 has been spent on the advanced technological equipment needed for the project.

You might think the answer to how dust becomes airborne is obvious: wind. However, explains Eckardt, there are many more complex factors that play a role. "Finer and drier dust particles are more likely to be released. There are also crusts that form a kind of lid, preventing dust from escaping into the

One of the eleven observation sites on the Makgadikgadi Pan in Botswana. The sampling equipment measures wind and dust as well as surface conditions and processes.

Low-level cloud covers about 10 percent of the world's oceans and acts as a mirror, reflecting energy into space; its presence or absence, therefore, has important implications for ocean temperature and climate change. Clouds form as a result of condensation, which occurs when moisture adheres to particles in the atmosphere, some of which are dust particles.

One of these projects is CLARIFY (Clouds and Radio-active Impacts), another NERC-funded UK-wide consortium between the UK Meteorological Office and the universities of Oxford, Reading, Leeds and Manchester, and led by Washington.

The fate of aerosols is still poorly understood. CLARIFY, along with ORACLES (discussed below), seeks to study the area over the south-east Atlantic off Namibia, as this region hosts some of the largest aerosol optical depths on the planet. Aerosol optical thickness refers to the degree to which aerosols prevent the transmission of light by absorption or scattering of light.

ORACLES (Observations of Aerosols Above Clouds and their intEractionS) is another project, funded by NASA to the tune of $30 million, which will look at the atmospheric interplay

FORGET THE MYTHS
ABOUT IMMIGRANTS

Somali migrants, Muminom Omar and Ifrah Ahmed, who live and work in the Western Cape.

A new wave of attacks on foreign migrants working in the informal economy makes it clear that the problems that bubbled over recently are far from resolved.

hard-working entrepreneurs who employ similar techniques to those of formal retailers.

This finding is among many drawn from extensive surveys of foreign informal-business owners in Johannesburg and Cape Town by the International Migration Research Centre, alongside researchers at the Southern African Migration

or the municipality. Together, the 500 migrants interviewed in Cape Town paid just under R10 million a year in rent.

- Foreign migrants source most of their goods from South African formal shops and contribute to the tax base. The vast majority of interviewees obtained their supplies from formal economy wholesalers, supermarkets and South African factories. They are paying VAT on these goods.

Taken as a whole, the study suggests that foreign-owned informal businesses are interwoven with the local economic landscape, and are making a contribution that has not been sufficiently acknowledged in recent debates and policy pronouncements.

Migrant entrepreneurs are celebrated in many countries for their contribution to economic growth and employment creation. In South Africa, the opposite appears to be true, as the ongoing violence against migrant businesses makes all too clear.

In fact, the problems foreign entrepreneurs face are similar to those faced by their South African counterparts – too many competitors, lack of access to credit, and theft and other crimes. In addition, as the new wave of violence has painfully demonstrated, they experience frequent verbal and physical abuse because they are foreign.

The truth is that most of the competitive strategies employed by foreign businesses simply follow the example of South Africa's formal retailers. For example, they tend to:

- Have long opening hours. Most migrants and refugees work extremely long hours, and their spazas, for example, often open at 5.00 am and close at 11.00 pm.
- Take care with sourcing goods. While some buy collectively from wholesalers, the importance of bulk buying is often exaggerated. Rather, most foreigner shopkeepers carefully compare prices of wholesalers and often share transport costs.
- Have a loss leader, which involves selling a key commodity such as bread below its market cost to stimulate sales of more profitable goods.
- Rely on high turnover and a low mark-up on goods for profits. Even then, the profitability of the foreign-owned business is often overestimated: the majority of Johannesburg migrant business owners, for example, reported profits of R5 000 or less a month.

This suggests that there is nothing unique about the business practices and strategies of migrant entrepreneurs.

Creating platforms where foreign and South African entrepreneurs can engage with one another would be a positive step – but Zulu's plan for a detailed 'sharing of business practices' is not the answer. Rather than focusing on regulating foreign businesses and telling them to share their secrets, the government would do better to focus on putting in place policies that support the informal economy.

While initiatives such as that in Gauteng to revitalise township economies are promising, they should not exclude the foreign entrepreneurs, who contribute a great deal to the South African economy.

Story by Jonathan Crush and Caroline Skinner. Images by Thom Pierce. This story first appeared on TimesLIVE.

Below: Thomas Mhlunga from Mozambique runs a tailoring business in Gauteng.

SOUTH AFRICA BY NUMBERS:

WHAT IS HAPPENING TO POVERTY, EMPLOYMENT AND DISEASE?

Above: image courtesy of Niko Knigge. Top: image courtesy of Wikimedia commons.

The National Income Dynamics Study (NIDS) is one of a kind, tracking nearly 30 000 citizens and measuring the changing dynamics of their lives. From

On a wet late-summer's morning, Thulani Nhlapo punches co-ordinates into his GPS and we set off from Mthatha, through thick traffic and muddy potholes, to the national road. We drive north, climbing through the mist, and then east on a gravel road until we reach a village

We reach the spot that Nhlapo has aimed for: a small, neat homestead of brightly painted huts. Mrs Nomakhaya Ndlovu [not her real name] welcomes us into the biggest hut. The room is bare except for a few wooden and plastic chairs, a sideboard with ornamental plates and pots, and a fridge that does not work but is used as a cupboard. The interior walls are bright pink. On them are sheets of prayers in isiXhosa: Ndazisa ukuba/Sibambene/Ngantoni na/Ndicele uXolo (Let me know what I have done wrong, so that I can ask for forgiveness).

Here we find 28-year-old Palesa More, who has come down from her home on the East Rand. She checks the GPS co-ordinates outside, and inside takes out a tablet and a notebook and carefully writes down the names of all the people living in the homestead. She is one of the 128 interviewers currently in the field for the National Income Dynamics Study (NIDS).

Nhlapo, 31, is a field supervisor for Geospace, survey specialists who have been contracted by the Southern Africa Labour and Development Research Unit (SALDRU) at UCT to interview thousands of people around the country for this study.

Some 28 000 individuals in South Africa are tracked every two years. They are guaranteed confidentiality. Each member of the household is interviewed, measured, weighed, and has his or her blood pressure taken. From this we know that poverty is falling, but that nearly two-thirds of those classified as poor in the 2008 survey were still poor in 2012. And that about 22 percent of those who were non-poor in 2008 had fallen into poverty by 2012. That nearly half of employed youths (46 percent) don't have stable employment. And that obesity rates are soaring, making chronic lifestyle disease the second most pervasive illness after HIV/AIDS.

"It is the only survey where we get to see the dynamism in people's lives," says Ingrid Woolard, an economics professor at UCT and one of the principal investigators of NIDS.

NIDS is now in its fourth wave, and the interviewers have spread out across the country like a small, patient army. They interview every person in a household except very young children, or those in prison or hospital. To visit one household can take a whole day, even longer.

going to need to know they are there, to understand how the household income works."

Commissioned by the Policy Unit in the Presidency in 2007, NIDS aims to provide a picture of the changes in people's lives in the country. It is intended to provide empirical evidence for policy-making. Brown's experience in other parts of the world has taught him that "there is lots of policy made without evidence; so it was a high-leverage thing to do".

Mastoera Sadan, the project manager of NIDS, has worked in the Presidency for the past 11 years. She says it became apparent to government 10 years ago that it needed to understand the changing dynamics in South Africa. NIDS has helped to draw a picture of how lives change. "We should see it as a national resource, and work hard to ensure that government uses it," she says. "Otherwise we are just doing things by the seat of our pants."

Here are a few important lessons from the NIDS data: one is that, among the poorest people, there is enormous "churn", to use Brown's term. In many households, "the slightest windfall" – like getting a job – is enough to push them out of poverty. But losing a job, or having indigent relatives move in, can push them back just as quickly.

> There is nothing else like NIDS in the country – or indeed in most countries. There are only a handful of similar household income and expenditure surveys in the world that track the same people on a regular basis.

The second lesson is that child-support grants are well targeted, and make a difference – not only to the health of children, but to their chances of staying in school longer.

The third, and most salutary, is how unequal a society we are. The graph on income distribution drawn up by NIDS is a long

the richest believe they are two or three rungs below where they actually are (two percent think they are among the very poorest). Partly, this is a legacy of apartheid. Our separation is still so profound that, as Brown says, people in Sea Point "regard themselves as terribly poor – because their neighbours are in Clifton, not in an informal settlement".

About one-third of the poorest, though, correctly understand that they are on the lowest rung of that ladder (the rest think they are better off than they are). Mrs Ndlovu is near the bottom. She has six children, three of whom are entitled to grants, and her husband gets a disability grant. She has, since the last interview, taken in a nephew whose parents have died. But, she says, another relative is getting the foster grant.

More, the NIDS interviewer, has a long list of questions: addressed first to the household, then to each individual in it. Mrs Ndlovu is about 40. Of her six children, the first was born when she was 16, her youngest 12 years ago. She has never worked, and has lived in the village all her life. (According to NIDS, 'movers' – migrants – are more likely to find work than 'stayers'.) She left school in grade seven. She gets about R2 400 a month in grants "but it finishes soon".

But, she says, things are better than they were 10 years ago. Grants have improved her life. Her assets are: a vegetable garden, 11 goats, 15 sheep, three chickens, two dogs (and two skeletal puppies), two horses, three pigs, a cat, and an affectionate kitten.

She is puzzled when asked how much her house is worth. More asks how much she thinks she would get if she sold it. She shrugs and says, maybe R5 000.

It is perhaps in these surveys that the poor, separated by distance, education and language from the rich, get some glimpse into the lives of the top 20 percent.

"Do you have a TV?" asks More.

Hayi. (No)

A computer?

She has a radio and a cellphone (as almost all South Africans do). Her income goes almost entirely on food and on school uniforms. Her children get their schoolbooks free, but she has to cover them. There is a communal tap a few metres from her house, but it is sometimes broken. Better to rely on her large green water tanks – Jojos – to collect the summer rainwater. She has electricity, but uses it only for light – it is too expensive for heat or cooking. And she has a pit latrine with a ventilation pipe.

When the children return from school, they are interviewed, measured and weighed. The youngest tries to persuade me that a bicycle (for him) would be a good investment in his education. He could ride to school instead of doing the 20-minute walk. But More quickly disabuses him of any notion of a bicycle. The interviewers give 'incentives' – small gifts such as beanies or clocks – but never money. The fieldworkers tell the interviewees that the information is for the university. And perhaps the government can use it to make their lives better.

> Young men are among the poorest of the poor. They are not eligible for grants and are unlikely to get a job. They are the most disaffected and volatile group. In the urban areas, this is more apparent.

In fact, the data on schools seems to have had some effect. There is now a school within two kilometres of every household. The problem, though, in the case of the Ndlovu children, is that the school only goes to Grade 9. After that, they must walk further. We cannot establish how her teenage son has navigated those difficult senior school years because he "gets away" without being interviewed, as More says. After pasturing the goats and sheep, he goes out and does not return, despite her pleas.

Grandfather and subsistence farmer Selby Hambisa, 79, sits with his wife Nolayani Hambisa, 62, in their family communal mud hut in the hills near Coffee Bay, South Africa.

He was angry. "He asked why we chose this specific house, why didn't I go to the leader. And then he wanted to whistle to call the people so they could do mob justice on me ... That was the worst experience."

Eventually, he and his female colleague negotiated their way out of there, and past a "big dog" in the yard, which they persuaded the suspicious householder to restrain.

Nhlapo goes everywhere in the country – rural villages, suburbs, small towns, informal settlements and the "high wall" areas. Of these, he says, informal settlements and settlements, they face danger if they don't know who to ask for "permission" to interview the residents.

He is also struck by the lack of "social cohesion" in the country. "When people ask me what is the most 'developmental' thing they can do, I say, pay your taxes."

The point of NIDS, though, is not to prescribe. "In government we struggle with complexity," says Sadan. "Politicians in particular want simple answers to complex social phenomena."

As the sun begins to fade, the battery on More's tablet dies.

SATELLITE TRACKERS
SHOW VULTURES ON DECLINE

Using aerospace technology to look at dwindling Bearded Vulture populations from afar

In an academic paper titled "Anthropogenic activities influence the abandonment of Bearded Vulture (**Gypaetus barbatus**) territories in southern Africa" written by bird experts at UCT's Percy FitzPatrick Institute of African Ornithology, Dr Sonja Krüger, Dr Robert Simmons and Dr Arjun Amar examined

"But even in these isolated mountains, the population continues to decline, due to human encroachment on nesting sites and feeding territory."

Results, they said, also suggested that food abundance might influence the bird's overall distribution, and that supplementary vulture-feeding schemes might be beneficial.

The study concluded: "We recommend that mitigation of existing power lines, stricter scrutiny of development proposals, and proactive engagement with developers to influence the placement of structures is essential within the home range of a territorial pair."

In a second study conducted between 2007 and 2014, titled "Differential range use between age classes of Southern African Bearded Vultures (**Gypaetus barbatus**)", also authored by Krüger, Amar and Dr Timothy Reid, data from the satellite trackers backed up the findings made in the other paper.

"The trackers ... provided critical information on movement patterns and mortality. Tagging enabled dead birds to be recovered quickly and their cause of death determined ... The tracking data also provided new information about the birds' ranging behaviour."

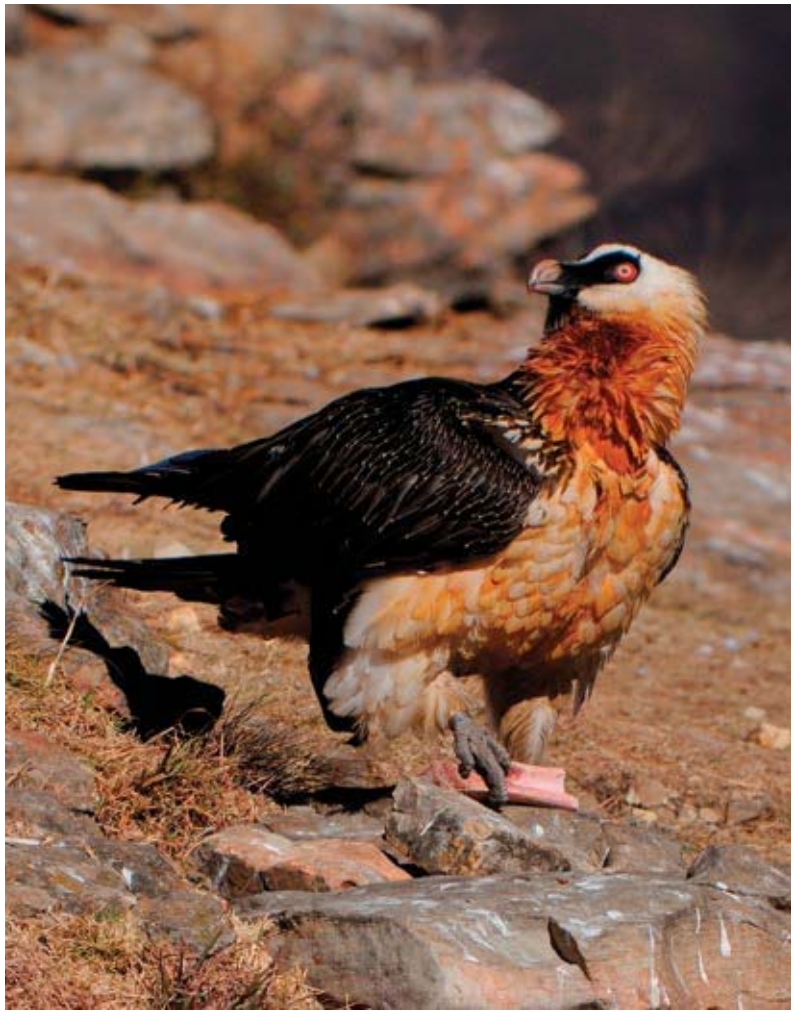
They said some young non-breeding birds patrolled an area the size of Denmark, and the average adult bird had a home range of about 286 km^2. "The range was much smaller for breeding adults, at just 95 km^2."

Researchers used meat lures to capture the birds, which were then each fitted with a 70g solar-powered tracker designed to relay detailed information every hour between 5.00 am and 8.00 pm, including GPS co-ordinates and flight speed.

"The more they travel, the more they risk colliding with power lines or falling prey to poisoning," said Amar.

Plans for multiple wind farms in and around the highland regions of Lesotho, he explained, would be likely to place even more pressure on this vulnerable species, and might be 'the final nail' in this species' coffin.

Last year, Birdlife South Africa, custodian of the International



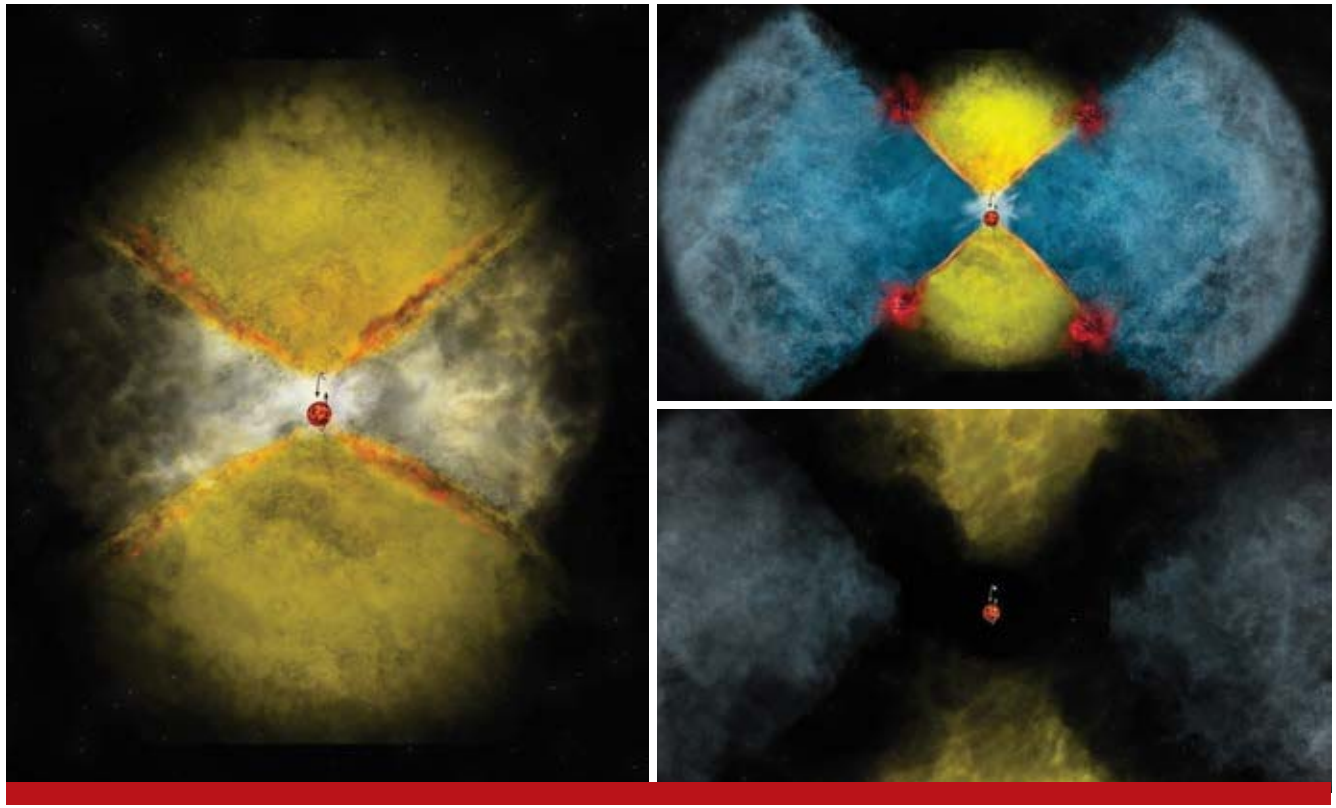
Adult Bearded Vulture feeding.

of Bearded Vultures in the Lesotho Highlands and the surrounding escarpment of South Africa.

"Birds do not observe political boundaries, and the populations span South Africa and Lesotho. Significant impacts on the birds in one country will spill over to its neighbour. We therefore believe that the project has a responsibility to respond to the threat that the proposed Letseng Wind Farm poses to populations of Bearded Vultures, as further declines of birds in

RADIO TELESCOPES

UNRAVEL MYSTERY OF NOVA GAMMA RAYS



Highly detailed radio-telescope images have pinpointed the locations where a stellar explosion called a 'classical nova' emitted gamma rays, the highest-energy

The discovery revealed a probable mechanism for the gamma-ray emissions, which mystified astronomers when they were first observed. "We not only found where the gamma rays came from, but also got a look at a previously unseen scenario that may be common in other nova explosions," said Assistant Professor Laura Chomiuk of Michigan State University in the USA, lead author of the paper that has recently been published in Nature.

nearby star onto itself. This causes an increase in pressure and temperature that eventually triggers a thermonuclear explosion, which blows debris into space.

Astronomers did not expect this process to produce high-energy gamma rays, which are usually produced by the hottest and most energetic objects in the universe (the Sun, for instance, also produces gamma rays, but right in the core, where the temperatures are extreme). However, in June 2012, the US National Aeronautics and Space Administration (NASA)'s Fermi spacecraft detected gamma rays coming from a nova called V959 Mon, some 6 500 light years from Earth.

"Nova eruptions are the most common galactic explosions," says Ribeiro. "This particular explosion was very interesting: because it was the first to produce gamma-ray emissions, there was a lot of interest in understanding its parameters."

Ribeiro was one of the first astronomers to model the V959 Mon nova in order to determine its shape more accurately. "Radio wavelengths are ideal for measuring the basic parameters of these explosions, such as their mass and how energetic the explosion was," he says. "However, many of the models applied to date have been assuming that the geometry of these explosions was spherical, since this is the easiest approximation."

Ribeiro's models, however, discovered that the eruption had a bipolar shape, similar to a dumbbell. This has contributed significantly to a better understanding of the process. When the nova first erupts, the force of the explosion causes the white dwarf and the nearby star to lose some of their orbital energy. This propels the ejected matter even faster, out into the plane of their orbit. Later, the white dwarf blows off a faster wind of particles along the poles of the orbital plane. When the faster-moving polar flow hits the slower-moving material at the equatorial region, the shock accelerates particles to the speeds – close to the speed of light – that produce the gamma rays.

Since the observation of the V959 Mon nova, Fermi has detected gamma rays from three further nova explosions. "This mechanism may be common to such systems. The reason the gamma rays were first seen in V959 Mon is because distances, allowing us to start exploring these systems – not just as individuals, but as populations."

Ribeiro himself, meanwhile, has just taken up a position as a Radboud Excellence Fellow at Radboud University in the Netherlands, a fellowship awarded to exceptionally talented young researchers. This is just another step on the trajectory for Ribeiro, who is a living example of SKA's intent to nurture African talent and prepare it for future leadership roles in SKA science.

Ribeiro is still closely linked to the UCT team and hopes to return to Southern Africa in time for the start of the MeerKAT/SKA era. "The SKA fellowship allowed me to be part of a vibrant and rapidly changing environment, as well as to build lasting relationships with the South African astronomy community."

NOVA EXPLOSION PROGRESSION

Radio telescope images have revealed in detail the progression of a classical nova explosion.

In the initial explosion (opposite: left), the nova envelope – the nuclear explosion that encompasses the white dwarf and its nearby companion – expands (the light yellow area). This interacts with the binary system, which you can see right in the middle: a star and a little circle, showing the orbit. The effect is that material in the equatorial region (dark yellow, going vertically in the image) becomes much more dense.

After the initial explosion (opposite: top right), the dense material (now in yellow) starts moving at a slower velocity, as the material coming out of the poles moves at a much faster velocity (now in blue). This is because there is not much interaction at the poles, so the material can flow smoothly. This difference in velocity is what produces the shocks (orange lines), and the red blobs depict the shocks in the radio emission. The reason we don't see these shocks in other regions is because they are embedded within the ejecta, which is opaque (in the same way that you cannot see through a dense cloud).

RARER THAN RHINO

AND JUST AS PRIZED BY POACHERS

Critically endangered cycads are disappearing from the wild and from botanical gardens, ripped up by the roots to feed the lucrative

A method that has been used to trace cocaine, explosives and bank notes is being applied for the first time to help combat the illegal trade in cycads. In a paper published in the **Journal of Forensic Sciences** and reported on in **Nature**, Kirsten Retief and colleagues at UCT and the South African National Botanical Institute (SANBI) describe their

raids at Kirstenbosch National Botanical Garden in Cape Town in August 2014. The poachers stole 24 cycads, a haul worth more than R700 000.

"It was a very well-orchestrated operation," says uPhakamani Xaba, senior horticulturist at Kirstenbosch. "It was a rainy night on both occasions. They knew exactly which plants they were targeting – they even went for female plants, which are normally worth more than male plants." Some of these slow-growing plants had been nurtured in the Kirstenbosch nurseries for 20 years and were only planted a year or two ago.

Thefts like these pose an urgent challenge to those charged with protecting South Africa's cycads. Kirstenbosch has ramped up its security in the wake of the two raids, but plants in the wild remain extremely vulnerable.

"These plants sell by the centimetre," says Dr Adam West, senior lecturer in UCT's Department of Biological Sciences and lead principal investigator on the project. "A large rare plant will sell for around R400 000. When you put a price tag like that on a plant, there's an incentive."

Trading in these endangered cycads is illegal – banned by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) – but enforcing the law relies on the ability to prove that a cycad in someone's garden came from the wild.

A range of techniques has been used in the war on poachers, including microchips and micro-dotting: spraying the plants with 100 or more miniscule dots, each of which contains an individualised reference code. However, neither of these methods is foolproof. Poachers have taken to x-raying plants and digging out the microchips, and both methods rely on going into the wild and tagging each plant at risk.

"SANBI approached us for help in developing a technique to trace cycads that showed up in suspicious locations where they'd never been seen before," says West. "Cycads have very localised distributions, so we can characterise their environment relatively well using stable isotope composition."

The researchers can take tissue out of the stems of cycads at can see burn marks and porcupine bites on them," says Retief. "Our method will test their stories."

"The advantage of this method," explains West, "is that the signature has been locked up in the plant's tissue, and you can't get rid of that. It's not like a microchip, which you can pull out. It's not like a DNA marker, which tells you about parentage but doesn't tell you about origin. And it's not like most methods where you have to go into the wild to label the plants – we can trace these plants without having seen them before."

There is a great sense of urgency, he says. "When we go out into the wild to survey some of those populations, we go to locations where they were, and there are just holes in the ground. These plants are disappearing from the wild over timeframes in the order of weeks and months, not years."

CYCADS: KEY FACTS

- Cycads are the world's oldest seed plants. They have existed for 340 million years and have survived three mass extinctions.
- Globally there are 303 extant cycad species, of which 63 percent are classified as threatened.
- South Africa is a hotspot for cycad diversity with 38 indigenous cycad species (more than 10 percent of the world's cycads). Three endemic species are extinct in the wild, 12 are critically endangered and four are endangered. Of the 12 critically endangered species, three species have not been seen in the wild since 2006, and four have fewer than 100 individuals remaining in the wild.
- This makes cycads more threatened than the rhino (the white rhino is near threatened; the black rhino is critically endangered).
- More than 50 percent of our cycads face extinction in the near future.
- All South African cycads are on appendix 1 of CITES, therefore trading in any wild cycad is illegal.
- Cycads are gymnosperms, like conifers: they reproduce through huge seed cones rather than producing flowers

125-MILLION-YEAR-OLD CHANGYURAPTOR

SHEDS LIGHT ON DINOSAUR FLIGHT

An international team of experts, including Professor Anusuya Chinsamy-Turan of UCT, has

The international team was led by Dr Luis Chiappe, a palaeontologist from the Natural History Museum of Los Angeles County, USA. Their findings, which were published in **Nature Communications**, show that, with a weight of four kilograms, the 122-cm-long

Changyuraptor fossil with details of plumage.

According to 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.

"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 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 (30 cm in length) helped to keep it airborne and could have assisted with landing."

are of particular importance. "It makes sense that the largest microraptorines had especially large tail feathers – they would have needed the additional control," says Dr Michael Habib, a researcher at the University of Southern California in the 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. According to 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."

Illustration (facing page) by S Abramowicz. Image by Luis Chiappe.

NEW DINOSAUR FROM SOUTH AFRICA GETS SESOTHO NAME

South African and Argentinian palaeontologists have discovered a new early dinosaur from South Africa. The specimen was found in the late 1930s in the Zastron area of South Africa, about 30 km from the Lesotho border. Considering the location of the discovery, it was decided that a Sesotho name would be appropriate and that, since in Sesotho 'sefapano' means 'cross', the dinosaur should be named **Sefapanosaurus**. Professor Anusuya Chinsamy-Turan and PhD student Emil Krupandan are part of the team that named the dinosaur.

For a long time, the remains of the dinosaur just languished on the shelves in the collections at the Evolutionary Science Institute (then the Bernard Price Institute) in Johannesburg. A few years ago it was studied and considered to represent the remains of another South Africa dinosaur, **Aardonyx**. However, close scrutiny of the fossilised bones of this approximately 200-million-year-old dinosaur has revealed that it is a completely new dinosaur. One of the most distinctive features is that one of its foot bones, the astragalus, has a cross shape, for which the dinosaur is named.

The remains of the **Sefapanosaurus** include limb bones, foot bones and several vertebrae. Dr Otero, lead

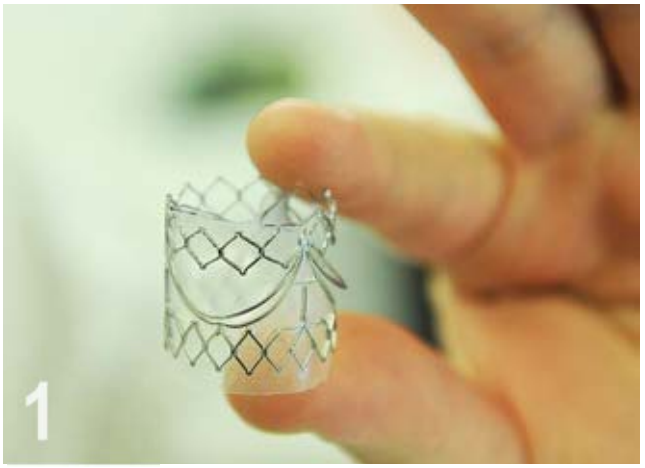
HEALTH BY DESIGN

CUTTING-EDGE LOW-COST LOCAL INNOVATIONS

Innovation, whether reÁected in **technology, design or systems, is the lifeblood of the health sciences; and at UCT it's being harnessed**

1. HEART VALVES

Several initiatives tackle the high rates of heart disease in the country and in the rest of Africa. Strait Access Technologies (SAT), a UCT spin-out company, develops and manufacturers cardiac-related medical



2. TITANIUM BONES

Mechanical engineer Dr George Vicatos has married engineering know-how and a life-long interest in the medical field to design titanium-alloy bone and joint implants and prostheses, changing the lives of more than 500 patients at home and abroad. This technology can salvage a damaged or diseased limb, and avoid the need for amputation. Recently, Vicatos and his team of Dr Rushdi Hendricks and student James Boonzaier made another surgical breakthrough in a tricky area: the upper jaw (maxilla). The Maxillofacial Distractor is a semi-circular structure with a moveable carrier that allows patients who are missing large parts of the upper jaw to regrow their own soft tissue and bone, from gums to palates.

3. SMART GLOVE FOR LEPROSY PATIENTS

Indigenous technology developed partly at UCT is helping leprosy patients in India, where a new 'tactile' or 'smart' glove is being tested. The glove, built from a revolutionary fabric with embedded sensors that help patients avoid hand injuries caused by sensory loss due to nerve damage (for example, picking up a hot pot without realising how hot it is), was developed by Dr Sudesh Sivarasu, a biomedical engineer in the Department of Human Biology. The technology tracks pressure points on the palms and fingers and is being tested at the Leprosy Mission Hospital in New Delhi.

5. PINPOINTING BRAIN TUMOURS

Last year, a new colour-coded brain-tumour operating technique was introduced at Groote Schuur Hospital, using 5-ALA, a drug administered before surgery. This drug is preferentially taken up by brain tumours, which literally light up under the operating microscope, helping neurosurgeons pinpoint a tumour's exact location. Pioneering neurosurgeon Dr Sally Röthemeyer of UCT's Division of Neurosurgery conducted the six-hour operation on a 52-year old patient. The division is headed by Professor Graham Fieggen, who in 2009 received a medical doctorate for his work on the innovation known as the Cape Town Stereotactic Pointer (CTSP). Importantly, the CTSP provides a cost-effective alternative for neurosurgeons working in under-resourced settings. The system was patented by the Medical Research Council and has been sold around the world.

6. APP FOR COGNITIVE DISORDERS

The Department of Psychiatry and Mental Health's Professor John Joska has developed the Cognitive Assessment Tool – Rapid Version (C.A.T. rapid), a quick, easy-to-use smartphone application to assist the clinical assessment of cognitive disorders in busy clinical settings, and particularly those where there are limited resources. The app was written for Android, and can be used in multiple healthcare settings to screen for a range of neurocognitive impairments.

7. RAPID TB TESTING

Pioneering pulmonologist Professor Keertan Dheda has developed a test for TB outside the lung (lining of the lung, heart and other organs, also called extra-pulmonary TB). Conventional TB tests (such as GeneXpert) work poorly for this type of TB, which is common in Africa. The same-day test is being commercialised by a UCT-co-owned spin-out company, Antrum Biotech, while a user-friendly bedside version of the test is also being developed. Dheda also led a team whose findings, published in **The Lancet**, showed that placing new rapid TB diagnostic technology in a clinic setting is feasible when the testing is performed by a nurse – making roll-out of this test feasible in TB hot-spots and resource-poor settings. This approach has led to rapid diagnosis of drug-resistant TB, with more patients being placed on treatment.

8. EARLY WARNING SYSTEM

Dr Una Kyriacos's modified early warning score (MEWS) system for adult patients, incorporating a reporting algorithm, has had a significant impact on nurses' recognition and recording of deterioration in their patients. This early-warning system is a useful adjunct to the clinical skill of observation, standardising early-warning signs. Kyriacos's observation chart incorporates existing UK MEWS and, uniquely, unscored clinical signs. MEWS has been adopted by the Western Cape Department of Health for bedside monitoring on general wards at public hospitals from 2015. Kyriacos's research has also inspired medical manufacturer Welch Allyn to incorporate a colour-coded early-warning score protocol in their Respiratory Monitoring and Electronic Vital Signs Documentation System, and to add the UCT MEWS system to their Vital Signs Monitor for demonstration purposes.

9. E-HEALTH MOBILE TECHNOLOGY

In 2004, when civil engineer Associate Professor Ulrike Rivett, together with colleagues Professor Jon Tapson (electrical engineering, UCT) and Dr Jevon Davies (electrical engineering, CPUT), conceived Cell-Life – an e-health mobile-technology development. It addressed two of the country's biggest medical challenges: monitoring patient adherence to antiretroviral (ARV) treatment, and managing stocks of ARVs at clinics and pharmacies. Over the past decade, Cell-Life (now an NGO) has rolled out its in-house pharmacy management platform, 'Intelligent Dispensing of Antiretroviral Treatment', or iDART, to a number of sites in South Africa and the rest of the continent. Users in 112 countries have downloaded the platform, which operates as a stock-and-patient-management system.

10. ELECTRONIC HEALTH REGISTERS

Tier.Net is an electronic register that allows the rapid digitisation of paper registers and further prospective electronic capture for patients on HIV and TB treatment. Developed by the School

11. REAL-TIME POISON INFORMATION

Once described as UCT's most successful social responsiveness project, the Poison Information Centre at the Red Cross War Memorial Children's Hospital recently launched a new internet-enabled platform that makes the most comprehensive poison databank on the continent, AfriTox, available to a broad community of medical practitioners. With more than 40 000 records and accessible via mobile device, AfriTox is used in over 40 centres in South Africa, as well as in Botswana, Zimbabwe, Mozambique, Kenya and Nigeria. In a new development, patient information is now available immediately, thanks to a programme designed to record telephonic information and generate reports in real time, as well as immediate statistics. The programme's developer is alumnus Dr Selig Leyser.

12. DIGITAL MAMMOGRAPHY

Technology developed by Emeritus Professor Kit Vaughan and his team in the Department of Human Biology five years ago has come to fruition in the form of the PantoScanner, an advanced mammography platform that combines ultrasound

than 25 years, 700 technology-dependent children have been able to return home to their families and communities, rather than remain in hospital indefinitely. Although this has saved over 32 500 hospital days, the real saving has been in the social and psychological effects of long-term hospitalisation on the children and families, says Booth.

Compiled by Helen Swingler. Images by Michael Hammond.

We thank the participants who feature in this story and for their permission to be photographed.

Science

strAtegic reseArch PlAn 2015–2020

The new Strategic Plan aims to increase the international impact and relevance of research undertaken in the faculty. It recognises six distinct, multidisciplinary impact areas in which the faculty will strive to become a world leader:

- **African climate & development**
- Biodiversity & the Cape Áoristic region
- **Chemistry & biology for health in Africa**
- **Marine biology & the southern oceans**

12

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348

A□□□□d □□□d
journal units
(Units are assigned to accredited research outputs and translate into a total monetary value)

raised via

nrf ratings

Top-rated researchers

16 A rated

66 B rated

6 P rated

2 new A ratings

in 2014 evaluation round:

- Professor **Russ Taylor,** UCT/UWC SKA Research Chair
- Professor **Patricia Whitelock**, Department of Astronomy and astronomer with the South African Astronomical Observatory

POSTGRADUATES

404
PhD students

463
Master's students

72
Doctoral graduates
– a record high

139
Master's graduates
23 percent with distinction

External AWArDs

Professor **Daya Reddy,** Department of Mathematics and Applied Mathematics and DST/NRF SARChI Chair in Computational Mechanics – named next President of the International Council for Science (ICSU).

Associate Professor **Coleen Moloney**, Department of Biological Sciences and director of Ma-Re Institute – first woman marine scientist to win the national Gilchrist Memorial Medal.

Honorary Professor M a f a received the prestigious John FW Herschel Medal from the Council of the Royal Society of South Africa.

The 2015 Erna Hamburger Prize was awarded to Professor j f a a by the EPFL (Swiss Federal Institute of Technology) WISH Foundation (Women in Science and Humanities), which honours leading researchers in science, engineering and architecture worldwide.

Internal AWArDs

Associate Professor **Sophie Oldfield**, Department of Environmental and Geographical Science – the **UCT Social Responsiveness Award** for her approach to scholarship and pedagogy built through a decade-long collaboration with Gertrude Square and the Valhalla Park United Front Civic Organisation.

Dr **Andrew Hamilton**, Department of Physics, for

Health Sciences

strAtegic reseArch PlAn 2015–2020

Main aim: **'to advance and encourage research excellence within the FHS, within the context of the vision and mission of the faculty and UCT, and thereby improve and promote our national and international standing as a research-led institution'**

Ultimate goal: **to improve the health of the people of South Africa and beyond**

To be achieved through: **improving research infrastructure; building health research leadership and capacity for the future; enabling translation of research into public health impact; encouraging partnerships; increasing funding; strengthening governance and [illegible]**

BenchMArking

10 NRF A-rated scientists

122 [illegible]

(34 B-, 55 C-, 23 Y-rated) out of UCT's 480

48[illegible]

The 2014-15 Times Higher Education World University Rankings places UCT at 48th for **clinical, pre-clinical and [illegible]**

528

A [illegible] **journal units**

(Units are assigned to accredited research outputs and translate into a total monetary value)

r 684 million

raised via

879

contracts

(income increased by 23 percent from 2013)

New Neurosciences Initiative

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DST/NRF SARChI Chair vacancies filled: professors **Anthony Figaji** (Department of Paediatric Neurosurgery) in Clinical Neuroscience; **Graeme Meintjes** (Department of Medicine) in Lung Infection and Immunity; s a Ba (Department of Clinical Laboratory Sciences) in Cancer Biotechnology

Newly awarded DST/NRF SARChI Chair: Professor Aq Da (SA – Swiss Bilateral Research Chair in Global Environmental Health, School of Public Health and Family Medicine)

POSTGRADUATES, POSTDOCTORAL FELLOWS AND EMERGING RESEARCHERS

Over 1 200 postgraduate students

514 FHS students received 862 funding awards to the value of over **R47 million**

54 doctoral graduates – the highest number yet in one academic year

108 postdoctoral fellows, close to a third of UCT's total

Internal AWArDs

Professor c k l u d (Department of Psychiatry and Mental Health) won UCT's Alan Pifer Award in recognition of outstanding welfare-related research

Professor **Gregory Hussey** (director of Vaccines for Africa and acting dean) elected to UCT College of Fellows

Honorary Professor W am P k (School of Public Health and Family Medicine) awarded President of Convocation Medal (2014)

UCT College of Fellows Young Researcher Award: Dr l **Johnson** (Centre for Infectious Disease Epildemiology Research)

External AWArDs

14 MRC (Medical Research Council) Strategic Health Innovation Partnerships Awards

MRC Flagship Award to Professor **Robin Wood** (Department of Medicine and director of the Desmond Tutu HIV Centre)

MRC awarded Collaborating Centre for Malaria, a Gynaecological Cancer Research Centre, four Collaborating Centres for TB and/or HIV/AIDS, and a new MRC unit

MRC Platinum Medals for lifetime achievement awarded to professors **Gregory Hussey** and **Robin Wood** (Department of Medicine and director of the Desmond Tutu HIV Centre)

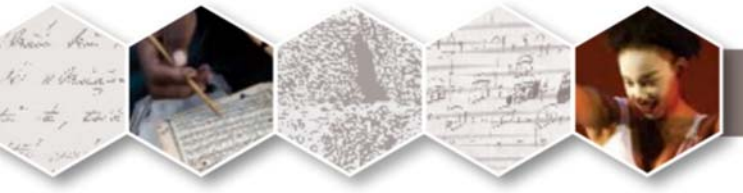
Three Silver Medals were awarded by MRC to recent postdoctoral researchers for scienti¿c or capacity-building contributions

12 researchers received NRF Career Advancement Fellowships

NRF Lifetime Achievement Award: Professor **Lionel Opie** (Hatter Institute of Cardiovascular Research)

World Lung Health Award: Professor h a Za (Department of Paediatrics)

World Hypertension League Award: Professor B a r a



Humanities

fAcUlty reseArch strAtegy

The faculty aims to:

Support and encourage current research through its disbursement of funds through the block grant process

Enable senior academics to display academic leadership in advancing work in their discipline and in mentoring more junior colleagues

Foster the next generation of scholars through postdoctoral fellowships and doctoral scholarships (renewable for three years)

Reward and incentivise good scholarship

4

Dst /nr f sAr c i c a

A d d **journal units**

(Units are assigned to accredited research outputs and translate into a total monetary value)

193

79 **NRF-rated** a

5 A rated

27 B rated

Internal AWArDs

Professor Mark Fleishman (Department of Drama) was awarded the 2015 Creative Works Award for his production, Every Year, Every Day, I am Walking

Professor **Sa'diyya Shaikh** (Department of Religious Studies) has won the 2015 UCT Book Award for her exploration of the ideas of a 13th century Sufi mystic, poet and scholar in Sufi Narratives of Intimacy

Associate Professor **Xolela Mangcu** (Department of Sociology) received the Meritorious Book Award for his telling of Steve Biko's story in Biko: A Biography

External AWArDs

Sheila Biddle Ford Foundation Fellowship from Harvard University: Associate Professor **Floretta Boonzaier** (Department of Psychology)

African bid for the Optimus Study: Associate Professor Carmen Ward (Department of Psychology); Associate Professor **Lilian Artz** (Gender, Health and Justice Research Unit); Patrick **Burton** (Centre for Justice and Crime Prevention)

Shuttleworth Foundation Flash Grant: Associate Professor **Marion Walton** (Department of Film and Media Studies)

NRF Blue Skies award: Associate Professor **Mohamed Adhikari** (Department of History)

Oppenheimer Trust Grant: Associate Professor Andrew Tshabangu (School of Music)

NRF Grant to associate professors **Morné Bezuidenhout** and Thembinkosi Sambudla (School of Music)

POSTGRADUATE ENROLMENTS AND POSTDOCTORAL FELLOWS IN 2015

28 Postdoctoral fellows

New master's course launched:

Commerce

36

NRF-rated

2

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r 107 million

Grant and contract income

78

A d d
journal units

(Units are assigned to accredited research outputs and translate into a total monetary value)

Postgraduate students

– an all-time record

Highlights of SCHOOLS and DEPARTMENTS

Graduate School of Business

- In partnership with MTN, launched the MTN Solution Space – it will give MTN unique opportunities to engage with the next generation of African innovators through the GSB Africa Fellows Programme
- The first paper written by researchers based in Africa to be published in American Management Review

Graduate School for Development Policy and Practice

- 2 major books: The Oxford Companion to the Economics of South Africa by **Haroon Bhorat, Alan Hirsch, Ravi Kanbur** and Mthuli Ncube (eds) and Working with the Grain: Integrating Governance and Growth in Development Strategies by Brian Levy

College of Accounting

- Published 7 textbooks of which the majority are prescribed at most South African universities
- Launched an online journal, Accounting Perspectives in Southern Africa

Department of Finance and Tax

- The Tax Section negotiated the co-operation agreement with the International Bureau of Fiscal Documentation, based in the Netherlands, for collaborative research

Department of Information Systems

- Professors **Ojelanki Ngwenyama**, Urooj Khan and **Lisa Seymour** were awarded project grants of

Highlights of RESEARCH GROUPINGS

African Collaboration for Quantitative Finance and Risk Analysis

- Co-hosted 2-day workshop on quantitative finance with Prescient Securities

Southern Africa Labour and Development Research Unit

- Dr **Brendan Maughan-Brown** and Dr Vimal **Ranchhod** were awarded NRF Junior Research Fellowships
- Won the tender for the 4th wave of the National Income Dynamics Survey

Research Unit in Behavioural Economics and Neuroeconomics

- Conducted studies on problem gambling prevalence and its determinants with 10 000 subjects in Denmark, funded by Danish government
- Designed and studied results of 4 behavioural economic interventions in the Western Cape

Institute for Monitoring and Evaluation

- Designed an M&E framework for the Office of Astronomy for Development – to be published in Science
- Was awarded a tender for a national programme for emerging farmers

Development Policy Research Unit

Engineering & the Built Environment

Professor Alison Lewis is the first woman dean and the fifth permanent dean of the Faculty of Engineering and the Built Environment (EBE)

6

Dst /nr f sAr c i
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Professor A aud Ma a (Department of Mechanical Engineering) appointed to a DST/NRF SARChI Chair in Industrial Computational Fluid Dynamics

Professor **Vanessa Watson** (School of Architecture, Planning and Geomatics) is leading a new ESRC/DFID-funded R2 million project through the African Centre for Cities called 'Consuming Urban Food' in collaboration with partners in Zambia, Zimbabwe and Kenya over the period 2015–2017

A d d
journal units

(Units are assigned to accredited research outputs and translate into a total monetary value)

89

38%

nr f r At ings

51 NRF-rated researchers in 2014

1 A rated

POSTGRADUATE ENROLMENTS AND POSTDOCTORAL FELLOWS

1300
Overall postgraduate student cohort

14 Doctoral graduates

205 Master's graduates of whom 112 were research master's degrees

26 Postdoctoral fellows

Internal AWArDs

In Chemical Engineering, the algal team from the Centre for Bioprocess Engineering Research (CeBER) were awarded seed funding through the Technology Innovation Agency for the development of a novel process for the production of the blue pigment, phycocyanin

Professors e□□ □a□ s □□□□ and **Sue Harrison** (Department of Chemical Engineering) were

External AWArDs

Professor **Genevieve Langdon** (Department of Mechanical Engineering) was the winner of the British Association Medal [Silver] 2014, awarded by the Southern Africa Association for the Advancement of Science (S2A3) to a person under the age of 40 who is actively engaged in research and has, by way of international participation and publications, shown outstanding capability and achievement

Professor A□□aud Ma□a□ (Department of Mechanical Engineering) was an NSTF (National Science and Technology Forum) award winner in the category for contributions to SET for Research Leading to Innovation for the work done in Elemental Software and□the□establishment□of□a□spin-out□company,□ Elemental Technologies IP Holdings (Pty) Ltd

Dr **Marijke Fagan-Endres** (Department of Chemical Engineering) received the 2014 'Woman in Engineering and the Built Environment Excellence' (WiEBE) award in the category 'Most Promising Young□Woman:□Research',□acknowledging□achievements of women in academia

Dr **Rob Huddy** (Centre for Bioprocess Engineering) was awarded the NRF Career Advancement fellowship,□a□¿ve-year□award□valued□at□R2□million□for□ a young researcher to establish himself within the academic environment

Dr P□□□□l □□□□qu□ (Department of Chemical Engineering) and Dr **Nico Fischer** (Centre for

Law

significAnt reseArch cOntriBUtiOns

The faculty contributes to legal, social, political, economic and cultural development at a local regional and international level:

- **Commissioned research for South African Law Deans' Association (SALDA)**
- **Drafting of the procedural litigation rules for the Magistrates' Courts, High Courts and the Supreme Court of Appeal**
- **Took the lead in compiling a report on how to improve policing in Khayelitsha**
- **Provided assistance to the International Labour Organisation (ILO), on a project titled 'Addressing the Implementation Deficits': assisting the constituents in Botswana, Lesotho, Namibia and South Africa (BLNS) to implement the comments of the Committee of Experts on the Application of Conventions and Recommendations (CEACR)**
- **Provided capacity to the World Intellectual Property Organisation (WIPO)**

64

A□□□□d □□d **journal units**

(Units are assigned to accredited research outputs and translate into a total monetary value)

60 **Contracts processed**

Postgraduates increased from 58 → 85

Doctoral cohort increased from 69 → 76

Major research grants

The Institute of Marine and Environmental Law on Trans-boundary Fisheries Crime

The Centre of Criminology and the DST/NRF SARChI Chair of Security and Justice, in collaboration with the Safety and Violence Initiative, to develop the UNODC Guide for Development Practitioners awarded by the United Nations Office on Drugs and Crime

The Democratic Governance and Rights Unit to develop its 'virtual research assistant' project

Funding for a new project, 'Improving Access to Mining Laws in Africa'

Inaugural LECTURES

Professor **Alexander Paterson** (Institute of Marine and Environmental Law) gave a lecture titled "Sitting on the fence as it gets cut from below: co-managing conservation and land reform agendas in South Africa's protected areas"

Internal AWARDS

Professor **Hanri Mostert** (Department of Private Law) received the Meritorious Book Award from the University Book Award Committee in acknowledgment of her book Mineral Law: Principles and Policies in Perspective, as one of the outstanding books recently produced by UCT authors

External AWARDS

An award for the 10th most frequently cited criminology scholar in 2006 – 2010 across international journals to Emeritus Professor **Clifford** s a (Department of Public Law)

Yorke Prize by the Cambridge Law Faculty in recognition of the exceptional quality of his doctoral dissertation awarded to Associate Professor A a P (Department of Private Law)

CHED (Centre for Higher Education Development)

r eseAr ch str At egy f Oc Us Ar eAs f Or 2014

Identifying research areas for more intensive focus, including curriculum development, educational technology, first-generation u□□□□□□□□ □□ud□□□

Research capacity development: Mellon-funded mentor, Professor Sue Clegg (Leeds Metropolitan University, UK)

Increasing visibility, dissemination and impact of CHED research via OpenUCT

14.5

A□□□□d □□d **journal units**

(Units are assigned to accredited research outputs and translate into a total monetary value)

7

NRF-rated

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PUBI ic At iOn s

2 edited books, with editing and authored chapters by CHED staff – Risk in academic writing: Postgraduate teachers, their students and the making of knowledge and Surfacing possibilities: What it means to work with ¿rst-generation higher education students

Dr A□□□□□A□□□□□(Academic Development Programme)□is□the□co-editor□(with□Denise□New¿eld)□of the book titled Multimodal Approaches to Research and Pedagogy: Recognition, Resources, and Access, published in 2014

g r Ant s

2 Worldwide University Network (WUN) grants. In the Academic Development Programme (ADP) staff, Associate Professor **Moragh Paxton** and Dr **Roisin Kelly Laubscher** are the South African members of the “First in the Family at□University”□(FIFU)□project,□involving□6□universities□and□5□countries

Centre for Educational Testing for Access and Placement (CETAP)□received□a□¿ve-year□grant□from□Standard□Bank.□A□portion of this grant is for translating the National Benchmark Tests scores into diagnostic information to inform teaching and learning at South African higher education institutions