UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

UNIVERSITY OF CAPE TOWN RESEARCH & INNOVATION 2016-17

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THE YEAR IN REVIEW: 2016-17

PART ONE

2016-17 IN NUMBERS

UNIVERSITY OF CAPE TOWN (UCT) WORLD UNIVERSITY RANKINGS

1st in Africa

191st **IN THE WORLD**
QS 2018

171st **IN THE WORLD**
THE 2018

112th **IN THE WORLD**
US NEWS 2017 BEST GLOBAL UNIVERSITIES

BRICS RANKINGS

THE 2017 BRICS and emerging economies 4th

14th **QS 2016 BRICS**

SUBJECT RANKINGS

TOP 100
Clinical, pre-clinical and health

1st IN AFRICA

61st IN THE WORLD

THE 2016-17

TOP 10
Development studies

10th IN THE WORLD

QS 2017

8th IN THE WORLD
Mining and mineral engineering

GRAS 2017

TOP 50
Geography

47th IN THE WORLD

QS 2017

40th IN THE WORLD
Public health

GRAS 2017

TOP 100
- Immunology
- Microbiology
- Social science and public health

US NEWS 2017 BEST GLOBAL UNIVERSITIES

TOP 5
Ornithology

3rd IN THE WORLD

Area studies

4th IN THE WORLD

CWUR 2017

TOP 100
- Anatomy and physiology
- Anthropology
- Archaeology
- Architecture and built environment
- Education
- English language and literature
- Law
- Sports-related subjects
- Theology, divinity and religious studies

QS 2017

KEY TERMS

THE Times Higher Education **QS** Quacquarelli Symonds **CWUR** Center for World University Rankings
GRAS Shanghai Rankings **BRICS** Brazil, Russia, India, China and South Africa

RESEARCH PERFORMANCE INDICATORS

TOTAL RESEARCH PUBLICATIONS

2014	2015	2016
3110	3165	3413

NRF-RATED RESEARCHERS

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%) than any other university in South Africa.

A-RATED RESEARCHERS

A-rated researchers are international leaders in their field. Just under a third of the country's A-rated researchers are at UCT.

SARCHI CHAIRS

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. Almost a fifth of the country's SARChI Chairs have been awarded to UCT.

INCOME

R1.6 BILLION
external research income in 2016

In 2016, UCT received the highest number of direct awards, as well as the highest amount of funding from the US National Institutes of Health (NIH) than any other higher education institution outside the US.

2016 Research

2 226
research
contracts signed
2015: 2306

RESEARCH
CONTRACT VALUE
R1.49 bn
2015: R1.44 bn

PUBLICATIONS
(2015 FIGURE)
1653.45
2014: 1623.61

VALUE FOREIGN RESEARCH
CONTRACTS SIGNED
R838 m
2015: R880 m

VALUE LOCAL RESEARCH
CONTRACTS SIGNED
R652 m
2015: R564 m

IP Protection

INVENTION
DISCLOSURES:
56
2015: 42
NEW RECORD!

PATENT APPLICATIONS
FILED:
67
2015: 56

PATENTS
GRANTED:
59
2015: 15

Innovation

LICENSE INCOME:
R1.76 m
2015: R3.7 m

MATERIALS TRANSFER AGREEMENTS (OUTBOUND):
69
2015: 29

LICENCE AGREEMENTS (OUTBOUND):
12*
2015: 13

Total Income from IP:
R15.2 m
2015: R3.8 m

SPIN-OFF COMPANIES:
2
2015: 2

INVENTION DISCLOSURES BY FACULTY:

42% Health Sciences

40% Faculty of Engineering & the Built Environment

10% Science

INVENTION DISCLOSURES:

72% male

28% female

CLICK HERE TO READ MORE in *Innovation at UCT 2017*

*Includes Option and Assignment Agreements

UCT research 2016-17 highlights and awards

01 UCT among very best in the world in subject rankings

ORNITHOLOGY AND AREA STUDIES SOAR

The Centre for World University Rankings (CWUR) released their inaugural subject rankings this year, and UCT was placed in the top five in two subjects: ornithology and area studies.

UCT was ranked third globally for **ORNITHOLOGY** along with Lund University in Sweden, which received the same ranking score (90.22). The University of Groningen in the Netherlands and Cornell University in the USA were ranked first and second respectively.

UCT postgraduate, Rowen van Eeden. Photo: Andre Botha

Professor Peter Ryan, director of the FitzPatrick Institute of African Ornithology, said: "This is great recognition of the contribution that researchers at UCT make towards ornithological studies. The fact that UCT is so prominent in ornithological research provides further validation of the success of the National Research Foundation (NRF) Centre of Excellence funding model."

AREA STUDIES covers the resources concerned with the social, economic, political and military character of a geographical area. UCT ranked fourth in this field of study behind Oxford University in first place, the University of the Witwatersrand in second, and the School of Oriental and African Studies (SOAS) at the University of London in third.

Professor Jeremy Seekings, interim director of the new Institute for Democracy, Citizenship and Public Policy in Africa, said: "Being ranked fourth in area studies is a tribute to several generations of scholars at UCT who have sought to locate the study of South Africa – its languages and literatures, its history and politics, its economy and society – in a more broadly African context."

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Development studies in global top 10 for third year running

UCT was ranked 10th in development studies in the 2017 QS World University Rankings by Subject. The universities of Sussex, Harvard and Oxford took the first three places.

For the fourth year in a row, UCT featured in the top 50 (47th) for geography.

The university ranks in the top 100 in a further nine subjects: anatomy and physiology, anthropology, archaeology, architecture/built environment, education, English language and literature, law, sports-related subjects, and theology, divinity and religious studies.

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UCT in the top 10 in the world in mining and mineral engineering

The recently released Shanghai Ranking's Global Rankings of Academic Subjects (GRAS) 2017 has placed UCT in the top 50 in two academic subjects: mining and mineral engineering (8th) and public health (40th). A further two were in the top 100: geography and ecology.

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BELOW: Workers drain a flooded thoroughfare after a night of severe thunderstorms in Kisumu, Kenya. Photo: Peter Kapuscinski / World Bank. Licensed under a Creative Commons Attribution 4.0 International license.

02 Researchers recognised at the National Research Foundation (NRF) Awards

Researchers at UCT are playing a critical role in creating knowledge in South Africa and building an inclusive scientific community. That was the message for the UCT academics who were celebrated for their contributions and research excellence at the 2017 National Research Foundation (NRF) Awards.

HAMILTON NAKI AWARD: PROFESSOR LUNGISILE NTSEBEZA, CENTRE FOR AFRICAN STUDIES

From political prisoner during the 1970s and early 1980s to land-reform scholar, research chair holder, intellectual and activist, it has been a challenging journey for Professor Lungisile Ntsebeza. Named after the self-taught surgeon who trained generations of medical students in surgical techniques, the Hamilton Naki Award honours individuals achieving world-class research performance despite considerable challenges.

Today, Ntsebeza's research focuses on three themes: democratisation in the countryside, land and equity, and social movements in the land sector. In 2008, he was appointed the Department of Science and Technology NRF Research Chair in Land Reform and Democracy in South Africa: State and Civil Society Dynamics, building UCT's Centre for African Studies into a major international focal point for research on Africa.

SCIENCE TEAM AWARD: CARDIOVASCULAR GENETICS LABORATORY, UCT AND GROOTE SCHUUR HOSPITAL

This award recognises that it's often teams working collaboratively – not individuals – that produce the types of research that profoundly benefit society. This was the case for the team at the Faculty of Health Sciences that discovered the gene responsible for a heart condition that can cause sudden death in people younger than 35 years, particularly during athletic activity. The condition is known as Arrhythmogenic Right Ventricle Cardiomyopathy and the discovery came after 20 years of research and international collaboration across four countries on three continents, led by the South African team headed by Professor Bongani Mayosi, dean of the Faculty of Health Sciences, along with researchers at the Italian Auxologico Institute of Milan and the University of Pavia. Read the full story in this publication.

CLICK HERE TO READ THE ARTICLE

03 New A ratings

An A rating identifies a researcher recognised among their peers as a leading international scholar in their field. Two UCT researchers were acknowledged for the first time as A rated in the latest cycle. They are part of a group of 41 A-rated researchers at UCT – about one-third of the total in South Africa.

Professor Anusuya Chinsamy-Turan, Department of Biological Sciences, was recognised for her influential work driven by the biology of extinct animals, particularly dinosaurs and early birds.

Professor Peter Ryan, also with the Department of Biological Sciences, is an internationally renowned ornithologist with an extensive body of work. UCT was recently ranked third in the world in ornithology.

04 UCT researchers honoured at 'Oscars of science'

Four UCT researchers were honoured in the 2017 NSTF-South32 Awards. The awards, known in the South African research community as the 'Oscars of science', recognise and reward excellence in science, engineering and technology, and innovation in South Africa. If the calibre of finalists recognised at the awards is anything to go by, South Africa has a great deal to celebrate.

"The NSTF-South32 Awards offer us an annual opportunity to really celebrate the world-changing work South African researchers achieve," says UCT Vice-Chancellor Max Price. "Every day, without much fuss and fanfare, these researchers conduct work that changes people's lives for the better."

UCT'S WINNERS WERE:

NSTF-TW KAMBULE AWARD FOR AN EMERGING RESEARCHER

Associate Professor John Ele-Ogo Ataguba is based in the Health Economics Unit of the School of Public Health and Family Medicine. Through his work he has made a great

Emerging Researchers Award winner Associate Professor John Ataguba delivering his acceptance speech. Photo: Brenda Biddulph from Monsoon Photography

contribution to our understanding of health inequalities, social determinants of health and health system equity in Africa. When accepting his award Ataguba said: "I come from very humble beginnings and know what it is like to live in real poverty. In accepting this award I would like to recognise all those who, despite their hard work, are unable to break the bonds of poverty."

Dr Robyn Pickering, an isotope geochemist in the Department of Geological Sciences, has successfully adapted uranium-lead dating techniques to provide the first set of direct ages for the South African caves in which early human fossils were found. "My dream since undergraduate days was to date local cave sites, and I had to go away (to Europe and Australia) to learn how to do that," Pickering told the *Mail & Guardian*. "But I'm excited to be back and help train and inspire a new generation of scientists. Married and with two small children, I am aware that I can be a positive role model for young women. I also want to help ensure that expertise and funding come to South Africa and stay here."

NSTF-GREENMATTER AWARD

Professor George Ekama is professor of water quality engineering in the Department of Civil Engineering. He has spent over 40 years researching ways to keep South Africa's water clean and running. Today his work continues to provide much-needed solutions to our country's serious water problems, while also inspiring

the next generation of researchers to pick up the clean-water baton.

DATA FOR RESEARCH AWARD

Professor Martin Wittenberg of the School of Economics is head of DataFirst, which is the leading social science data archive in Africa. It provides researchers with online access to survey and administrative microdata from a number of countries across Africa. "I am proud that DataFirst has made it much easier for young academics to obtain data in a form that is usable for research," he told the *Mail & Guardian*. "The data that we distribute is at the core of many of the debates about transformation and development. Furthermore, we run numerous courses to give researchers the skills to be able to do high quality work." In his acceptance speech, Wittenberg thanked the National Science and Technology Forum (NSTF) for recognising the importance of data for research.

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Robyn Pickering (middle) after receiving her Award from the Minister of Science and Technology Naledi Pandor (left) and Co-Chair of proSET Reinhard Meyer (right) Photo: Brenda Biddulph from Monsoon Photography

05 Honour for innovative, multifaceted linguist

Professor Ana Deumert received the prestigious Humboldt Research Award for her work in general and applied linguistics. Her peers have described her as one of the world's most distinguished and innovative thinkers in the field of sociolinguistics.

Ana Deumert receives the laudation for her Humboldt Research Award from Professor Helmut Schwarz, president of the Alexander von Humboldt Foundation, in Berlin

Deumert heads up the Linguistics Section of the School of African and Gender Studies, Anthropology and Linguistics, and is currently also acting director of the school. The Humboldt Award is also about research partnerships with German universities. The award will primarily support her multifaceted research projects with the University of Cologne's Anne Storch, professor of African studies, and Christiane Bongartz, professor of English linguistics. Deumert had shaped the field in new ways, they wrote in their laudation. An excerpt reads: "An outstanding sociolinguist, she has devoted her international career to a constructive re-envisioning and, one can say, reinvention of the entire field and with it our understanding of it."

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06 Kelly Chibale named one of the 2017 Quartz Africa Innovators

Professor Kelly Chibale is one of the 33 innovators in Africa honoured in 2017 by the digital news agency, Quartz. Chibale heads up UCT's Drug Discovery and Development Centre (H3D) and has been at the helm of ground-breaking research to manufacture a single-dose drug to combat malaria.

According to the Quartz Africa editor, Yinka Adegoke, the reason for the annual publication of this list is to showcase innovation in Africa. "The narrative in Africa has moved from seeking foreign-solutions-to-African-problems, to discussing African-solutions-to-African-problems," he says.

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Photo: Michael Hammond

07 Marakalala wins fellowship for TB work

Dr Mohlopheni Marakalala, senior lecturer in UCT's Division of Immunology and an associate member of the Institute for Infectious Disease and Molecular Medicine (IDM), has been awarded a Wellcome Trust Intermediate Fellowship in Public Health and Tropical Medicine.

The Wellcome Trust Intermediate programme helps mid-career researchers from low- and middle-income countries to establish independent research programmes in their countries. The programme strives to support research that will improve public health and tropical medicine at a local, national and global level. Marakalala will be studying human tuberculosis granulomas as targets for host-directed therapies and prediction of disease progression.

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08 Stephanie Fanucchi recognised at the 19th L'Oréal-Unesco for Women in Science Awards

Dr Stephanie Fanucchi was one of 15 young female scientists recognised for her innovative research in cancer and autoimmune diseases and one of two postdoctoral fellowship recipients for the 2016 L'Oréal-UNESCO for Women in Science Sub-Saharan Africa Regional Programme.

The L'Oréal-UNESCO for Women in Science Programme supports more than 260 young women scientists who are the "scientists of tomorrow" by accompanying them at a key moment in their careers, during their PhD theses or postdoctoral studies. A L'Oréal-UNESCO for Women in Science fellowship is awarded to these researchers at national and regional ceremonies that take place in more than 45 different countries.

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09 New fellows honoured for distinguished work

Two new UCT fellows were formally inducted in December 2016. UCT fellowships recognise original, distinguished work.

Professor Nicola Mulder is the principal investigator for H3ABioNet, a pan-African bioinformatics network for the Human Heredity and Health in Africa (H3Africa) programme. The network includes over 30 African institutions and is playing a leading role in building bioinformatics capacity on the continent. The award of a UCT fellowship is both an honour and an important recognition of the field of bioinformatics as a research area in its own right, says Mulder.

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Professor Alphose Zingoni holds a PhD from Imperial College London and is a recipient of the prestigious Research Fellowship of the Royal Commission for the Exhibition of 1851 (1992–94). He is regarded as a pioneer in the use of group theory (a type of mathematics) in studying problems involving symmetry in structural mechanics. The formulations he has developed have the benefit of reducing the computational effort that is usually associated with large-scale engineering problems, and have had the added benefit of shedding new insights on the vibration of structures with complex symmetry.

10 Up-and-coming researchers recognised by College of Fellows

UCT's College of Fellows has awarded the Young Researcher Award to three young academics to honour the significant contributions they have made to research in their particular fields. The College of Fellows was established by the Council of the university as recognition of distinguished academic work by permanent academic staff.

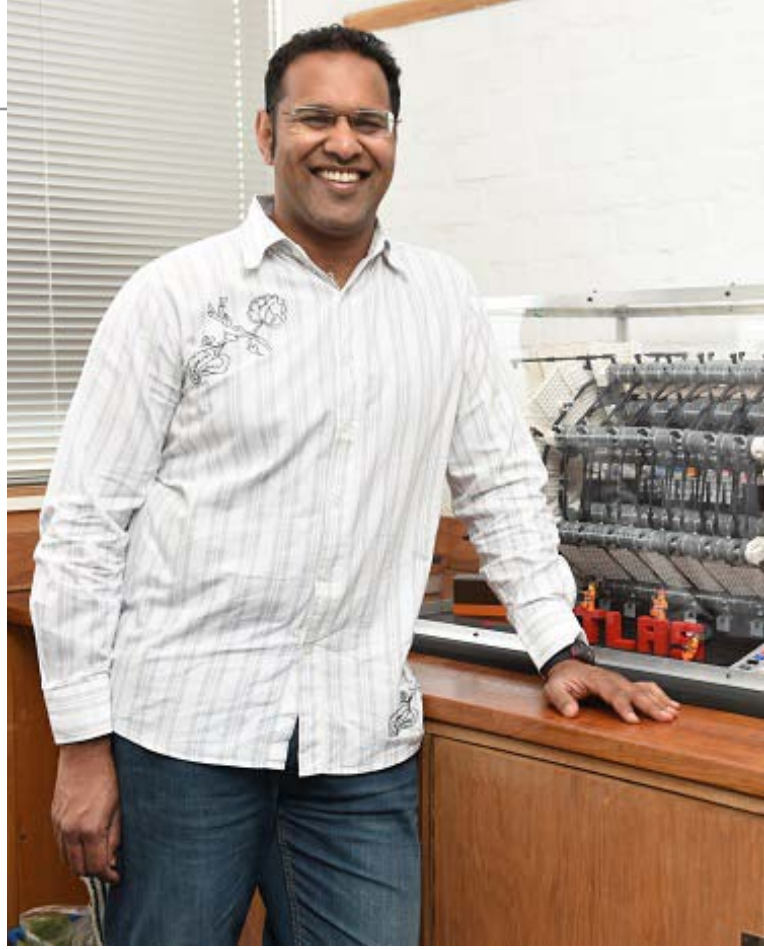
DR MOHLOPHENI MARAKALALA,
Senior Lecturer, Division of Immunology, Department of Pathology; Associate Member, Institute of Infectious Disease and Molecular Medicine (IDM); Visiting Scientist (Adjunct), Harvard School of Public Health

Marakalala's current research focuses on tuberculosis (TB)-related lung damage, and development of new therapies against the disease. His recent work in this area was published in the prestigious journal, *Nature Medicine*. In 2008, he was awarded the Bronte Stewart Research prize for the most meritorious PhD thesis submitted by a doctoral student at the Faculty of Health Sciences. He went on to complete postdoctoral training in Immunology at the IDM followed by another three and a half years of postdoctoral training in Infectious Diseases at Harvard University (2012-16). His postdoctoral work produced a number of research articles and reviews in leading journals, including *Nature Medicine*, *Immunity*, *Plos Pathogens*, *PNAS* and *Cell Host Microbes*, and he has presented his work on over four continents.

ASSOCIATE PROFESSOR JOHN ATAGUBA,

Senior Lecturer in the Health Economics Unit, School of Public Health and Family Medicine

Ataguba has made a significant impact in the field of health and economic research in South Africa and in Africa. He has earned international praise for his innovative research projects on equitable health financing and universal health coverage in many African countries including in South Africa. He undertook the first ever comprehensive analyses of equity in health financing and health inequality in South Africa. These analyses have been central to the South African National Health Insurance (NHI), a policy proposal by the Department of Health for a health financing system designed to pool funds to provide access to health services for all South Africans based on their needs rather than socio-economic status.



DR SAHAL YACOOB,

Lecturer in the Department of Physics

A particle physicist, Yacoob investigates the fundamental interactions between the elementary particles in our universe in order to further our understanding of the world around us. He has been a part of one of the largest scientific collaborations in existence, called ATLAS, at the European Organization for Nuclear Research (CERN) since 2010. He contributed to the discovery of the famous Higgs boson, often referred to as the 'God Particle'. Its groundbreaking discovery was proof of the mechanism by which the building blocks of matter gain their mass. Yacoob is still actively involved in the ATLAS project.

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11 UCT postgraduate awarded CERN PhD grant

Every year, CERN's ATLAS project awards a special PhD grant to between three and eight young researchers from around the world. The grant provides funding for two years of thesis research, including a full year based at CERN. Chilufya Mwewa, a Zambian-born particle physicist currently completing her PhD at UCT, can now count herself among their number.

Image of Chilufya Mwewa supplied

The SA-CERN Consortium, an inter-university network, funds the participation of UCT and other South African universities in this research. Through this consortium, and thanks to funding from the Department of Science and Technology (DST), students are given the opportunity to participate in this research and to visit CERN. It was through this research avenue that Mwewa first went to Switzerland. "The first time I visited CERN, I was speechless," she remembers. "To be a part of that environment, where the world's finest physics minds are studying the fundamental particles that make up our universe, was an indescribable feeling."

While there, her supervisors encouraged her to apply for the grant. If Mwewa was surprised at winning the grant, her co-supervisor Dr Sahal Yacoob was proud: "Winning such a prestigious award is a recognition not just of being competent but of being outstanding," he says.

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12 Harald Winkler selected to serve on high-level commission on carbon prices

At this year's Spring Meetings of the World Bank and International Monetary Fund, and the G20 Hamburg Summit in July, finance ministers gathered to discuss, among other pressing matters, climate change. Carbon pricing took up some of the discussion time, particularly at the G20 Summit. Thankfully, an in-depth report on carbon pricing was available – one with notable contributions by UCT's Professor Harald Winkler.

Winkler, the director of the Energy Research Centre, was selected to be one of the 12-member High-Level Commission on Carbon Prices. "These are very eminent economists working on climate change, so to work on a relatively small commission with them is an honour and a fantastic opportunity for me to learn from them," says Winkler.

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13 Fighting African fungal infections: the world's first international research centre at UCT

The world's first international research centre for tackling fungal infections, which kill around 1.3 million people globally every year, has been set up in South Africa by the University of Aberdeen in conjunction with UCT.

The majority of global deaths related to fungal infections happen in Africa, particularly sub-Saharan Africa. In this part of the world, fungal infections contribute to between 600 000 to one million deaths – more than malaria and around the same number of deaths as tuberculosis. The £600 000 University of Aberdeen AFGrica Unit will be based at UCT's Institute of Infectious Disease and Molecular Medicine (IDM), headed by Professor Valerie Mizrahi. The unit will give the internationally recognised AFG a centre of operations in Africa where they can work in collaboration with UCT experts to establish research programmes that can target the priority areas in fungal diseases that are relevant to the continent.

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14 Prestigious new Wellcome Centre for Infectious Diseases Research in Africa for UCT

A Wellcome Centre for Infectious Diseases Research in Africa (CIDRI-Africa) is being established at UCT to augment acknowledged strengths in the basic and clinical aspects of infectious diseases research in the Faculty of Health Sciences.

The Wellcome Trust announced funding of £118 million to 14 major research centres over the next five years, of which CIDRI-Africa will receive around R85 million. This prestigious award is the only one given to an organisation outside of the United Kingdom. One of seven newly established Wellcome Centres, CIDRI-Africa will focus on infectious diseases. The burden of infectious disease in South Africa and on the continent is extreme with an estimated 25.5 million of the 36.7 million people living globally with HIV in sub-Saharan Africa. As a consequence 75% of the world's cases of HIV-associated TB also occur on the continent. As well as testing vaccines and drugs in communities most affected by the disease, capacity and capability to research the basic science of such diseases and to carry out intensive earlier phase experimental medicine studies is also crucial to the enterprise and to innovation.

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Robert Wilkinson (left), group leader at the Francis Crick Institute and director of the Wellcome Centre for Infectious Diseases Research in Africa at UCn, photographed with researchers at UCT. Wilkinson led the proposal and will direct the Crick African Network programme.

15 Crick African Network to train top African scientists

The Francis Crick Institute and five partner institutes in Africa announced a fellowship programme to train African researchers to tackle infectious diseases in their home countries.

The programme, called the Crick African Network, is supported by a £6 million grant from the Global Challenges Research Fund, a five-year initiative led by the UK Department for Business, Energy and Industrial Strategy to address problems faced by developing countries.

Paul Nurse, director of the Francis Crick Institute, which is a state-of-the-art biomedical research facility in London, said, "We are delighted to receive such promising talent from our partner institutes, and welcome their contributions to our existing research into infectious diseases."

This UK–Africa collaboration will provide successful African postdoctoral scientists with two years of intensive training and mentorship – the first year at the Crick Institute and the second year at their African partner institute – to foster the next generation of research leaders in Africa.

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16 Two UCT researchers announced among the Next Einstein Forum Fellows 2017-19

In September 2017, the Next Einstein Forum (NEF) announced its second batch of fellows recognised as the best young scientists and technologists from Africa. Two UCT scientists were among the 2019 Fellows Class of 16. Their two-year stint as NEF fellows includes campaigns and events and a presentation of their research at the second NEF Global Gathering in March 2018.

Dr Kevin Dzobo, lecturer, Department of Integrative Biomedical Sciences; senior research scientist, International Centre for Genetic Engineering and Biotechnology

Dzobo's Einstein Challenge is to bring stem-cell-based treatments to patients. To do this, he hopes to develop easier and cheaper methods or technologies to stimulate stem cells into tissue-forming cells that can be used to treat several diseases and pathological conditions.

Dr Mamdou Kaba, postdoctoral fellow, Division of Medical Microbiology

Kaba's Einstein is the development of early diagnostic tools for altered human microbial profiles associated with specific diseases, and the development of microbial-based therapies (containing a mixture of missing protective microbes) for the prevention or treatment of diseases.

The first round of 2015-17 Fellows Class have now joined the new NEF Community of Scientists. Of the 15 young scientists, three are from UCT: Associate Professor Tolu Oni, (School of Public Health and Family Medicine), Dr Mohlopheni Jackson Marakalala (Division of Immunology) and Associate Professor Amanda Weltman (Department of Mathematics and Applied Mathematics). This newly launched cohort of scientists is, according to the NEF, "designed to participate in national and continental policy formulation, cross-cutting research and innovation activities, lead public engagement around science and technology in Africa, and provide mentorship to early-career scientists and students".

17 UCT's GSB one of nine universities chosen by the UNDP to develop an SDG research agenda

UCT is one of nine universities chosen by the United Nations Development Programme (UNDP) to develop a research agenda that will better leverage private investment to finance the sustainable development goals (SDG). Representing Africa, UCT's initiative will be led by the Bertha Centre for Social Innovation and Entrepreneurship at the Graduate School of Business (GSB).

The announcement was made alongside the 72nd session of the United Nations General Assembly earlier in September at an event titled "Big Data, Impact Management & the SDGs".

The partnership is led by UNDP SDG Impact Finance (UNSIF), which brings the private and public sectors together through impact investment that yields competitive financial, social and environmental returns.

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18 Prestigious fellowship for Gumedze

Dr Freedom Gumedze of the Department of Statistical Sciences has been awarded a Newton Advanced Fellowship from the Royal Society, in partnership with the Academy of Medical Sciences, for the period 2016–19.

The fellowship gives established international researchers an opportunity to develop the strengths and capabilities of their research groups through collaboration with research partners in the UK.

Gumedze will collaborate with Professor Jane Hutton at the University of Warwick on a project titled "Robust statistical methods and statistical diagnostic techniques for multivariate longitudinal and survival data in health research".

Dr Gumedze is a member of the Next Generation Professoriate.

19 Antarctic adventure

Professor Peter Ryan from the Fitzpatrick Institute of Ornithology, and Dr Sarah Fawcett and postgraduate student Heather Forrer from the Department of Oceanography, jumped at the chance to join one of the biggest and most ambitious scientific expeditions in history.

The Swiss-funded Antarctic Circumnavigation Expedition (ACE) drew dozens of scientists from around the world and swung them round Antarctica on the Russian research vessel Akademik Treshnikov.

It was composed of 22 different projects, bringing together research teams from six continents. They focused on different areas of study, which are all fundamental for a better understanding of Antarctica's ecosystems.

A team of scientists en route to an ice core drilling site. Photo: Jean-François Lagrot for ACE.

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PART TWO

Last year's research publication 'UCT research & innovation 2016-17' focused on the United Nation's 2030 Agenda for Sustainable Development. This is not a short-term project; as we compiled the stories for this year's publication, we were once again struck by the important work our researchers are doing, and the critical role UCT will continue to play in research towards reaching the sustainable development goals (SDGs), and in providing a leading voice from the global south about how best they can be achieved. We therefore continue to draw attention to this research, and the icons below indicate where one or more SDG is relevant in this publication.

UCT'S RESEARCH STRENGTHS AND THE SUSTAINABLE DEVELOPMENT GOALS

Zero hunger, sustainable cities and responsible consumption
SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
SDG 11: Make cities inclusive, safe, resilient and sustainable
SDG 12: Ensure sustainable consumption and production patterns

Affordable, clean energy and climate action
SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all
SDG 13: Take urgent action to combat climate change and its impacts

Quality education
SDG 4: Ensure inclusive and quality education for all and promote lifelong learning

Industry, innovation and infrastructure
SDG 9: Build resilient infrastructure, promote sustainable industrialisation and foster innovation

Life below water and life on land
SDG 14: Conserve and sustainably use the oceans, seas and marine resources
SDG 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss

No poverty, economic growth and reduced inequalities
SDG 1: End poverty in all its forms everywhere
SDG 8: Promote inclusive and sustainable economic growth, employment and decent work for all
SDG 10: Reduce inequality within and among countries

Clean water and sanitation
SDG 6: Ensure access to water and sanitation for all

Partnerships for the goals
SDG 17: Revitalise the global partnership for sustainable development

Peace, justice and strong institutions
SDG 16: Promote just, peaceful and inclusive societies

Good health and well-being
SDG 3: Ensure healthy lives and promote well-being for all at all ages

Gender equality
SDG 5: Achieve gender equality and empower all women and girls

Meet the woman on a crusade to improve urban health

STORY AMBRE NICOLSON **PHOTO** MICHAEL HAMMOND

These days Associate Professor Tolullah Oni describes herself in four short words: public health physician scientist. The journey she took to arrive at such a succinct designation, however, has spanned the globe and proved to be neither short nor straightforward.

Tolu Oni, an associate professor in the Department of Public Health and Family Medicine, has always gone where her curiosity has led her, and it has taken her to some very interesting places. She has watched a jaguar swim past her dugout canoe in the jungles of French Guiana, learned social dynamics in the confined (but arguably wilder) environment of a posh English boarding school and rushed to catch midnight trains after extended shifts in an Australian bush clinic.

"I've always been bolshy," she explains, "but I am really a city girl at heart." This may well be because she grew up in one of the world's greatest cities – Lagos – and completed her medical degree at University College London (UCL), right in the heart of another.

A TASTE FOR THE UNFAMILIAR

"I had decided years before that I was going to become a paediatric heart surgeon after seeing a documentary about open-heart surgery on TV as a child. Luckily for me, I come from the kind of family where no one raised an eyebrow when I announced this before the age of 10," she says.

Her decision to go to UCL was more immediate: "It was somewhere that I didn't know anybody," Oni explains. This desire to try new things with unfamiliar people in unknown places would set a precedent for a pattern that has repeated itself throughout her life. "I have always enjoyed changing things up because you learn new

things about yourself that way," she says, "and looking back now I am grateful. In a way, seeking out new experiences has brought me full circle."

At UCL, Oni discovered a new course that would allow medical students to complete their intercalated BSc in international health. The course was the passion project of Professor John Yudkin, a diabetes consultant with an interest in public health access. Oni was one of 14 students selected for the course's first intake.

"It was all very new and strange," she remembers. "Instead of memorising facts, for the first time I was asked what I thought of something as part of a discussion group. I look back to it now as the real start of my education." At the end of the year Oni knew she wanted to do something in the field of public health but she didn't yet know what.

FINDING HOME IN THE AMAZON JUNGLE

In her final year of her medical degree Oni embarked on a research trip to French Guiana, a tiny French overseas territory perched on the north-east shoulder of South America. She found herself travelling door to door on a muddy quad bike in a remote village on the border of Suriname. There she conducted research into a virus similar to HIV: the human T-lymphotropic virus (HTLV), which has few short-term effects for sufferers but very serious long-term health consequences.

"I had chosen French Guiana because I wanted to practise my French, but when I arrived I discovered that former slaves from West Africa had founded the village in which I was living. I was surrounded by people who looked just like me. I could even understand a bit of the local dialect since it was related to Nigerian pidgin. So it took me going to the Amazon to reconnect to my bit of Africa."

ON THE PATH TO PUBLIC HEALTH

In 2006, Oni moved to Cape Town to conduct HIV research in Khayelitsha: "I knew I wanted to research an infectious disease that had global relevance." With the encouragement of Professor Robert Wilkinson at UCT's Institute of Infectious Disease and Molecular Medicine, she ended up back in London, completing her

"Instead of memorising facts, for the first time I was asked what I thought of something as part of a discussion group. I look back to it now as the real start of my education."

master's and research doctoral degrees in clinical epidemiology simultaneously.

"It was then I discovered my real focus: looking at the ways that social conditions and chronic non-communicable diseases impact outcomes for infectious diseases like TB and HIV. I started asking myself questions like, what roles do things like rapid urbanisation, obesity and diet play? Are we trying to treat one disease or improve overall health? And, most importantly, how can we create pragmatic integrated public health interventions?"

"... I started asking myself questions like, what roles do things like rapid urbanisation, obesity and diet play? Are we trying to treat one disease or improve overall health? And, most importantly, how can we create pragmatic integrated public health interventions?"

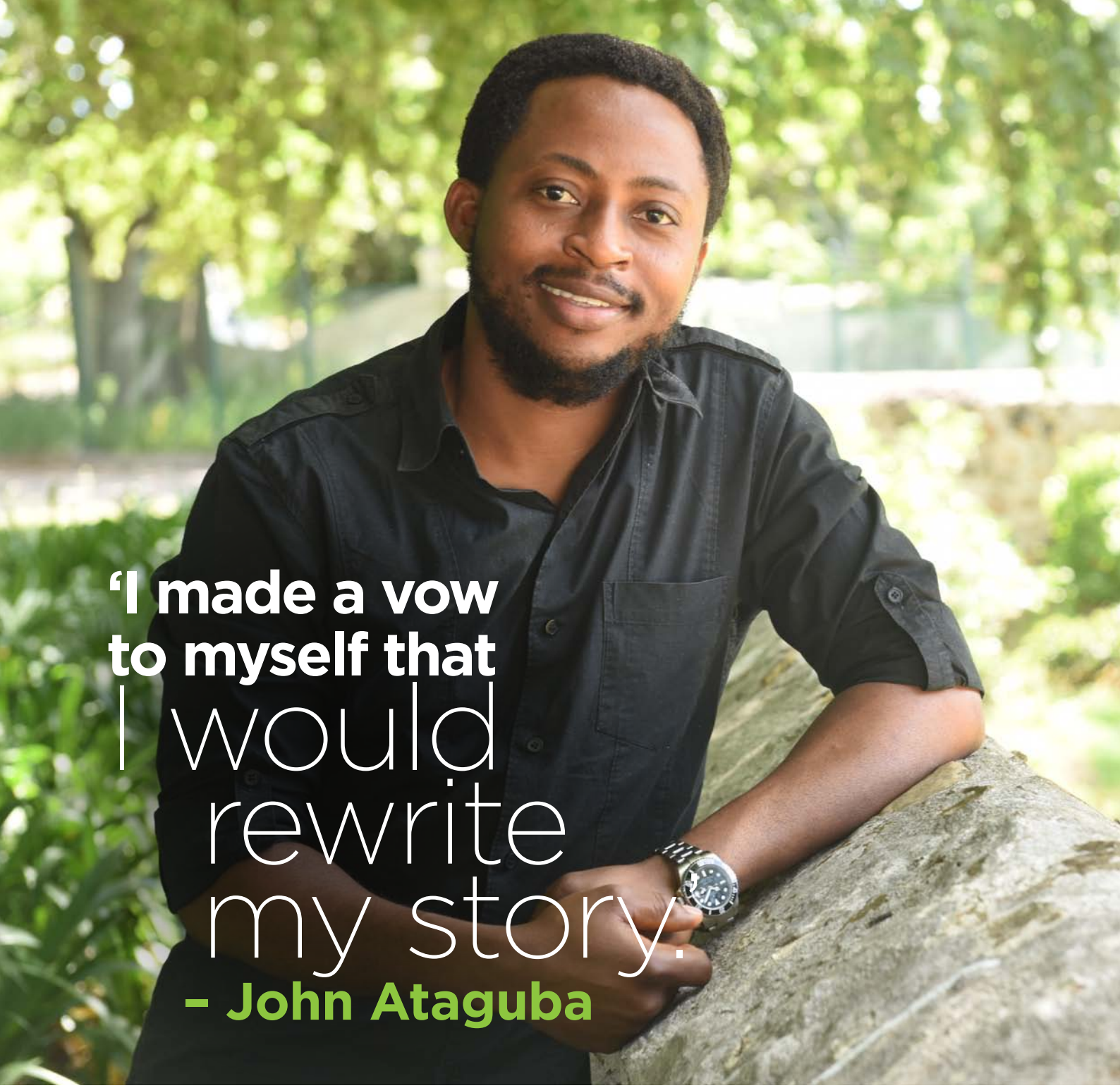
Oni has focused on these intersections ever since. Having lived in so many cities herself, it is perhaps not surprising that the themes of the urban environment have continued to play a large role in her research work. She has played a leading role in starting a research group that conducts projects on topics such as housing and health and the role of rapid urbanisation for outcomes of chronic health conditions. In 2011 she also applied for the registrar programme at UCT. "It was the best decision I made because it was a super immersive experience and taught me so much about how to effect real change."

Her work has not gone unnoticed. Oni has been the recipient of numerous awards including the Carnegie Next Generation of African Academics award, the Claude Leon Merit award and the UCT College of Fellows Young Researchers award. She has also been recognised as a Next Einstein Forum Fellow.

LOOKING AHEAD TO FUTURE CIRCLES

In 2013 she started teaching undergraduate courses in a bid to give the students of today a perspective that Oni had to discover for herself. "As a student I didn't know that public health could even be a specialisation. Of course things are very different these days but in the future I hope to go even further and play a role in creating a standalone one-year degree in global public health." One of the first things she did when it came to the possibility of setting up a new degree was to use a visiting scholar grant to bring her old mentor, John Yudkin, to Cape Town to workshop the idea.

The circle is complete. But, judging by her history, a new circle is likely being drawn this very moment. ■



‘I made a vow to myself that I would rewrite my story.
– John Ataguba

STORY AMBRE NICOLSON **PHOTO** MICHAEL HAMMOND

Associate Professor John Ataguba has been the recipient of numerous awards recognising his prowess as both an economist and a teacher. He is a Commonwealth Scholar, a member of the South African Young Academy of Science (SAYAS), a Mandela Mellon Fellow and a recipient of a National Science and Technology Forum (NSTF) Emerging Researcher Award and the Claude Leon Merit Award for Young Lecturers.

> "This place is Africa but also not Africa. In Nigeria I would speak in pidgin English unless it was a formal situation. Here it is one long formal occasion."

But, says Ataguba, none of these have meant as much as receiving the news that he had been accepted to the University of Nigeria as an undergraduate student.

He spent his childhood moving between towns like Gboko and Lakoja in Nigeria's north-central region. His father was a civil servant and his mother an informal trader. The family went where the government posted them and Ataguba had the opportunity to witness first-hand the vastly unequal living standards of his home country.

By the time he was a teenager they had settled in Lagos and he knew that his family, while more fortunate than many, did not have the money to send him or any of his five siblings to one of the prestigious high schools that ensured a place at a good university. He knew that if he was to succeed, he was going to have to get excellent results in the national university entrance exams, conducted by the West African Examinations Council (WAEC).

He applied for the first time when he was 16, newly matriculated from secondary school and hopeful. He did not make the grade. The next year he tried again and once again did not succeed. In the third year the exam was cancelled due to university strikes. Finally, at age 20, he received an envelope that contained the news that he had not only won a place at a tertiary institution, but that it was at the respected University of Nigeria.

ECONOMICS OF HEALTHCARE

"On that day, I made a vow to myself that I would rewrite my story," says Ataguba. He set about this revision by choosing economics as his area of study. Four years later, he graduated top of his class, department and faculty. It had taken Ataguba almost

a decade to attain his undergraduate degree but now he was determined to complete his master's and doctorate in record time.

Looking back, Ataguba remembers having a sense of disbelief that he had made it that far. "I felt a bit like an imposter, but I persevered," he says.

After completing his mandatory military service in Nigeria, he arrived at UCT in 2005. Coming to Cape Town was a strange experience. "This place is Africa but also not Africa. In Nigeria I would speak in pidgin English unless it was a formal situation." Ataguba laughs. "Here it is one long formal occasion."

It was at UCT that he discovered two things: a love of teaching that has never left him and a particular interest in the economics of healthcare systems. If he found the first surprising, he knew that the second was a result of his own experience of inequality in childhood.

"Living in some of the rural areas that I did as a child gave me a strong sense of what it means not to be able to afford basic services like healthcare. My work became more and more focused on themes of equity, universal healthcare and how to adequately measure the affordability, availability and accessibility of national healthcare systems around the world."

FUTURE FOCUS

In 2011 he was awarded a split-site Commonwealth Scholarship that supported his doctoral studies for two years at the London School of Hygiene and Tropical Medicine (LSHTM). He completed all his research in six months and graduated the following year with a doctoral thesis on the topic of health delivery systems. "I did not want to waste any time," he says. "My wife was pregnant with our second child, so I had a very important deadline."

In 2012 he became Dr Ataguba, in 2014 he was made senior lecturer and in 2017 he became an associate professor and director of the Health Economics Research Unit. In the same year he was awarded a Mandela Mellon Fellowship to make a comparative study of healthcare reforms between South Africa and the United States.

"I arrived there at a very interesting time in history," he says. "Efforts to repeal and replace Obamacare were under way."

Ataguba is still working on a paper based on this research that looks at how different population groups access healthcare as well the social determinants of health, impact evaluation and health financing.

He says there are many countries in the world where national systems work very well in terms of access to equitable healthcare. "Rwanda comes to mind, as do Thailand and Ghana. That will remain my focus in the future: How can we ensure that more people have better access to better quality health?" ■

Dodo illustration by Julian Hume

Secret life of the dodo revealed

STORY HELEN BRIGGS, COURTESY BBC NEWS
IMAGES JULIAN HUME ARTWORKS

Scientists are piecing together clues about the life of the dodo, hundreds of years after the flightless bird was driven to extinction.

Few scientific facts are known about the hapless bird, which was endemic to Mauritius and was last sighted in 1662.

A study of bone specimens shows the chicks hatched in August and grew rapidly to adult size.

The bird shed its feathers in March, revealing fluffy grey plumage recorded in historical accounts by mariners.

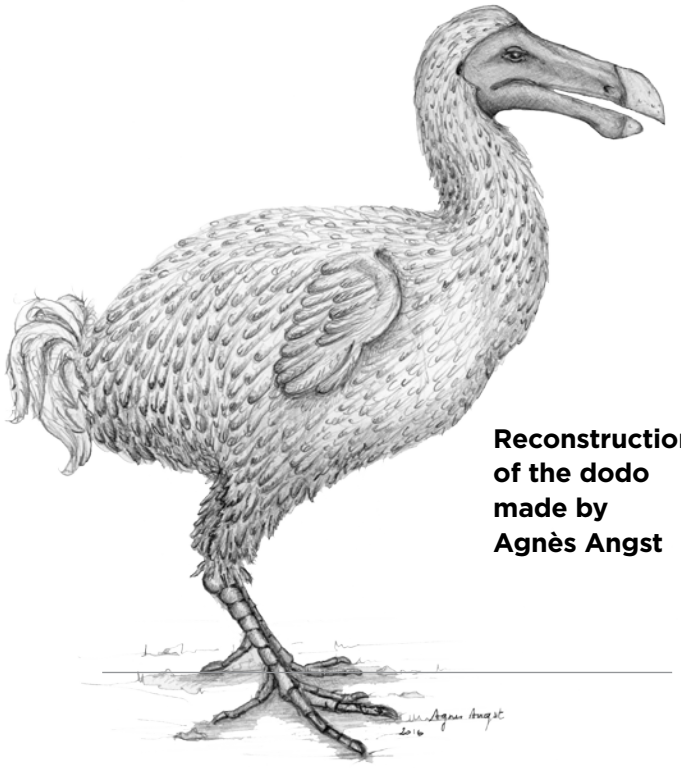
Dr Delphine Angst of UCT was given access to some of the dodo bones that still exist in museums and collections, including specimens that were recently donated to a museum in France.

Her team analysed slices of bone from 22 dodos under the microscope to find out more about the bird's growth and breeding patterns.

"Before our study we knew very very little about these birds," said Angst.

"Using the bone histology for the first time we managed to describe that this bird was actually breeding at a certain time of the year and was moulting just after that."

The scientists can tell from growth patterns in the bones that the chicks grew to adult size very rapidly after hatching from eggs around August.



Reconstruction of the dodo made by Agnès Angst

Dodo illustration by Julian Hume

Dodo illustration by Julian Hume

This would have given them a survival advantage when cyclones hit the island between November and March, leading to a scarcity of food.
However, the birds probably took several years to reach sexual maturity, possibly because the adult birds lacked any natural predators.

The bones of adult birds also show signs of mineral loss, which suggests that they lost old damaged feathers after the breeding season.

Ancient mariners gave conflicting accounts of the dodo, describing them as having "black down" or "curled plumes of a greyish colour".

The research, published in *Scientific Reports*, backs this historical evidence.

"The dodo was quite a brown-grey bird, and during the moulting it had downy, black plumage," explained Angst.

"What we found using our scientific methods fit perfectly with what the sailors had written in the past."

EGG THEFT

The research could also shed light on the dodo's extinction about 350 years ago, less than 100 years after humans arrived on the island.

Hunting was a factor in the dodo's demise, but monkeys, deer, pigs and rats released on the island from ships probably sealed their fate.

Dodos laid their eggs in nests on the ground, meaning they were vulnerable to attack by feral mammals.

Angst said the dodo is considered "a very big icon of animal-human induced extinction", although the full facts are unknown.

"It's difficult to know what was the real impact of humans if we don't know the ecology of this bird and the ecology of the Mauritius island at this time," she explained.

"So that's one step to understand the ecology of these birds and the global ecosystem of Mauritius and to say, 'Okay, when the human arrived what exactly did they do wrong and why did these birds became extinct so quickly'."

Julian Hume of the Natural History Museum, London, a co-researcher on the study, said there are still many mysteries surrounding the dodo.

"Our work is showing the seasons and what was actually affecting the growth of these birds because of the climate in Mauritius," he said.

"The cyclone season, when often the island is devastated with storms - all the fruits and all the leaves are blown off the trees - is quite a harsh period for the fauna - the reptiles and the birds on Mauritius."

The dodo, which is related to the pigeon, evolved on Mauritius.

However, bone samples are rare, making it difficult to trace the evolutionary process.

Although many specimens of the dodo ended up in European museums, most were lost or destroyed in the Victorian era. ■

This story was published with kind permission from BBC News.
READ THE ORIGINAL STORY HERE.

The sun never caught Chuma Himonga sleeping

STORY CARLA BERNARDO **PHOTO** ROBYN WALKER

After 24 years of service at UCT and nearly 40 years in customary law, advancing the rights of women, children and indigenous communities, Professor Chuma Himonga is the latest recipient of the Alan Pifer Research Award for Socially Responsive Research. It is the celebration of an illustrious career that all began on a farm in Zambia where young Chuma started on a path supported by her determination, discipline and love for her roots.

DISCIPLINE, DEDICATION AND RURAL ROOTS

"I am a rural girl," says Himonga, who grew up on her father's farm in Monze, where she and her siblings helped care for the cattle and harvested maize, sweet potatoes and groundnuts.

It was hard work from a young age, and Himonga credits her father for laying the foundations for the discipline she applies in many areas of her life today.

"He would say to us, 'If the sun finds you in bed when it rises, you will be poor.'"

Her father's words were her guiding light from the farm to boarding school, to the University of Zambia, University of London, University of Bayreuth in Germany and all the way to UCT where Himonga is set to retire at the end of 2017.

"If my father was still alive today, I would tell him that the legacy he left was the work ethic he instilled," she says.

It was this – along with her love for the system that regulated her life as well as those of her friends and family – that led Himonga to carve out a celebrated academic career in customary law.

COMMON LAW AND CUSTOMARY LAW

In rural Africa, customary law regulates the lives of millions – people who live at a "complex and shifting intersection of traditional and state institutions". Equally, black Africans living in towns often regulate many aspects of their lives using a combination of customary law and other systems of law in a country's legal system.

In rural Africa, customary law regulates the lives of millions – people who live at a "complex and shifting intersection of traditional and state institutions".

Himonga, as a leading scholar on both common law (the law of European origin in African legal systems) and customary law (a community's customs or practices that were never codified but are so common that they are considered legally enforceable), is uniquely placed to speak to overlaps between these systems of law.

Among her many contributions to reconciling traditional regulatory frameworks and common law, Himonga has been part of a group of legal academics who have been influential in seeking ways of defining and ascertaining customary law for purposes of its application and reconciling this system of law with human rights, including constitutional rights in South Africa.

Throughout, Himonga's work has greatly contributed to advancing the rights of women, children and indigenous communities.

IMPACT

Professor Penelope Andrews, the dean of law, and Professor Dee Smythe, director of research in the Faculty of Law, refer to Himonga's work as "a remarkable record of engagement with vernacular justice in practice".

In their nomination submission for the award, Andrews and Smythe laud Himonga and her research, her collaborative efforts, strides made under her leadership as Department of Science and

Technology/National Research Foundation South African Research Chairs Initiative (SARCHi) Research Chair, nurturing of the continent's leaders, her transformative role within the Faculty of Law, and her teaching.

"Always, there is the pressing question of how to reconcile rights to culture and gender equality, and to give full effect to the constitutional recognition of customary law."

Her research centres on the law of persons and marriage, African customary law, legal pluralism, and women and children's rights under customary law in Southern Africa.

"It is a body of work that reflects four strong imperatives," says Andrews.

These are demonstrating the operation of law in practice; debunking the enduring primacy of common over customary law; working towards creating a complex, responsive and vibrant legal system; and, to illustrate the need and advocate for reform of both systems, better serving the most disadvantaged.

These priorities, says Smythe, are readily apparent in Himonga's fourth and most recent book, *Reform of Customary Marriage, Divorce and Succession in South Africa: Living Customary Law and Social Realities*, co-authored with UCT sociologist Elena Moore.

Himonga and Moore look in detail at the impact of interventions into the customary law of marriage and succession.

"Critically, the book also deals with the financial consequences of divorce and the impact on children," says Smythe.

She adds that Himonga's writing "spans the terrain of personal law", the consequences and dissolution of marriage, rights of women living in or entering into polygynous marriages, lobola, land grabbing in the context of inheritance, and the rights of the children.

"Always, there is the pressing question of how to reconcile rights to culture and gender equality, and to give full effect to the constitutional recognition of customary law."

LEAVING A LEGACY

In committing her life's work to advancing the rights of Africa's marginalised, Himonga's career is marked by collaboration with other academics, across disciplines and with a number of civil society organisations.

She has collaborated with the UCT Faculty of Health Sciences in exploring new perspectives based on African philosophies about the right to health and has worked alongside traditional leaders on the coexistence of

indigenous and non-indigenous legal cultures, among others.

"There is a long history of impact in her work," says Andrews

Along with many other achievements and roles, Himonga co-founded Women and Law in Southern Africa, an activist-research organisation, in 1988. She is the warden of All Africa House, hosting, among others, African scholars from different countries on the continent in addition to convening and coordinating the All Africa House Fellowship Programme for the past six years; and she is the current South African Research Chair in Customary Law, Indigenous Values and Human Rights hosted by UCT, funded by the Department of Science and Technology (DST) and administered by the National Research Foundation (NRF).

"My Chair has been the highlight of my career for the simple reason that it helped me do what I love to do, which is study customary law and the operation of law in practice," she says.

Andrews describes how in her position as Chair, Himonga has facilitated "a rich and forward-thinking research agenda", teaching a generation of UCT lawyers the importance of customary law. Under Himonga's guidance, UCT is one of the few law faculties to offer customary law as a compulsory LLB subject.

FAMILY TIME

As retirement nears, Himonga is looking forward to spending more time with her two children, their spouses and her three grandchildren.

While growing as an academic, she raised her children as a single mother after she was tragically widowed early in her career.

"It was a challenge because no one thinks of the family situation, of the whole person," she says of some of the hidden faces of gender in academia.

Fortunately, Himonga says, her children were easy and demonstrated the same kind of independence and discipline her father and mother had instilled in her so many years ago.

"They recognised very early on that they had to fight the battle of life together," she says.

THE FUTURE

Now, Himonga is looking forward to receiving the Alan Pifer Award and has already planned her celebrations.

"It will give my children and grandchildren the opportunity to see my work," she says smiling.

Then, in keeping with the work ethic instilled in her during her formative years on the farm, Himonga will tie up as much of the research at her Chair as possible before retiring.

But do not expect her to slow down. She plans to undertake faith-based community outreach, helping community members living in poverty lead healthier lifestyles, spend more time with her family and keep one foot in academia.

Certainly, even in retirement, the sun will never catch this socially responsive researcher sleeping. ■

PhD student Sivile Mgese at the water hub, where he is investigation how natural systems treat water without the addition of chemicals.

Researchers test nifty way to save water in informal settlement

STORY TREVOR BOHATCH **PHOTOS** TREVOR BOHATCH AND KEVIN WINTER

A partnership between UCT, Stellenbosch Municipality and the Western Cape government is turning an abandoned water treatment facility in Franschhoek into a centre for water reuse research and innovation. The goal of The Water Hub, as the project has been named, is to demonstrate how effectively natural water systems can clean storm-water runoff.

LEFT Research director Kevin Winter walking across the first completed phase of The Water Hub.

BELOW Rubbish and foam in the Stiebeuel River. A new project aims to make this water clean and usable.

"One of the things that we've done badly across all of Africa... is to deal with the surface runoff," said Kevin Winter, The Water Hub's research director. In South Africa in particular, Winter said, these processes are especially lacking in informal settlements. "While these settlements have basic services of public tap stands, communal toilets and laundry stations, the drainage infrastructure is limited, often dysfunctional."

At The Water Hub, Winter plans to treat water runoff from Langrug informal settlement, making its way into the Stiebeuel River, which runs through the site and into the Berg River system. Langrug is just under two kilometers uphill from The Water Hub, which sits on a plot near Rickety Bridge Winery. Because of its positioning and Langrug's poor drainage infrastructure, Stiebeuel is laced with rubbish, grey water, and sewage. "It's quite a significant river system and we are now going to slowly start to rehabilitate it," Winter said. "We want to start at the bottom and work our way up."

Winter also said the project should be viewed as a pilot for larger operations aimed at both conserving water and cleaning it naturally. "Ideally, what one would probably have to do is centralise these kind of systems, because you want to treat at a bigger scale."

Early in June, researchers travelled to the site to collect the first round of treated water samples from the site. The first phase of the project involves taking water out of the river and

running it through several pits filled with assorted materials to clean the water. “We are using media such as small stones, peach pips and plants to clean the water. Microbial organisms are being introduced to the system to clean the water without using chemicals,” Winter said.

Winter and his team will pump the water that would have otherwise been discarded into an adjoining wetland and eventually use it for on-site crop production. He plans to employ Langrug residents in the agricultural venture as well. “The business of food production is critical to providing work and opportunities. It will also stimulate education and further opportunities around tourism, park management and maintenance,” he said. “[Engaging] people productively in the project is key to building a strong connection between the Hub and the informal settlement.”

Upon its completion in 2022, in addition to a fully fledged storm-water treatment facility, The Water Hub will also play host to public park space,

Architectural image of the Water Hub by Roark Robinson of MRA Architects.

exhibits, a research lab, restaurant, event space, reclaimed wetland, quarters for researchers, as well as aquaculture and algae ponds.

FUTURE WATER INSTITUTE

This initiative is part of the Future Water Institute, a transdisciplinary research institute addressing issues of water scarcity in South Africa largely through water sensitive design. It recognises the importance of integrating technical, social, environmental and economic perspectives towards robust sustainable solutions. To this end the institute provides the space for discipline specialists as well as generalists across the faculties of Humanities, Law, Commerce, Health Science, Science and Engineering and the Built Environment to interact, develop co-learning and transdiscplinary approaches to address critical issues, holistically and together. ■

The universe **as never seen before**

STORY NATALIE SIMON **PHOTO** SUPPLIED BY IZIKO MUSEUMS OF SOUTH AFRICA

Guests to the launch of the Iziko Planetarium and Digital Dome were treated to display of how the new facility can be used for both research and edutainment.

Iziko Museums has built a planetarium and digital dome facility that brings data to life in an immersive visualisation – and could be a model for planetariums around the world – as part of a partnership that includes UCT.

"A digital planetarium enables the wonders of the natural world to touch our lives in unexpected ways," said world-renowned astrophysicist, author and science communicator Dr Neil DeGrasse Tyson in his endorsement of the Iziko Planetarium and Digital Dome, which was launched at the end of May.

"Whether we gain perspective of our place in the world experiencing the diversity of pan-African culture, its folklore and its art writ large in the night sky, or by witnessing the forces of nature and how climate change affects our planet, or by exploring the infinite universe we are not the same walking out of the dome as when we walked in."

The revamp of the 30-year-old planetarium into the multifunctional Iziko Planetarium and Digital Dome is the result of a partnership between Iziko Museums, UCT, the University of the Western Cape and Cape Peninsula University of Technology, among others (see the fact box at the end of the story for the full list of partners).

"The model created here in Cape Town – of the partnership formed between a public facility and the research community – is one I hope will be replicated around the world," said Dr Mark SubbaRoa, director of the Space Visualisation Laboratory at the Adler Planetarium in Chicago and International Planetarium Society president-elect, speaking at the launch.

When the Adler Planetarium was launched in 1930, its founder, Max Adler, said that planetaria existed, in part, for the advancement of science. But, back then, that was a lie, said SubbaRoa.

"In 1929, Edwin Hubble had discovered that the universe was expanding, but in 1930 our planetaria were telling people stories about constellations made up by the ancient Greeks," he said.

Today's planeteria, however, with advanced technologies to create immersive visualisation facilities, really are in a position not only to help researchers rapidly advance our understanding of the world, but also to make that same information available to the public in an easily accessible, visual form.

Cape Town's Iziko Planetarium and Digital Dome.

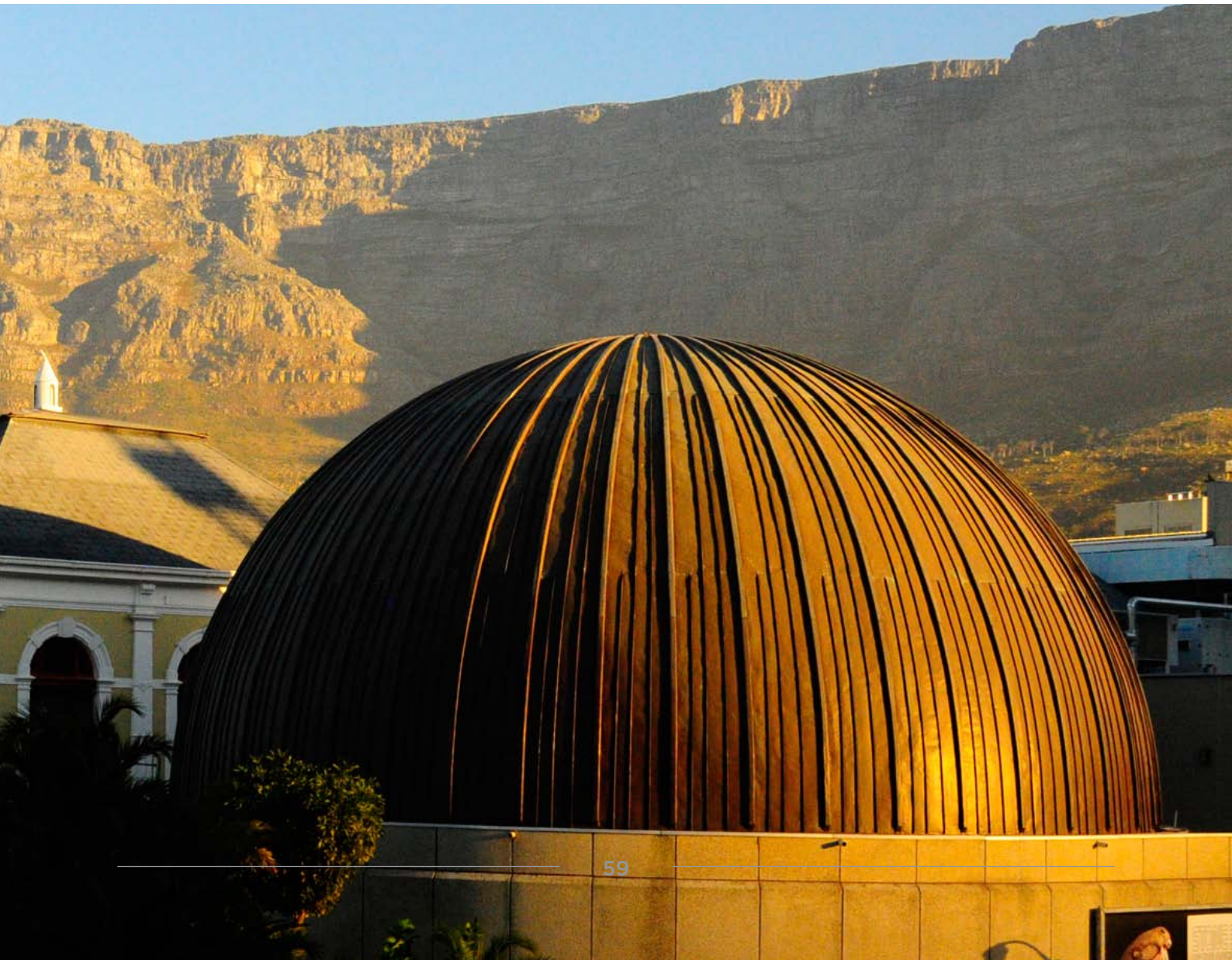
VISUALISING BIG DATA TO BETTER UNDERSTAND OUR WORLD

Big data refers to the large, complex data sets created and collected through technology. This can range from the data created in 'big science' projects such as the Square Kilometre Array (SKA) or the European Organization for Nuclear Research (CERN), to social media data analysed by researchers in the social sciences, to the huge data sets in bioinformatics projects such as gene sequencing.

The planetarium and digital dome is a fully immersive visualisation tool that can be used across a range of disciplines.

Collecting the data is only the start: it still needs to be analysed and interpreted. And when it comes to data analysis, a picture is indeed worth a thousand words.

"In the world of huge data sets, some data can only be understood if you can see it, and some of those data sets are so big, you need to see them on a large scale," said Emeritus Professor Danie Visser, patron of the Iziko Planetarium and Alexander von Humboldt Fellow at the Max Planck Institute for Comparative and



International Private Law in Hamburg, who, during his tenure at UCT as deputy vice-chancellor for research and innovation, played an important role in bringing to fruition the digital planetarium project and ensuring the research community was on board.

"This is a powerful tool across all disciplines," he added.

The SKA project is an obvious candidate for the digital dome. Massive data sets are already being created, as the precursor to the SKA telescope, the MeerKAT, comes online. Astronomers working on the project are looking at how to get the data onto the dome as quickly and easily as possible.

"Through the use of cloud computing we have already developed portals that can be accessed by researchers through web browsers as a way to get data sets onto the dome," explained Dr Michelle Cluver, associate director of the Inter-University Institute of Data Intensive Astronomy (IDIA) and Iziko Planetarium astronomer.

This has positive implications for the public at large, too. It means that, in time, they won't only be reading about the SKA discoveries in international headlines, but will be able to see, in a fully immersive local environment, the secrets of the universe SKA astronomers are unlocking. And, as more researchers use the facility for their data analysis, more groundbreaking science will become available to the public in an easily accessible visual form.

EXPLORING OUR UNIVERSE

Marvin Ratcliffe from SkySkan, the company that provided the technology for the digital dome, took guests at the planetarium launch on a trip through our local solar system and into the greater universe. Using data collected by astronomers over decades and rendered in real time onto the digital dome, he took the audience beyond the Earth-centred view of the universe to show them the full catalogue of galaxies gathered by astronomers, located in the dome exactly as they are in the universe.

Included in the tour was a trip to Saturn using the data collected by the spacecraft Cassini, before its mission to the planet ended in September this year.

Visitors were also treated to the real-time visualisation of a data set that looks at how galaxies are distributed around the universe, to get a better understanding of how they form and evolve, courtesy of Professor Tom Jarrett of UCT's Department of Science and Technology and South African Research Chair in Astrophysics and Space Science.

Dr Ben Loos of the Neuroresearch Group at Stellenbosch University showed the audience how cells in a brain are affected by and respond to neurodegenerative diseases like Alzheimer's. "I am incredibly excited to use this platform for teaching purposes, to inspire learners to go into the sciences, and for students already at university to engage with the data sets," said Loos.

BRINGING THE SCIENCES AND HUMANITIES TOGETHER

The value of this digital dome for arts and the humanities is clear, said Dr Ian-Malcolm Rijsdijk, senior lecturer at UCT's Centre for Film and Media Studies.

"The most obvious capacity for the dome is in the area of digital media, animation and even fine art," he said. "What I would really like to see is how artists develop innovative ways of using the space in the most immersive way possible."

He also stressed the potential of this space to bring the arts and sciences together for productive collaboration, especially around science communication.

"There is a desire among scientists across the disciplines to better communicate their science and research to the public, to better tell the story of their research. This space offers real potential to build meaningful collaborations between the arts and sciences that will hopefully benefit the public at large." ■

Explore the rings of Saturn rendered in real time.

PARTNERS TO THE PROJECT INCLUDE:

- **Department of Arts and Culture** (DAC)
- **Department of Science and Technology** (DST)
- **National Research Foundation** (NRF)
- **National Lotteries Commission** (NLC)

and key academic institutions in the Western Cape:

- **UCT**
- **University of the Western Cape** (UWC)
- and **Cape Peninsula University of Technology** (CPUT).

Birds, binoculars and biodiversity

STORY CARLA BERNARDO **PHOTOS** ROBYN WALKER AND PETER RYAN

Where does it all begin for someone like Professor Peter Ryan, who leads a field at UCT that was recently ranked third in the world? It starts with a pair of binoculars and continues with the funding of the FitzPatrick Institute of African Ornithology as a Centre of Excellence.

"I think most good ornithologists start out as kids," says Ryan.

The foundation for his celebrated career was laid when he was seven and received his first pair of binoculars. England, where Ryan was born, is not known for its biodiversity, but it provided him with ample opportunity to grow his love for birds.

Three years later, Ryan and his family moved to South Africa, a country that boasts some of the most biodiverse regions in the world.

"It was exciting to have lizards and grasshoppers in the garden – things we take for granted in Cape Town are rare in England," he says.

While revelling in the newfound diversity, he never lost his love for birds, something that has sustained him throughout his life and career.

Peter Ryan

AT THE CENTRE OF EXCELLENCE

Ryan's lifelong passion for birds has paid off in at least three ways: heading up a Centre of Excellence, being recognised as a leading international researcher, and convening one of UCT's globally ranked subjects.

While he often attributes much of his success and that of the FitzPatrick Institute of African Ornithology to outside factors such as biological diversity, he is in fact at the centre of it all.

The Institute, affectionately known as the Fitztitute, was identified as a Centre of Excellence (CoE) in 2004, along with five other centres recognised by the Department of Science and Technology (DST) through the National Research Foundation (NRF). The centres can be physical or virtual, are multi-institutional and are intended to concentrate existing research excellence, capacity and resources to enable collaboration across disciplines and institutions. These long-term projects are both locally relevant and internationally competitive.

"The recognition as a Centre of Excellence really gave the Fitz a boost," says Ryan. While not vast, the funding they receive as a COE ensures that they do not have to spend all of their time "scrambling for money", he says. An added bonus has been the collaborations built with ornithologists at other institutions, notably the universities of Pretoria and Limpopo and the Nelson Mandela Metropolitan University.

However, the situation may change, as the Fitztitute is into its third five-year funding cycle. The initial plan for CoEs was that funding would be phased out after two funding cycles. "The funding model has been so successful that all the initial CoE contracts were extended for a third five-year term, but there's a great deal of uncertainty as to what's going to happen at the end of the current cycle."

While there may be hope that some form of funding continues, the model has to change, bringing in other stakeholders. However, says Ryan, finding interested donors to fund the Fitztitute is not easy, as ornithology is not a well-funded area in general.

"It's challenging, but we're doing the best we can."

GLOBALLY RANKED

Doing their best has paid off for the Fitztitute, at least when it comes to global recognition.

In early April, the Centre for World University Rankings released their inaugural subject rankings that placed UCT in the top five – out of over 26 000 higher-education institutions – in two subjects: area studies in fourth place and ornithology in equal third.

Ornithology at UCT was ranked alongside Sweden's Lund University, following Cornell University (US) in second place and the University of Groningen (the Netherlands) in first.

"The fact that UCT is so prominent in ornithological research provides

further validation of the success of the NRF Centre of Excellence funding model," says Ryan.

He adds that the ranking shows the success of internal collaboration – UCT's Animal Demography Unit (ADU) and Centre for Statistics in Ecology, the Environment and Conservation (SEEC) contribute to the critical mass of ornithological researchers and research expertise.

"It is unusual to have so many people interested in birds at one institution, and that obviously helps a lot," says Ryan.

Modest in his celebration of the ranking, he calls the Fitztitute a "special creation" and a "rare commodity", but attributes much of the success to being located in a biodiverse region. Having so many birds in this part of the world helps with the quality of their research, he explains.

CONSERVATION

As a result, Ryan feels he owes birds a debt – after all, he prefers their company to humans and has an interest in their survival.

"A lot of our work is about using birds as indicators of change and figuring out how can we make sure that, for example, there are still Bearded Vultures in Lesotho 20 years from now and Martial Eagles in the Kruger Park 50 years from now."

Ordinary citizens can play a role too, thanks to the Fitztitute and ADU's science citizen programmes, especially the Bird Atlas Programme. All you need is a smartphone to capture data.

"It's really a world leader in the way that we grab data from literally thousands of people, using it to determine the impact of an increasing human footprint," he says.

AROUND THE ANTARCTIC

Ryan's everyday ornithological work is punctuated by opportunities such as the recent Antarctic Circumnavigation Expedition (ACE).

The expedition kicked off in December 2016, when the Russian research vessel the Akademik Treshnikov set sail from Cape Town on the first of three legs of a three-month circumpolar voyage.

He joined some 60 other scientists aboard the vessel. Most of the 22 research projects were aimed at

"A lot of our work is about using birds as indicators of change and figuring out how can we make sure that, for example, there are still Bearded Vultures in Lesotho 20 years from now and Martial Eagles in the Kruger Park 50 years from now."

understanding the impact of climate change on the Southern Ocean and what it means for the rest of the world.

"The Southern Ocean is crucial in terms of regulating the Earth's climate, dominating global heat and carbon fluxes," says Ryan. "To understand how climate change is going to affect us, we need to both explore past climate variability in the region and understand how current changes in physical and biological processes will affect the way the Earth responds to ongoing atmospheric increases in greenhouse gases."

In addition to documenting changes in threatened seabird populations, Ryan's research was to assess the abundance of plastic pollution in the Southern Ocean. "You might think the Antarctic is remote," he says, "but we found synthetic fibres in surface waters all round Antarctica." What humans do impacts on birds and other elements of natural systems. His job, and that of the Fitztitute, is to help to mitigate these impacts.

"So I think that's the value to society of what we do," says Ryan of the work he began as a seven-year-old with his first set of binoculars. "It's all about trying to build a more sustainable future for our country, our region and the planet." ■

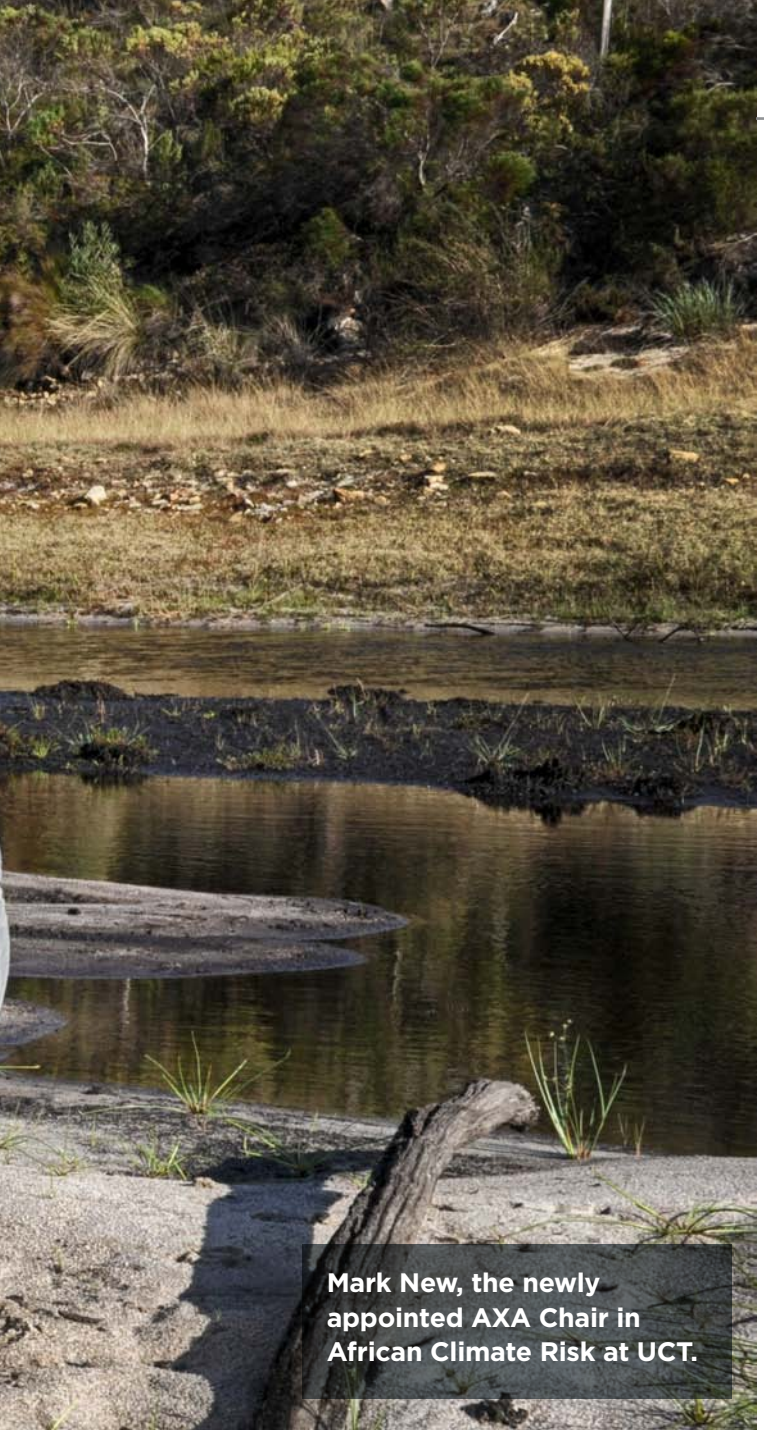
Ryan on Scott Island during the ACE cruise, with the Akademik Treshnikov in the background.

Brace for frequent extreme weather

STORY YUSUF OMAR
PHOTOS MICHAEL HAMMOND AND ROBYN WALKER

The severe two-year drought that is currently laying waste to the Southwestern Cape's water supply might become much more frequent, thanks to the impact of global warming on regional climate. This is according to Professor Mark New, the newly appointed AXA Chair in African Climate Risk at UCT.

Preliminary analysis suggests that the current drought experienced in the Southwestern Cape is twice as likely today when compared with 50 years ago, with an intense drought like this landing once every 25 years rather than once every 50 years, says New. If these readings are confirmed, the Western Cape water supply system will need to be rethought. Currently, it's designed to assure supply 98 out of every 100 years.



Mark New, the newly appointed AXA Chair in African Climate Risk at UCT.

"Climate change has loaded the dice," says New, who directs UCT's African Climate and Development Initiative.

Management of climate risks for systems such as water resources or agriculture needs good information on the probability of weather and climate events that impact the system.

"For example, if your input data to the design of your water system is wrong because the dice have been loaded, then you need to change your input data."

That's where New and his colleagues come in.

The AXA chair, which was launched on 6 April 2017, is the first of its kind in Africa. It will fund 15 years of research that will inform better management of climate change risks. New is the first holder of what AXA calls a successional chair – a new scholar will be appointed every five years.

Future positions will offer "an opportunity to develop the careers of researchers who are close to associate professor level", says New, adding that it would help entice the best climate change researchers to set up shop at UCT.

WHAT CAN WE BLAME CLIMATE CHANGE FOR?

New's area of climate science research is called detection and attribution.

"It's basically asking to what extent greenhouse gases are changing the climate risks that we're exposed to," New explains. "Say we have a heavy rainfall event that causes a lot of flooding in Cape Town. Is that climate change?"

The answer, says New, is not so simple. There have been extreme weather events since before greenhouse gases began polluting the atmosphere.

"What we can say is how global warming is changing the frequency and intensity of those events," he says. If the risks are changing – and the research suggests that they are – the way we manage those risks must change too, says New.

RISKS DEMAND DIFFERENT MANAGEMENT OF RESOURCES

Take the Western Cape's water supply as an example.

The province draws the bulk of its water from a network supply system from the Berg River, the Theewaterskloof, the Steenbras and the Palmiet. It is designed to be reliable – not run out of water – 49 out of every 50 years, on average.

But with more frequent, or more intense, droughts a real possibility, especially when these droughts last for two years, the system might be in need of rethinking, says New.

"We can think of the situation in terms of distal and proximate risks," says New.

The distal risk is global warming changing climate and rainfall. The proximate risks involve the ways that people-made landscape systems affect our sensitivity to the climate events that we cannot directly control. When flooding is on the table, think roofing on houses, drainage and storm-water systems, whether rivers are in concrete canals or natural channels, and so on.

"My house on the slopes of Table Mountain would never get flooded because the extreme rainfall just goes underground," says New. Somebody in an informal settlement on the Cape Flats will most likely see their home flooded, because the groundwater table rises and floods.

"So we're also interested in how the human management of the landscape is changing the sensitivity to those external rainfall events and how we can change the landscape to reduce that risk. That then helps the people who have to manage the risks to figure out how they need to change their risk-management strategies."

The Steenbras Dam on 11 April 2017 – one of the six major dams that supply water to Cape Town.

THE BIG QUESTION

New's big question, then, is how exactly the risk has changed, and they're working towards a final answer.

"We need to do a lot more work to get to a much more robust statement of how the risk of different high impact climate events has changed, but it looks like the risks have changed because of climate change," says New.

"We are proud to support this research programme, Mark New and the researchers who are actors of change regarding climate in Africa, and working for a better future," says Raphaël Gusdorf, head of the AXA Research Fund.

"I am glad to see AXA partnering with UCT, a leading institution in Africa, around science and education, which are key topics for AXA and risk education in general," adds Denis Duverne, chairman of AXA's board of directors.

The Research Chair in African Climate Risk is supported by the AXA Research Fund, which supports scientific research for the understanding and prevention of environmental, life and socioeconomic risks. The AXA Research Fund is an arm of AXA, an international insurance and asset management company. ■

Silindile Buthelezi smashing finance law's glass ceiling

STORY CHIDO MBAMBE **PHOTO** ROBYN WALKER

The Mandela Washington Fellowship is a programme that was created in 2014 by former US president Barack Obama and is named after former South African president Nelson Mandela.

The highly prestigious and sought-after fellowship is for under 35s from sub-Saharan Africa who have been identified as future leaders within their respective industries in their countries. They are placed in various academic institutions across the USA for six weeks of intensive academic and leadership training.

"It's a dream come true. I've always been an ambitious person, so these opportunities are not really things that are a matter of happenstance, they're things that have been in my heart," says Silindile Buthelezi, UCT lecturer and one of this year's Mandela Washington fellows.

She has been placed at Georgia State University, in Atlanta, Georgia.

"I'm looking forward to the academic training and developing my leadership skills, but I am also looking forward to the networking opportunities so that I can bring back whatever I learn to develop South Africa, at least in my field of interest – banking and finance law," she says.

Buthelezi knew about the fellowship since its inception but never felt she was quite qualified enough to apply.

"I'd always put off applying because I didn't think I was Mandela Washington material."

But after encouragement from friends, she mustered up the courage.

"I was very surprised when I found out that I had been selected and one thing I can take out of this experience

is that even when you think you're in doubt of whether you are good enough, the best thing to do is just try," says Buthelezi.

She finds that her biggest challenge in her field is being a young black woman and emerging academic.

"Banking law is a very male-dominated industry ... one of my main challenges right now is gaining visibility when it comes to my research and having people actually take what I have to say seriously," she says.

"I have already received an opportunity to present my ideas on the reform of South Africa's banking and financial sector regulation at an international conference, which was held at the University of Cambridge in 2016. I also recently appeared on the SABC news television programme *Interface* as part of the panel of experts discussing South Africa's Twin Peaks banking and financial sector reforms. These have been great opportunities as they are going to give me credibility. And that's what I need at this stage," says Buthelezi.

Silindile Buthelezi, lecturer in the Department of Commercial Law, hopes one day to use her expertise to advise government on regulatory issues around banking and finance.

DON'T DISCOUNT YOURSELF

Buthelezi describes herself as a small-town girl who has made it big in life.

"The main motivation I can give my students is to not discount yourself before you've even entered the game.

"At the time I applied I had doubts as to whether I would get the position but I applied anyway and here I am … The worst that could happen is that you'll get a no, and if it's a no you'll just move on. But also you never know, it could actually be a yes then you'll be living your dreams."

Her love for debating in high school led to her career choice in law. She always wanted to make a difference, even though at the time she didn't exactly know what she wanted to specialise in.

"I knew that being a lawyer would mean that you get an opportunity to make a difference," explains Buthelezi.

She holds an LLB and an LLM in business law from the University of KwaZulu-Natal. She completed her articles of clerkship at Cliffe Dekker Hofmeyr and was admitted as an attorney in the High Court of South Africa in 2012. Soon thereafter she worked as a law researcher for the judges at the Western Cape High Court prior to joining the Faculty of Law at UCT.

She says that working at UCT has opened up many opportunities for her. Within six months of joining the faculty, the executives in her department decided to send her to study her second LLM, in international banking and finance law, at University College London.

"I finally got to specialise in my area of interest," says Buthelezi.

"I knew that being a lawyer would mean that you get an opportunity to make a difference"

A PASSION FOR SOCIAL JUSTICE

Her research interests are in general corporate and commercial law, banking and financial markets regulation, corporate insolvency and restructuring, and international trade law. However, she also has a passion for social justice issues relating to violence against women and children.

"It actually only started when I worked as a researcher at the Western Cape High Court … I wasn't really interested in public law, but when you work as a researcher, you don't get to choose the type of cases you work on. When a judge needs you, a judge needs you," says Buthelezi.

Many of the criminal law cases that she worked on involved violence. And the victims were always women and girls.

"When you're helping the judges with the research, you're also looking at the evidence and it is then that you see the severity of the

violence and it really just breaks your heart.

"I thought how can I help? So I can do that through research," she says.

Her article "Human trafficking and new legal framework in South Africa: Intervention needed for the law to reach vulnerable girls and women" was published in the feminist journal *Agenda* in 2015.

"That was born out of the research I had actually done for a judge," she explains.

EMPOWERING THE YOUTH

Aside from her academic work, Buthelezi tries to get involved in as many youth empowerment projects as she can, and she is involved with various outreach programmes as well.

"I try [to] inspire the youth by going out to speak to the youth. For instance I help out at Emagqabini Education Academy in Khayelitsha, and I have previously helped out at Junior Achievement South Africa Western Cape. Again it's just speaking to young people who honestly don't have role models in their communities who look like them and are achieving great things," she says.

"I can relate to that. I may not have grown up in Khayelitsha, but I grew up in a small town and I understand to a certain extent what it means not to have people who are achieving great things within your own community."

She hopes to be able to introduce banking law as a module at the UCT Faculty of Law.

"We're a leading institution but we don't offer what is probably one of the most sought-after areas of law," she says.

"One of my dreams is for UCT to have a centre for banking and finance ... I think it would take us really far as an institution. So that's actually my major long-term goal," she says. ■

Delving into the darknet **to discover the** secret world of paedophiles

STORY CARLA BERNARDO

"Paedophilia isn't a crime. Child sexual abuse is the crime." This controversial statement is bound to evoke mixed and strong emotions from all corners – most particularly because it's a statement made by a South African researcher in a country where heinous sexual crimes are committed against children at a frightening rate. However, it is probably the least controversial statement made by Andrew Verrijdt, who is vehemently opposed to child sexual abuse and whose research is in progress at UCT's Department of Psychology.

Verrijdt is a practicing educational psychologist with a special interest in trauma, abuse, resilience, positive psychology and the problems and benefits of technology.

He walked away with top honours in the social sciences category of the UCT arm of an international competition, the Three Minute Thesis (3MT). It is the elevator pitch of the academic world.

For his presentation, titled "Paedophile websites on the 'darknet': What's up with that?", Verrijdt offered the following descriptor:

"I identified a pair of secret, underground websites for paedophiles, and I've been analysing what they say to each other. They were on the darknet, a part of the internet that is partially hidden and only accessible via specialised software. The research did not involve any pornography, only conversations. But the darknet's anonymity means it's the first research on paedophilia where they don't have an incentive to lie. As a result, I was able to study aspects of their beliefs and behaviour that have been relatively unexamined, including the possible identification of a new subtype of paedophilia: 'paedo-sadism'."

ILLNESS OR ILLEGALITY?

Verrijdt, like the Australian Institute of Criminology and the American Psychiatric Association, draws

a distinction between a paedophile and a child sex offender.

"Paedophilia is a sexual fetish for people below the age of puberty or around there," explains Verrijdt. "However, paedophiles will not necessarily act on it."

Contrastingly, a child sex offender is one who may not necessarily be a paedophile but who has or intends to molest a child. They are not, unlike paedophiles, necessarily aroused by the prepubescent child; some may simply see an opportunity and take it.

Verrijdt has also identified a group he terms 'paedosadists'. Both the prepubescent child and the acts of violence inflicted on the victim fuel arousal in the paedosadist.

Separating these groups is crucial because child sex offenders and paedosadists often hide among non-offending paedophiles.

Separating these groups is crucial because child sex offenders and paedosadists often hide among non-offending paedophiles.

THE RESEARCH VALUE OF ANONYMITY

Verrijdt began researching his original idea two years ago. It revolved around image board, 4Chan. 4Chan is visible on the 'clear net', the controlled online environment to which the majority of internet users are exposed.

A friend later suggested Verrijdt look into paedophilia and the Darknet, which is when the change in research was made.

According to Verrijdt's research, paedophiles do exist on both 4Chan and on other clear net websites. However, neither are ideal places to conduct research.

"There is a strong incentive to lie," says Verrijdt, explaining that law enforcement officials could simply subpoena a site to give up user details.

While navigating the clear net sites, Verrijdt came across mentions of darknet sites such as Hurt2theCore (H2TC), Hard Candy and 7axxn. After installing the anti-surveillance browser The Onion Router (Tor) – which is needed to enter the darknet – Verrijdt found himself on the edge of the abyss.

Tor was initially created to protect United States intelligence communication. Since then, it has evolved into a free speech tool and a platform for whistle-blowers. Using Tor, Anonymous – the hacking collective (the term is used loosely) – sent "care packages" to Arab Spring activists, assisting them in protecting their identities and distributing banned material online. Tor has, in this way, been instrumental in protecting democratic freedoms.

It also offers its users a cloak of anonymity; as a result, this parallel internet has become home to the

Stygian cesspool that fuels and validates the most awful of minds.

"If paedosadists exist, they're going to be found in the dark, underground web," says Verrijdt.

And there, he found them.

ENTERING THE DARKNESS

Despite now having the tool to enter the darknet, Verrijdt was still unable to access the relevant sites.

"You don't necessarily know where to go," says Verrijdt. "You need to know the URLs. They're impossible to find and impossible to remember."

Verrijdt found Hard Candy, a reference list for child pornography sites, and discovered an 'open' discussion forum. Before entering, Verrijdt ensured that images were disabled on Tor, so that he could not see any criminal material.

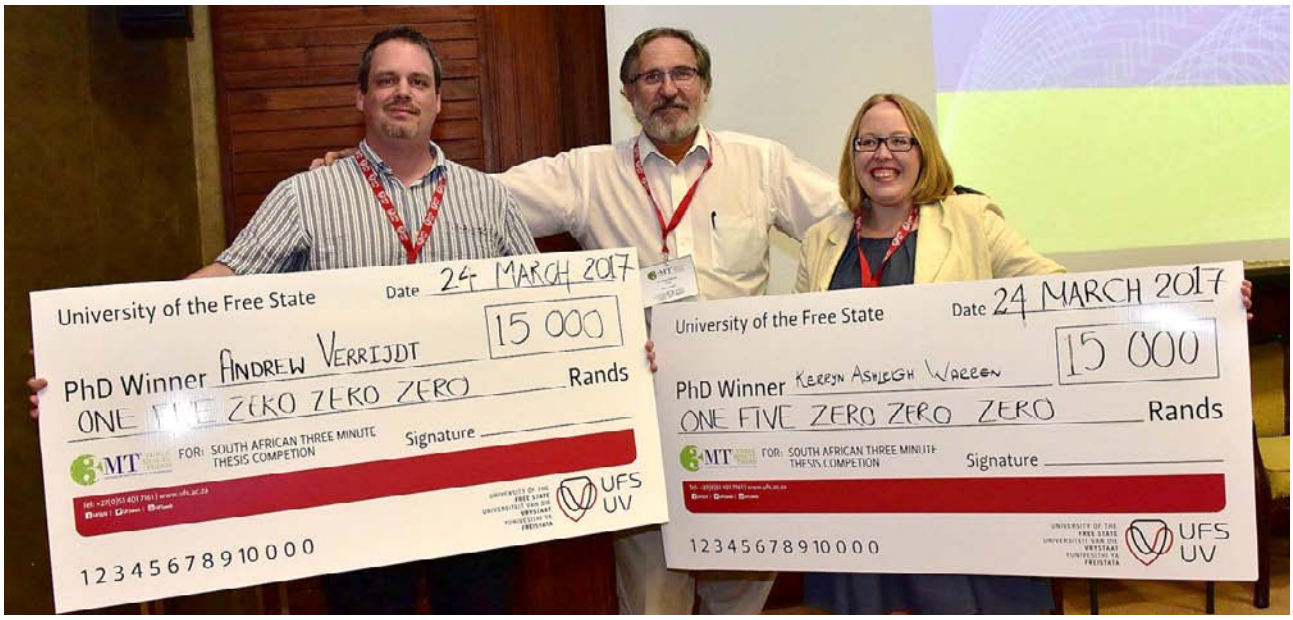
"If you see child porn on your PC, you are in possession of child pornography," explains Verrijdt.

On this site, Verrijdt was upfront, identifying himself as a psychologist and researcher. A debate ensued. Users finally agreed to speak to and accept the presence of Verrijdt, as long as he obeyed the site rules.

It is at this point that Verrijdt reiterates his argument for the differentiation of paedophiles and child sex offenders.

When paedophiles approach psychologists to seek emotional support and counsel, all too often they are castigated, vilified and rejected by those arguably best suited to offer help.

"Saying paedophilia is itself a crime



UCT postgraduate researchers Andrew Verrijdt and Kerryn Warren won the national 3MT competition held at the University of the Free State (UFS) in March 2017. Shown here with director of Postgraduate Studies and Researcher Development at UCT, Peter Meissner. (Image supplied by UFS Postgraduate School).

is the problem," says Verrijdt. "The problem is child abuse: that's where our focus should be."

Verrijdt adds: "If you exclude [paedophiles] from emotional support, you will drive them into the arms of dark websites and it will make the problem worse."

Interaction with child sex offenders and paedosadists then worsen the paedophile's inner conflict. The former encourage the molestation, convincing paedophiles that their urges are normal and do not cause harm to the victim. The latter group advocate outright for violent sexual assault.

USING THE DARK FOR LIGHT

Verrijdt hopes to use his research to combat child sexual abuse.

"I am more than eager to assist anyone out there who needs or can make use of my research," he says.

Among the tools Verrijdt can share – once his work is peer-reviewed – is a typology based on questions, and research on preventive therapy. The former helps to place an individual into one of the eight categories that identify the type of paedophile or child sex offender. The latter includes the use of recordings of victim testimonies to convince non-offending paedophiles that they will cause harm should they act on their impulses.

For those who do commit the crime, Verrijdt advocates for detainment. If released – something he is vehemently opposed to when it comes to active paedosadists – Verrijdt calls for vigilant monitoring. Preventive therapy, such as victim testimonies, would have the opposite effect on paedosadists, arousing them rather than steering them away from their actions.

HOW TO PROTECT YOUR CHILD

Verrijdt's advice for parents is the following: "The best way to protect your child is to have the kind of relationship where the child feels comfortable discussing sex and sexuality," he says.

Added to this is the importance of comprehensive sexual education – a responsibility that should be shared by parents and the schooling system – and an end to treating sexuality and sex as taboo.

"Child sex offenders are scared of the child that has an open, communicative relationship with someone they respect," says Verrijdt, "because they know that's how they'll get caught." ■

When paedophiles approach psychologists to seek emotional support and counsel, all too often they are castigated, vilified and rejected by those arguably best suited to offer help.

UCT researchers discover heart-attack gene

STORY CHIDO MBAMBE **PHOTOS** MICHAEL HAMMOND

Maryam Fish, Gasnat Shaboodien and Sarah Kraus, the all-female team of researchers who made the discovery of the CDH2 gene.

Fifty years after South Africa performed the world's first successful heart transplant, researchers at UCT's Hatter Institute for Cardiovascular Research in Africa (HICRA), through global collaboration, have identified a new gene that is a major cause of sudden death among young people and athletes. Maryam Fish, Gasnat Shaboodien and Sarah Kraus make up the all-female UCT team that made the discovery.

The gene, called CDH2, is found in everyone, but a mutation causes a genetic disorder known as arrhythmogenic right ventricle cardiomyopathy (ARVC), which increases the risk of heart disease and cardiac arrest.

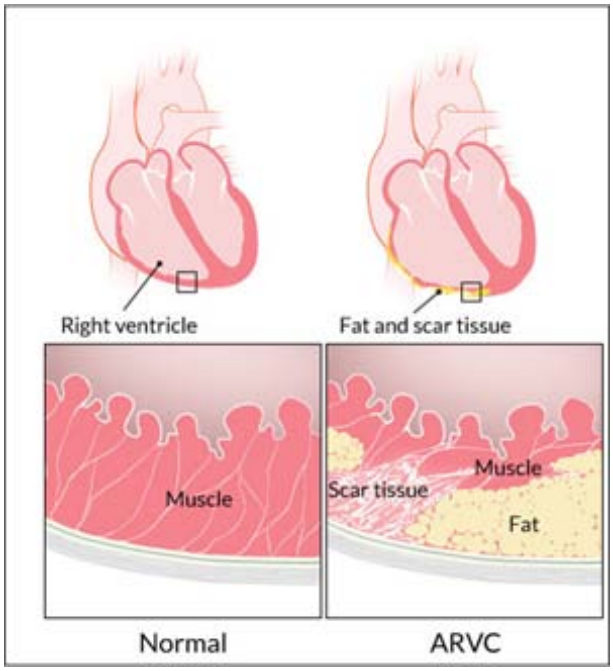
ARVC is a genetic disorder in which the heart tissue is replaced by fatty and fibrous tissue. This development causes rapid heart rhythm (cardiac arrhythmias) or rapid and erratic heart rhythm (ventricular fibrillation), which causes loss of consciousness and cardiac arrest. In the case of ventricular fibrillation, without a ready device to shock the heart, it causes sudden death in minutes.

The discovery, which was published on 9 March 2017 in *Circulation: Cardiovascular Genetics*, is the result of international collaboration that began 20 years ago. It was led by a South African team headed by Professor Bongani Mayosi, dean of UCT's Faculty of Health Sciences, along with researchers of the Italian Auxologico Institute of Milan and the University of Pavia.

A team of investigators from the Population Health Research Institute of McMaster University and

Bongani Mayosi

Illustration of a heart with arrhythmogenic right ventricular cardiomyopathy. The right ventricular myocytes are replaced with fibro-fatty tissue leading to the arrhythmias characteristic of the disease.
Image: Ted Rogers Centre for Heart Research



Hamilton Health Sciences, led by Dr Guillaume Paré, performed the genetic sequencing, as well as the bioinformatics analysis for the study. Dr Lia Crotti and Professor Peter Schwartz of the Italian Auxologico Institute of Milan sequenced all the coding regions of the genome.

"This is probably the biggest breakthrough in South African cardiology since Dr Chris Barnard's first heart transplant," said Mayosi. "This discovery is a first in the world – on our soil – and will permit the diagnosis and possible targeted treatment of heart muscle disease in the future."

PREVENTIVE STRATEGIES

According to research, cardiac deaths claim more than five lives every day in South Africa. In young South Africans, an inherited form of disease of the heart muscle (cardiomyopathy) appears to have a prominent role in the cause of sudden death that is related to cardiac disease.

The discovery of the CDH2 gene will help clarify the genetic mechanisms underlying ARVC, and will make early detection of the disease possible in otherwise unsuspecting people.

"We learnt that it's important if someone has the disease, intensive sports would be avoided. Athletes should be screened carefully. The disease can be treated, so that's why it's important to make the diagnosis early," said Schwartz.

Often, the diagnostic clinical signs of the disease only become clear after many years. However, if a subject with ARVC is a carrier of a mutation of the CDH2 gene, other members of their family who are genetically affected can be identified and preventive strategies could be started. This may lead to a reduction of cases of sudden death in patients with the mutation, explained the researchers.

EVOLUTION OF THE UNDERSTANDING OF ARVC

For almost 20 years, Mayosi followed a South African family affected by ARVC that had experienced several cases of juvenile sudden death. Excluding all genetic causes known at the time, the Italian researchers sequenced all the coding regions of the genome in two ill members of the family.

According to Shaboodien, whole exome sequencing, the technique the researchers used to find the gene, was unheard of about seven to eight years ago.

"In the old days it used to take two to three years to screen one gene … Suddenly with technology you are able to screen 19 000 genes within a matter of hours. We called it genetics on steroids."

After the sudden death of a 22-year-old family member, cousins of the family member were identified as carriers of ARVC.

"We sequenced all the genes in the human genome in two cousins who were affected," says Fish. "We then looked for common variants and had a list of 13 000, which we narrowed down through a series of filtering criteria to the CDH2 variant, which was the most likely causal variant in this family."

The discovery of this gene was validated by finding a second mutation of the same gene in a number of unrelated individuals who also had ARVC.

"None of this would have been possible without the families and people willing to allow us to explore their families and screen them," says Kraus.

Currently the UCT research centre where the researchers worked is one of the few places in South Africa where genetic screening was done.

"When pioneering medical researchers make discoveries such as this, it enables us to innovate to find easy ways to detect the gene or diagnose ARVC and find ways to prevent sudden death in young South Africans," says Professor Glenda Gray, president and CEO of the South African Medical Research Council.

"This collaborative research is what we relentlessly seek to fund, because it directly translates into finding ways to save lives in South Africa." ■

New ranking shows which SA banks contribute most to systemic risk

STORY AIFMRM

Two students from UCT have designed South Africa's first systemic risk ranking – which outlines what could happen in a financial crisis and identifies who is putting the system most at risk, and why.

A new ranking highlights some of the dangers and risks facing South Africa's banks – an industry that has been rocked by recent revelations of collusion and currency fixing, resulting in the Competition Commission referring to the Tribunal for prosecution against 17 banks.

Designed by two students from UCT African Institute of Financial Markets and Risk Management (AIFMRM), the SA Financial Institution Systemic Risk Ranking rates South African financial institutions according to their contribution to systemic risk – which is the likelihood that the failure of a bank would lead to the failure of the financial system as a whole. While the ranking does not give any indication of the likelihood that a financial institution will default, it gives an indication of how such a default would affect other South African financial institutions.

"We thought it was very important to understand the financial system as a whole and to be able to look at who

is putting the system at risk and why," says Qobolwakhe Dube, a PhD student at UCT. "We used a lot of statistics and mathematics to arrive at our model, which can be updated easily with a few clicks of the button," he says.

The model is an adaption of the SRISK model which was developed by Nobel laureate Robert Engle from the New York University's Stern School of Business following the financial crisis of 2008.

"It is especially valuable for policy makers and regulators to know which companies contribute most to systemic risk and may be in need of additional scrutiny and oversight," says UCT master's student and the co-founder of the ranking, Trésor Kaya.

The point of the systemic risk ranking is not to identify institutions that are at risk of failure, but to look at which institutions would have the greatest impact on other institutions should they fail anyway.

> "Our ranking provides novel and very useful information that will help financial institutions to internalise their systemic risk contribution."

UCT students Qobolwakhe Dube and Trésor Kaya. Image: supplied

According to Dube and Kaya's model, this would be the Standard Bank Group, which leads the ranking quite significantly at 25.56% before Barclays Africa Group at 13%. In third place is the FirstRand Group at 12.94%.

"It is significant because it shows that only three financial institutions constitute up to 50% of all systemic risk in South Africa," says Dube. "This is why it was possible for them to collude on fixing the rand. There is too much concentration and a lack of competition, which is not healthy for the industry."

Systemic risk is affected by factors like the company's share price as well the activities the bank engages in. Liabilities also come into play as well as to whom the banks owe money.

"Our ranking will be most beneficial to those in industry, to the regulators as well as policy makers," says Dube. "It provides novel and very useful information that will help financial institutions to internalise their systemic risk contribution."

Dube and Kaaya intend updating the ranking frequently and have made the code they used freely available as open source.

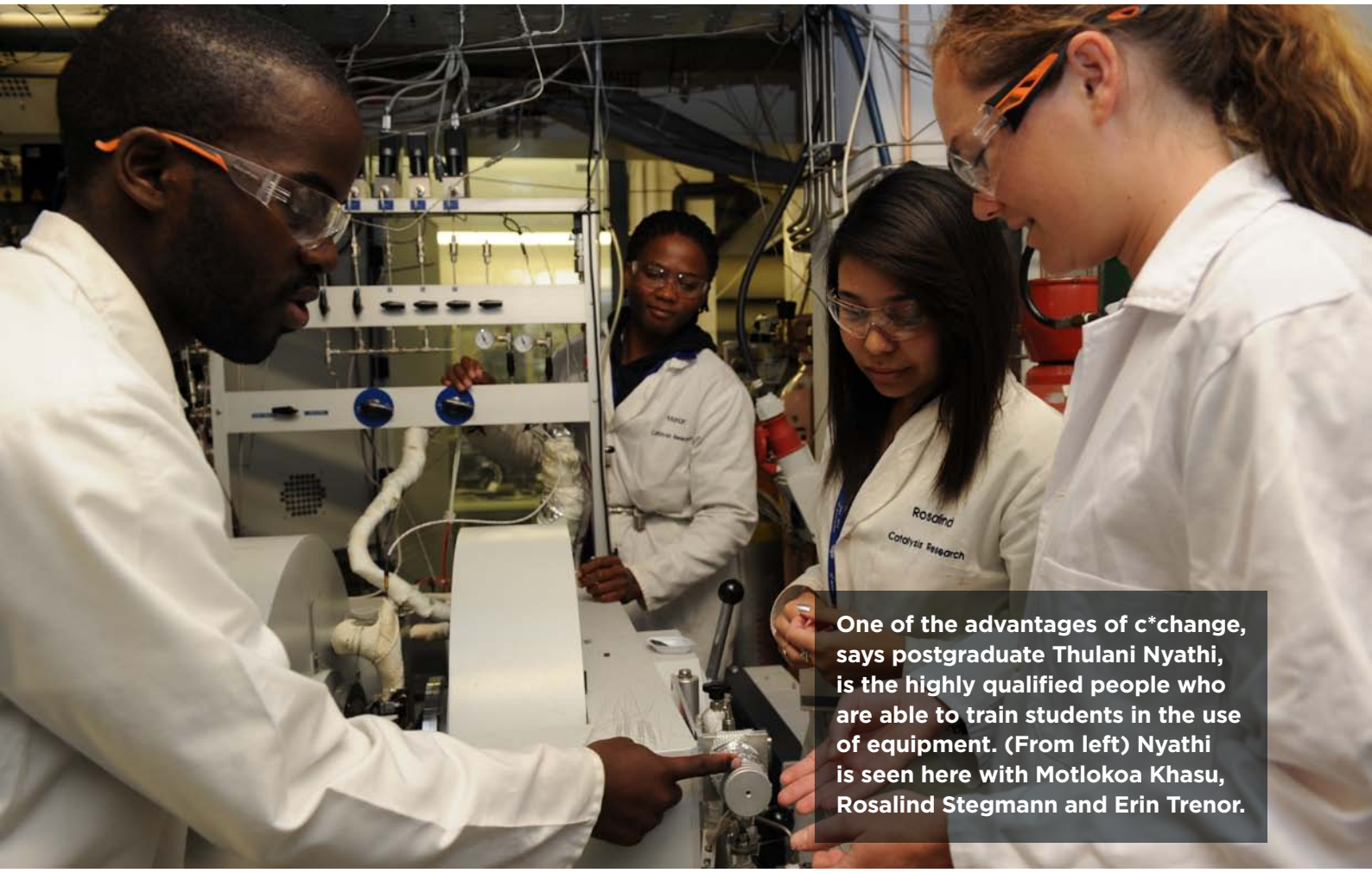
Dr Co-Pierre Georg from the AIFMRM who supervised the student's work explains the ranking's significance, "I am very proud of our students. It is the first time that a ranking like this has been done in South Africa and it comes at a crucial time. The concentration in our banking system has many adverse consequences. Our ranking provides an academically sound motivation for regulators to start thinking about a systemic risk tax that would help in making the sector more competitive and protect South African tax payers in the unlikely event of a banking crisis."

He said the research opened further fields of possible research related to the systemic risk in South Africa. ■

CLICK HERE TO VIEW THE RATING

How c*change is a catalyst for transformation at UCT

STORY CARLA BERNARDO **PHOTOS** MICHAEL HAMMOND



One of the advantages of c*change, says postgraduate Thulani Nyathi, is the highly qualified people who are able to train students in the use of equipment. (From left) Nyathi is seen here with Motlokoa Khasu, Rosalind Stegmann and Erin Trenor.

For change to occur, one requires a catalyst. Someone or something needs to create change that, in turn, will spark a chain of events. As one of the first centres of excellence established by the Department of Science and Technology (DST) in the country, c*change is that something, providing a blueprint for transformation at a tertiary level.

Hosted by the Catalysis Institute in the Department of Chemical Engineering at UCT and led by Professor Michael Claeys, c*change is a virtual centre funded by the DST through the National Research Foundation (NRF).

Claeys is the director of c*change and is leading the nationwide collaboration of 14 research groups at 10 universities. Currently there are between 55 and 60 postgraduate students within the centre, exceeding the required number of 40 as defined by its agreement with the NRF. In addition, 15 postdoctoral research fellows receive support.

The c*change funding covers the students' bursaries as well as the running costs of the respective scientific projects for the duration of their study. At a PhD level, yearly costs vary between R250 000 and R300 000.

This NRF funding is made available to c*change because of their adherence to a strategic commitment to transform the unit. A service-level agreement with the NRF details demographic targets and the duration of degrees, and lists required outputs.

Claeys emphasises that they have consistently managed to meet the targets and nurture a group of students that is "pretty much representative of the country", with half of the participants identifying as female and two-thirds as black.

Of course, change does not come without its challenges.

Claeys and the c*change group often compete with corporates and financial pressures to retain students. Another obstacle to transforming the research cohort is that many black students do not study further.

"The question is why they aren't making it to postgraduate level," says Claeys, adding that cost remains a major barrier.

Equally challenging is judging students' potential from their academic records alone, as well as convincing some stakeholders that transformation is a necessary and worthwhile pursuit.

"A mind shift is needed," says Claeys. "Historically, we've needed the buy-in from our partners, but it has become a lot easier because of our success."

Despite the challenges, Claeys listed numerous benefits for c*change students from the transformation journey. The unit provides students and staff with a wide and varied network, infrastructure, collaboration and security.

As for transformation's effect on c*change, Claeys says, "We don't feel that transformation is slowing us down."

A mind shift is needed to convince stakeholders that transformation is a necessary and worthwhile pursuit, says Prof Michael Claeys.

RISING THROUGH THE RANKS

More impressive – and testament to the successes of transformation – are those who have come up through the ranks.

Thulani Nyathi joined c*change in 2014 for his master's degree and, after graduating with distinction, began his PhD there in 2016.

Nyathi describes the start of his c*change journey: "I had mixed emotions about switching from the chemistry department to chemical engineering because I was not a chemical engineer and I had no idea how quickly I'd learn. So, that made me anxious."

However, says Nyathi, he received a warm welcome from Claeys and senior research officer, Dr Nico Fischer.

Once he was well acquainted with the deep end, Nyathi soon found himself thriving in c*change, enjoying the coursework, the annual symposium, the constructive discussions with peers, and the ongoing support.

"Apart from my supervisors – who are excellent and have an open-door policy – I also got close to many experienced students, who were always helpful," he says.

He mentions a few more advantages of c*change: "We have highly qualified people who are able to train students about using equipment."

A lack of resources is also not an obstacle to success in c*change as there is an active exchange of equipment between the partnering institutions.

Nyathi's tenacity culminated in him earning his master's degree and receiving the award for best student oral presentation at the 2015 Catalysis Society of South Africa conference.

Now Nyathi is focusing on finishing his PhD and publishing his MSc work. After that, he hopes to find a research-related job in the chemical industry.

REAPING THE BENEFITS

Having already completed her studies within c*change, Banothile Makhubela has reaped the benefits and is now leading a research group at the University of Johannesburg (UJ) affiliated to the unit.

"My entire postgraduate studies at c*change in the chemistry department of UCT have shaped my scientific thinking," says Makhubela. "I have been equipped with the necessary skills and am currently supported by c*change in the research programme I'm running at UJ."

Makhubela arrived at UCT in 2006 to study for her honours degree after graduating from the University of Zululand. Her time at c*change began in 2007.

"UCT was a lot different, both socially and academically. It was one of the most challenging years, but also a turning point," she says.

Makhubela said she was unfamiliar with the research-intensive environment, but she soon became acquainted with it, thanks to the help of passionate, supportive

Michael Claeys

academics. It also helped that she could see scientists that she had read about in her textbooks live at symposiums that had been organised by c*change.

During her time with the unit, which ended in 2012, Makhubela received funding support and opportunities to meet like-minded peers, display her research and attend international conferences.

"This gave me exposure to international labs, and I had the opportunity to expand my network of peers beyond South Africa," she says.

Makhubela says that studying at "the best research university on the continent" enabled her to produce research of an international standard.

Now, heading up the UJ arm of c*change, Makhubela has the opportunity to transfer knowledge and shape minds.

"Given our history in South Africa, I think transformation is extremely important, particularly in the science and technology arena where there is very little representation of previously disadvantaged groups and females," she says.

"Centres of excellence, such as c*change, are an example of what sustained support and a collective effort from dedicated academic researchers can achieve: producing master's and doctoral graduates and, in doing so, driving the transformation agenda." ■

Standerton service delivery protest. Photo by Jan Truter, courtesy Creative Commons licence, via Flickr

Understanding South African media through a global lens

STORY NATALIE SIMON

What values should guide the South African media? How can the media best serve all of society? Professor Herman Wasserman, Director of the Centre for Film and Media Studies, has dedicated his career to understanding – and answering – questions such as these. His work around media ethics and comparative media studies has recently been recognised and honoured internationally.

Professor Herman Wasserman began working as a South African journalist in 1995 – a year in which South African society was trying to redefine itself after the country's first democratic elections.

"This was really a period of redefinition for journalism in South Africa as we tried to grapple with what our role should be in this new democracy," he says.

It was perhaps here that the seeds were planted for Wasserman's illustrious research career. For the past 15 years, he has been working on research around normative ethics and the media: in other words, how value systems guiding the way journalism is practised in Africa can be developed to best fit society.

CRITIQUING THE NORTHERN FRAMEWORKS

While there is no single western media framework, one of the dominant frames that South African media have adopted is that of the watchdog aproach, with a focus on unearthing corruption and holding those in power to account.

"This is, clearly, a very important role in the South African context," says Wasserman. "Corruption is a problem in our society and courageous journalists are playing an important role in ensuring these dirty practices come out."

Herman Wasserman.
Photo by Robyn Walker

But it can translate into a very antagonistic kind of journalism that defines its primary role as in relation to government. According to Wasserman, we should also be asking questions around whose interests the media are watching out for. Much of South African journalism tends to foreground questions that are mainly of interest to an elite.

"So, in addition to saying we expect our media to play a watchdog role, how can we also foster ethical values of compassion, care and social justice? And how do we do this in a way that strengthens rather than undermines the media's ability to hold all forms of power – state, corporate and social – to account?"

Wasserman argues that the media in South Africa could also play a role in broadening our understanding of each other, going beyond the narrow interests of the elite. One approach he has found useful in recent years, he says, is that of 'listening' as a framework – actively seeking out and listening to voices that have historically been, and continue to be, suppressed, stereotyped and marginalised.

The need for this kind of listening framework was recently illustrated by the work Wasserman did with his colleagues at the Centre for Film and Media Studies – of which Wasserman is the director – Associate Professor Tanja Bosch and Dr Wallace Chuma, on an international project titled Media, Conflict and Democratisation (MeCoDem). Wasserman led the South African research team that compared the way South African media covered conflicts like community protests and xenophobic attacks with similar instances in other transitional democracies internationally.

"We found these protests are routinely reported only as an inconvenience for the middle classes, often merely mentioned as part of the traffic report. Attempts to engage with protestors, find out why they are protesting, why they don't opt for other forms of engagement and what has led to the breakdown in trust, are very rare," he says.

"Listening as an active way of engaging with, and around, conflict is very important in South Africa and we are in a good position to explore ways of reporting that could set an example for media in the global north."

"So, in addition to saying we expect our media to play a watchdog role, how can we also foster ethical values of compassion, care and social justice? And how do we do this in a way that strengthens rather than undermines the media's ability to hold all forms of power – state, corporate and social – to account?"

WHAT CAN THE NORTH LEARN FROM US? AND WHAT CAN WE LEARN FROM THE EAST?

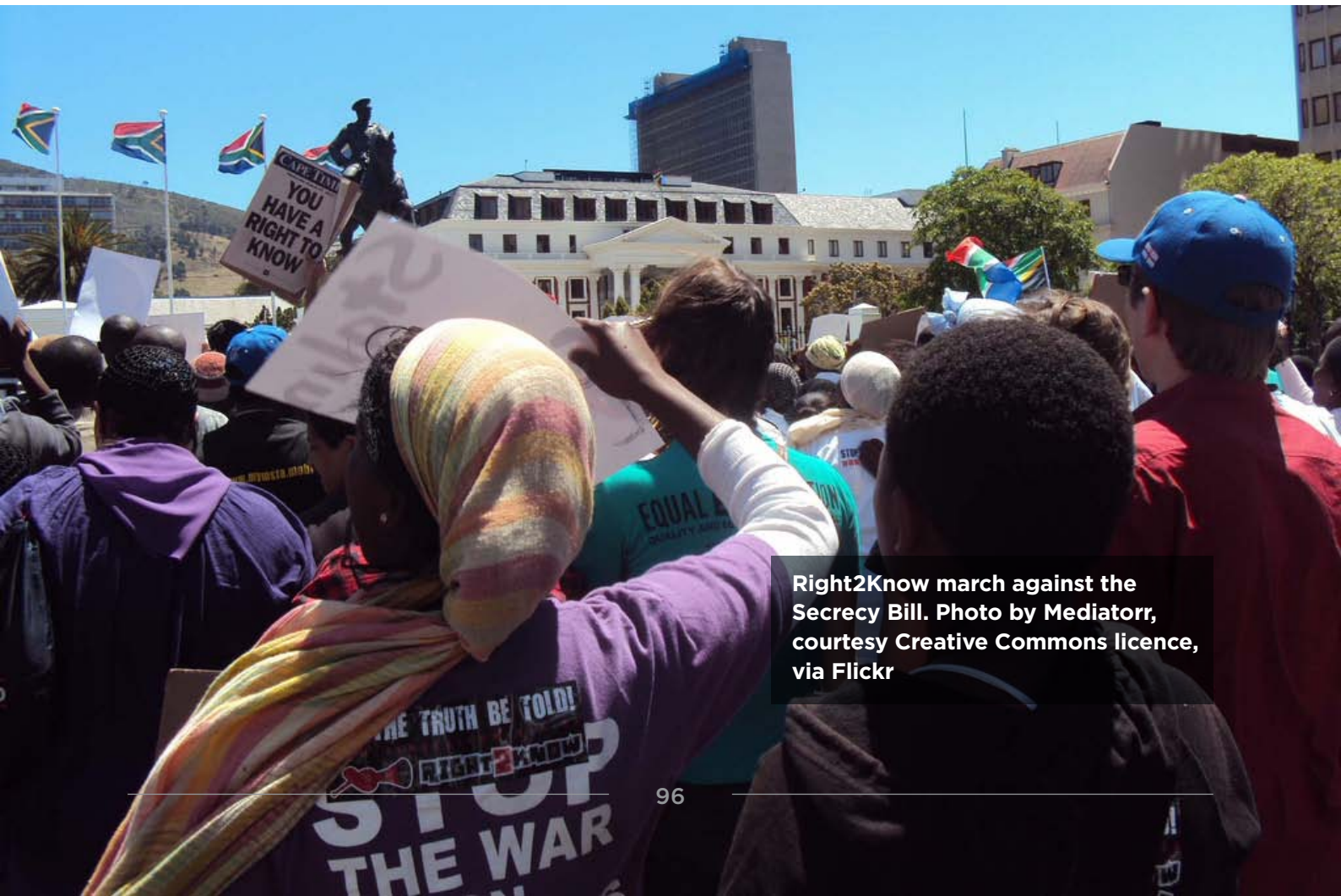
Wasserman stresses the importance of comparative media studies, arguing that in today's globalised media environment, questions of media ethics cannot be tackled in isolation.

He has argued in his work that historically, ethical norms for the media have been determined in the north and applied in the global south, without due attention to the role of media in these contexts. In his latest book, *Media, Geopolitics, and Power: A View from the Global South*, forthcoming in January 2018 from the University of Illinois Press, he argues that the South African media can serve as an example of how global shifts and changing geopolitics play out on the media landscape. This, he believes, can provide material for northern researchers to help understand their own changing environment.

He gives the increased migration and accompying intolerance we are currently witnessing in Europe and the USA as an example.

"Media in these countries are now confronted with questions around how to deal with conflicts arising from cultural differences," he says.

Because of its colonial history, cultural and ethnic conflict has been a challenge in Africa for decades. Wasserman argues that it might be useful for northern researchers to



Right2Know march against the Secrecy Bill. Photo by Mediatorr, courtesy Creative Commons licence, via Flickr

look at what has and has not worked on this continent, particularly around journalism for peace building and negotiating cultural identities.

Another interesting angle on questions of global media ethics in relation to local specificities has been his work on China–Africa media relations. Wasserman has been the principal investigator on a project, funded by the National Research Foundation, to investigate how China's increased media presence on the continent has prompted renewed questions about press freedom and journalistic value systems. "The media has been a key part of China's soft power initiatives in Africa," he says.

This has forced a reflection on the value systems underpinning African journalists' work and how this may differ from the Chinese approach to journalism, which some have called 'constructive journalism'.

"This is not to say the Chinese model is preferable," says Wasserman. "Rather it prompts us to ask deeper questions about what the best normative framework for African societies would look like, the history of how we have arrived at current normative approaches, and reflect critically on the assumptions underlying these."

"The media has been a key part of China's soft power initiatives in Africa."

SIGNIFICANCE OF THE GEORG FORSTER AWARD

Wasserman will have the opportunity for a great deal of further comparative work as a result of winning the Georg Forster Research Award by the Humboldt Foundation in Germany. The award includes an invitation to undertake a period of research in Germany, which Wasserman plans to use by spending his sabbatical in 2018 at the Ludwig-Maximillian University of Munich (LMU).

Wasserman is greatly looking forward to fleshing out some of his research questions with colleagues at the LMU, "South African media research tends to be quite parochial. This grant offers an important opportunity to study African media within a broader, global context.

"If we say we want to 'decolonise' media research, that cannot mean to become more inward looking or rejecting epistemologies from elsewhere out of hand. Instead, it requires us to examine the global power relations impacting upon our local situation, the history of how we got to where we are, and the ways in which we can speak back to global discourses."

He also notes the significance of this award beyond the personal. "Up to six of these awards are given out annually, and they are not discipline-specific," he says. "For me this award really recognises the importance of media research in a globalised world." ■

Crime-busting maggots: how insects can be the key to unlocking murder cases

STORY NATALIE SIMON **MAIN PHOTO** RICHARD BARTZ AND BEEMASTER HUBERT SEIBRING, MUNICH

Time of death can prove critical in a murder investigation and prosecution. But estimating time of death is a fine science, one that the police don't necessarily have the capacity to undertake. UCT's Division of Forensic Medicine and Toxicology is working with police to try to create a partnership in which tertiary institutions can serve as the police's research and development arm.

In 2000, an eight-year-old Johannesburg girl was abducted, sexually assaulted and murdered. A suspect was arrested for the crime, but claimed innocence of her murder saying he was in jail at the time of her death. But what was her exact time of death?

This case proved to be the first in South Africa where a murderer was convicted and sentenced based on forensic entomology: the use of insects in pathology as it pertains to law.

The child's body had been decomposing in the veld for seven weeks before she was found. Identifying time of death on a decomposing body – while critical for the criminal justice process – is incredibly complex.

Her time of death was accurately measured through a careful study of the insect activity on the corpse. This work was done by entomologist Dr Mervyn Mansell, who at the time worked at the Plant Protection Research Institute in Pretoria.

Forensic entomology is a burgeoning field in South Africa, and one where Dr Marise Heyns, a researcher in the Division of Forensic Medicine and Toxicology, is working towards a closer relationship between researchers and the South African Police Services (SAPS) to strengthen the evidence base for murder prosecutions in South Africa.

WHAT IS FORENSIC ENTOMOLOGY?

When a person dies, flies begin to accumulate around that body within minutes, explains Heyns. The flies lay their eggs on the body and those eggs then begin to go through known stages of development.

A forensic entomologist studies the maggots – soft-bodied, legless larvae, that form three of the four stages between egg and adult – feeding on that body to determine the stage of development, and thus give an estimated time for when the eggs were laid. This will often, although not always, correspond roughly with time of death.

There are sometimes challenges, says Heyns. "If a body is wrapped in a blanket or in plastic, then flies cannot immediately get to it, even though they are attracted to it. The circumstances of how the body was found is therefore something we always take into consideration."

Another important key is the species of insects that are found on the body, as different species arrive in different waves. Some are attracted to the gaseous smells given off by the digestive tract in the hours after death; others only come when the flesh begins to dry out, while yet others wait until only connective tissue and ligaments are left. Once the flying insects – the blowflies and the flesh flies – are done, beetles start arriving.

"So what we look at is the species, and then the length, width and weight of the maggot or pupa that you find on the scene," explains Heyns.

But the weather also plays an important role in this work. "Some of the early stage flies, for instance, will not come if it is raining," she says. "So we need to know if it had been raining

Maggots. Photo by Emma Forsberg, courtesy Creative Commons licence via Flickr

in the days or weeks leading up to the discovery of the body."

Varying weather conditions are an important reason to have a number of researchers in this field working in various areas of the country. The duration of the life cycle of a fly depends greatly on environmental factors such as temperature, humidity and night–day cycle. So it is impossible to use data collected from another geographical area and simply apply it to a case in your area.

"There has been very little research done on the Western Cape's forensically important flies," says Heyns. "We need to create databases and temperature ranges for larval development so we can adapt our analyses accordingly."

DRUGGED UP MAGGOTS

Beyond the environmental challenges, there are other potential spanners in the works. Certain drugs influence the development of the maggots. Cocaine, for instance, accelerates their development.

To deal with this, postgraduate researchers in the Division of Forensic Medicine and Toxicology studied the effects of drugs commonly used and abused in the Western Cape, such as methylphenidate and amitriptyline, to see how they affect larval development.

"When we are looking at a crime scene, we try to analyse the food source (flesh of the corpse) of the maggots. Alternatively we analyse the stomach contents of the maggot

"There has been very little research done on the Western Cape's forensically important flies," says Heyns. "We need to create databases and temperature ranges for larval development so we can adapt our analyses accordingly."

to identify if the victim was using any drugs. The study of the effects of drugs on insect development is part of entomotoxicology."

How do you analyse the stomach contents of a maggot? "Through very careful dissection," laughs Heyns.

RESEARCH AND THE SAPS

"When I first got involved in our multidisciplinary biomedical forensic

Maggots. Photo by Cory Doctorow, courtesy Creative Commons licence via Flickr

master's programme, which is a first in the country, I realised that forensic entomology is not practised by the regional SAPS," says Heyns.

"We have made real progress since then, with greater or less success depending on different regions. But my end goal is for tertiary institutions to work closely with the SAPS to become their research and development arm."

Tertiary institutions – and UCT especially – have the kinds of resources and the ability to solve real problems that hamper police investigations, says Heyns.

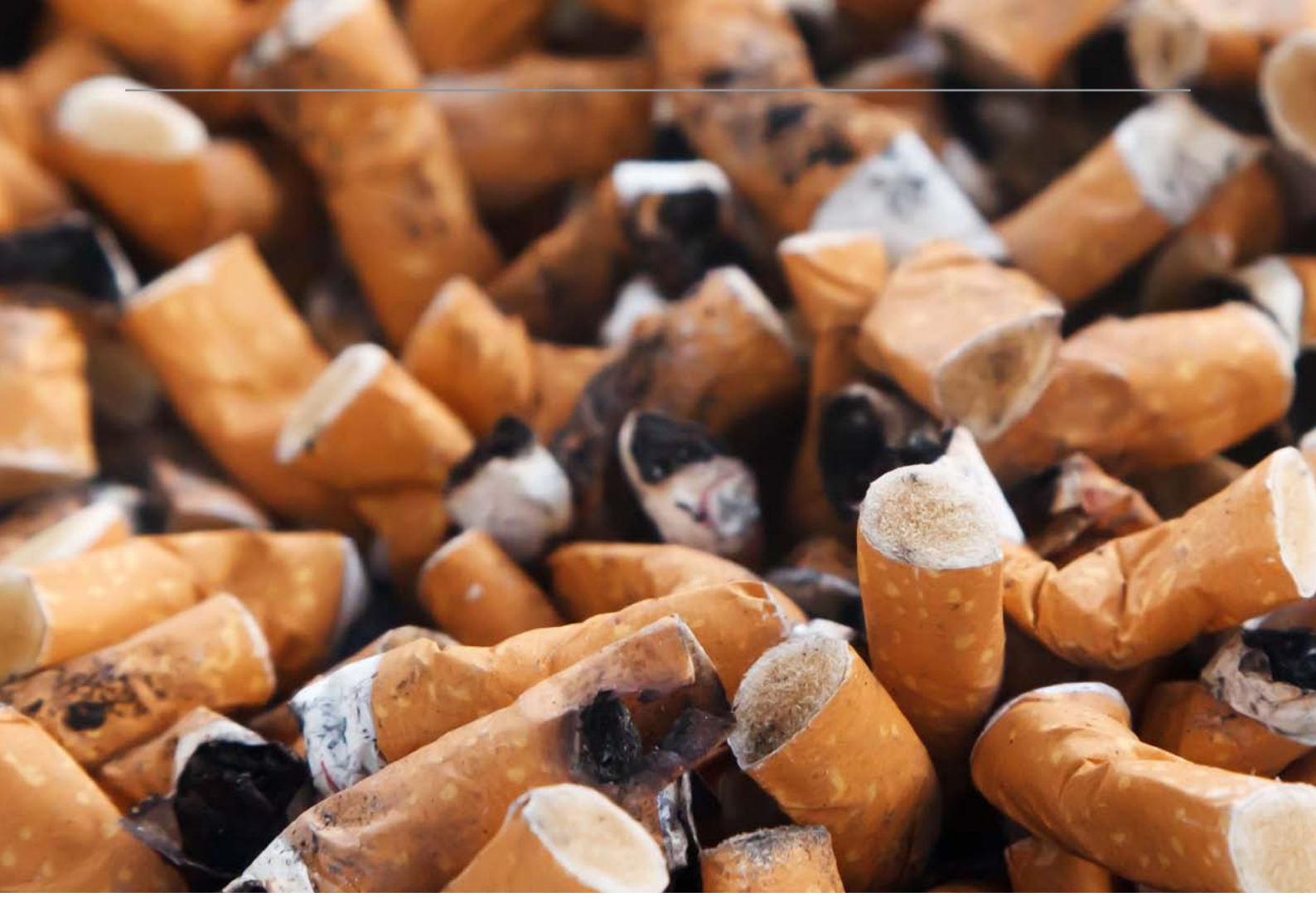
"For instance, samples taken from a crime scene often have to travel long distances to get to a laboratory. But those live maggots need to be in the laboratories for incubation soon after collection," she says.

"One of my students found a solution to this obstacle. She has successfully extracted the DNA from the maggots and flies to be able to identify their species. This way we don't have to wait for the maggots to incubate."

Heyns also wants to see more researchers working in the field with police. She hopes to encourage a police directive at national level, to ensure greater collaboration between police and researchers, and allowing the researchers to provide a real service.

"In the end, we are all working together towards the same thing," she says. "We want to improve the quality of the evidence, and the communication of the evidence in court to ensure a fair and professional criminal justice system." ■

"... my end goal is for tertiary institutions to work closely with the SAPS to become their research and development arm."



Targeting tobacco harm in Africa and Asia

STORY HELEN SWINGLER

Professor Corné van Walbeek is part of a multinational team of researchers, led by the University of Stirling in the UK. The consortium has been awarded £3.4 million from the Global Challenges Research Fund (GCRF) Research Councils UK Collective Fund to reduce tobacco-related harm in Africa and Asia. The project is housed at the Southern Africa Labour and Development Research Unit (SALDRU).

Led by Stirling's Professor Linda Bauld, the multidisciplinary three-year project involves six UK universities linked to the UK Centre for Tobacco and Alcohol Studies, as well as Cancer Research UK and eight partner institutions in seven countries. These are South Africa, Uganda, Ghana, Ethiopia, the Gambia, India (two partner institutions) and Bangladesh.

With almost 80% of the world's one billion smokers living in low- and middle-income countries, the aim is to decrease smoking rates and curb tobacco-related harm in these regions. The World Health Organization (WHO) estimates that about seven million people die prematurely from tobacco-related diseases annually.

TOBACCO EPIDEMIC

Global epidemiological studies show that smokers have a 50% chance of dying prematurely.

"Half of those who die prematurely die before 69," said Van Walbeek. "Epidemiologists estimate that, on average, if you die of a smoking-related disease you're dying 10 to 12 years earlier than you would have."

Bauld, who is Cancer Research UK's specialist on tobacco control, said: "As smoking dwindles to a minority activity in the UK, the number of smokers is still increasing elsewhere. Smoking kills more people every year than HIV, tuberculosis and malaria combined. By 2030 it's predicted that more than 80% of tobacco-related deaths will occur in low- and middle-income countries."

She said that the tobacco epidemic advanced in the developed world, where smoking rates skyrocketed in the first 60 years of the previous century.

"It took us many years to work out how to bring them down; through research, advocacy, communicating health risks and introducing evidence-based policies. This funding will allow us to work with countries that are now at the forefront of efforts to combat the world's biggest preventable causes of death."

The aim of the new project is to produce research that will inform tobacco taxation, tackle the black-market trade in tobacco and target tobacco companies' efforts to undermine governments' attempts to reduce smoking in their countries. At UCT, this work will be underpinned by postdoctoral research fellow Ernest Ngeh Tingum from Cameroon.

LOCAL PICTURE

Local statistics show that smoking prevalence has been decreasing consistently over the past two decades. In South Africa today, less than 20% of adults (over the age of 15) smoke. In the 1990s the figure was one in three. Although the numbers are still dropping, the rate of reduction is diminishing, said Van Walbeek.

Though health warning and campaigns have played a part, economics is key.

"The rates dropped massively in the 1990s when the government greatly increased the excise tax. In the past, prevalence was skewed towards the poor, but now the prevalence is

very similar across the various socio-economic groups of the population. However, the intensity of smoking (ie the number of cigarettes smoked per smoker) is higher among the rich than the poor."

With the bad reputation attached to the tobacco industry in Africa, from corporate espionage and social patronage to racketeering and other illegal activities, Van Walbeek believes that sound research on different aspects of the economics of tobacco control in the region will help governments in Africa to implement better strategies.

Much of this work is done by Van Walbeek and colleagues at UCT's Economics of Tobacco Control Project (ETCP) in SALDRU in the School of Economics. Van Walbeek has been working on the economics of tobacco control at UCT for 17 years.

EXPANDING RESEARCH

The ETCP is funded by the Bill and Melinda Gates Foundation (through the African Capacity Building Foundation), Cancer Research UK, the International Development Research Centre, WHO, the South African Medical Research Council and now also Research Councils UK.

The ETCP works to expand current research in the economics of tobacco control and enhance the knowledge of economic and tax issues among tobacco control advocates and policymakers to strengthen support for tobacco tax and price increases in sub-Saharan Africa. The project also underpins the creation of a new generation of tobacco control economists, to create a centre of research excellence in sub-Saharan Africa.

"Ours will be a more global role to support governments in countries that want to implement better tax regimes on tobacco by providing them with all kinds of technical assistance," said Van Walbeek.

"At the moment, we have 10 economists working either part-time or full-time on the project, so there's been a massive expansion. Although the current focus is on Africa, through the Knowledge Hub, we want to have an international focus."

The ETCP was nominated by the national Department of Health to establish a Knowledge Hub on tobacco taxation and illicit trade, on behalf of the WHO's Framework Convention on Tobacco Control Secretariat. The nomination of the ETCP team to fulfil this role was primarily due to the team's extensive experience in the economics of tobacco control, dating back to the mid-1990s.

Countries where smoking is increasing are nearly exclusively all lower- and middle-income. Of the top 25 countries in this bracket, 17 are in Africa.

Ernest Ngeh Tingum (left) and Corné van Walbeek. Photo by Robyn Walker

EASY TARGETS

People living in developing countries, particularly in Africa and Asia, are easy targets, said Van Walbeek.

"If you look at smoking statistics in high-income countries, it's clear that tobacco legislation and tax interventions are working. With countries like Australia, the UK and parts of the US having become aggressively anti-smoking, many European countries are following suit. Smoking is becoming unfashionable, even in a tobacco 'stronghold' like Turkey."

But countries where smoking is increasing are nearly exclusively all lower- and middle-income. Of the top 25 countries in this bracket, 17 are in Africa.

Van Walbeek attributed this to Africa's recent economic growth, weak or non-existent tobacco control measures in many African countries, and an increasingly brazen tobacco industry that takes advantage of marketing opportunities

"In some countries tobacco is still a very aspirational product. Smoking is strongly dependent on income. If income goes up, people tend to smoke more."

Coupled with promises of foreign investment and corporate social responsibility projects, this makes it easy for tobacco multinationals to get a foot in the door in developing countries. Sound research on the cost of tobacco-related harm in these countries is vital.

"The tobacco industry is strongly opposed to many of these tobacco control interventions because they're in it for the money. But their product kills its consumers." ■

In the quest to meet the SDGs, there's a danger that some may be left behind

STORY PROFESSOR TOM MOULTRIE

Photo by Curt Carnemark / World Bank

The United Nations' Sustainable Development Goals that countries have committed themselves to striving to reach by 2030 are a watershed in the global development agenda.

Vast resources will be allocated internationally and at all levels of government to ensure that the effects of the 17 goals are maximised. These range from ending poverty and hunger to mitigating the effects of climate change.

The SDG agenda and the efforts that will be expended to meet these goals must be welcomed. But the global development community should not be blinded to aspects of the agenda that appear to be neglected. These aspects may hamper efforts to achieve those goals.

The first relates to a core guiding principle of the SDG framework that "no one should be left behind". The second relates to the risk that in the rush to measure, monitor and track the progress towards meeting the SDGs, countries in the global South may find themselves disempowered.

Unless steps are taken to address these two gaps, efforts and resources may be misdirected, and the benefits of the 2030 development agenda may not be shared equitably.

LEAVING NO ONE BEHIND

This mantra in the SDG framework shows the clear intention that the fruits of achieving the SDGs should be shared equitably. Meeting the goals means meeting them for everyone, not just on average. Expressed like that, it is certainly a laudable ambition.

Certain dimensions of "no one left behind" are laid out in the

framework. These include income, sex, age, race, ethnicity, migratory status, disability and geographic location, in accordance with the UN's Fundamental Principles of Official Statistics. The principles lay out the framework for the collection, analysis and dissemination of official statistics.

But this masks a conceptual problem. As theorists of official statistics have noted, the classifications and categories employed in official statistics are themselves "named into existence". The act of not classifying or categorising certain groups can render them invisible in official statistics.

The use of simple binaries, such as sex for example, do not provide the space for transgender or intersex communities to be counted. Equally, not all minority populations – particularly those that fear, or experience, state-based discrimination or harassment – will want to be able to be identified in bureaucratic data. The question of who is to be counted so as to not be left behind is, fundamentally, political.

DISEMPOWERING THE GLOBAL SOUTH

The concept of leaving no one behind has further – more distal – ramifications in the global development agenda.

It is readily acknowledged that the monitoring, measuring and tracking of the more than 200 indicators associated with the SDGs will require data of a far finer granularity and precision than is currently routinely collected in the global South. Doing so will pose formidable challenges to national statistical systems in the global South. These will be felt by country particularly around budgets and finances and building and sustaining the required capacity.

There are two ancillary risks associated with these challenges.

First, the centre of gravity to design interventions and strategies to meet

Photo by Masaru Goto / World Bank

the challenge lies in the global North. Internationally leading universities, corporations and think tanks lead the way. These organisations have larger budgets, and greater capacity, than their counterparts in the global South. With this comes the risk of solutions being designed in the North and piloted and implemented on a one-size-fits-all basis in the South. Local specificities, dynamics and politics may be ignored. And the consequence is that methods and solutions shown to have some efficacy in one setting may be assumed to be as efficacious elsewhere.

Equally, without solid buy-in from local partners, these interventions may come to be seen as being as heavy handed and removed from local realities. This was the case with the Structural Adjustment Programmes pursued by the World Bank in the 1980s.

The second risk, in the absence (or failure) of sustained efforts to rebuild and recapacitate the national statistical systems of the global

South, is that the data for measuring, monitoring and tracking the progress towards the SDGs will increasingly be drawn from complex statistical and econometric models built and designed in the global North.

Already, the Institute for Health Metrics and Evaluation (IHME) produces model-based estimates of child mortality for all countries in the world. New versions of the model are capable of producing estimates at a sub-national level.

Similarly, the spectrum suite of demographic and epidemiological projection models is often used in the global South to produce estimates of population, HIV prevalence, or numbers of people in a country requiring antiretroviral therapy.

While there is undoubtedly need for such models, it would be a grave error to conflate the model results with the reality of what is happening. No model is perfect, and the results should – at best – be regarded as providing an approximation to the measure in the absence of empirically observed and derived estimates.

But the risks extend beyond that of model-based error. Models of this kind are frequently "black boxes" – with their inner working only fully understood by a very few. One should ask how many health researchers, epidemiologists, statisticians and demographers there are in countries in the global South who are capable of interrogating and questioning the results of such models, based on their own observations and experience.

Where this knowledge is either not drawn upon, or is absent, the risk is that countries in the global South may become increasingly dependent on the results of those models to provide the data required for monitoring progress towards meeting the SDGs.

BEYOND A CATCHPHRASE

Leaving no one behind is a catchphrase that ensures that all people benefit from the global development agenda. But the power to name those categories of people that should be monitored to ensure they are not left behind is neither neutral, nor necessarily benign. States should be engaging positively with domestic institutions and civil society organisations to determine for themselves the delineations of those at risk of being left behind.

At the same time, states in the global South should also guard against interventions for data collection and management, or model-based substitutes for those data, that may work to disempower local data communities. If not, these communities as a whole, may find themselves "left behind". ■

** This is an edited version of a column written for the UN SDSN Thematic Research Network on Data and Statistics (UN SDSN-TReNDS). Tom Moultrie is professor of demography at UCT. This is an edited version of a column written for the UN SDSN Thematic Research Network on Data and Statistics (UN SDSNTReNDS).*

Novel blindness gene identified

STORY SUPPLIED **PHOTO** STEPHANIE JULIUS

An international consortium that includes UCT geneticists has identified a novel gene, IDH3A, which is implicated in retinitis pigmentosa (RP), an inherited form of blindness.

The novel gene was identified by researchers from South Africa, Israel, the Netherlands and the United States. IDH3A is the third novel gene identified by UCT's Division of Human Genetics, in collaboration with their international partners.

IDH3A is important in all human tissues, but its mutations result only in degenerative retinal disease (dystrophy), the cause of which is not yet understood, said Professor Raj Ramesar, head of the Division of Human Genetics. The findings, published in *Ophthalmology*, report one family from South Africa, two families from the Netherlands and one from Israel in which RP patients carry mutations in IDH3A.

EXTENSIVE COLLABORATION

In the past 25 years, more than 80 genes have been associated with RP and together they explain approximately 70% of all cases. Novel identified genes such as IDH3A are typically found in less than 1% of the RP patients. This means that they can be identified only through extensive collaborations between RP researchers worldwide.

UCT's Division of Human Genetics has been researching inherited retinal disorders (IRD) such as RP in southern Africa since 1989. Working closely with ophthalmologists around the country and the lay support group Retina South Africa (which has funded the project since its inception), the division has recruited over 3 300 participants from 1 500 families. Major milestones of the UCT research group have included the previous identification of two novel RP genes: PRPF8 in 2001 and CA4 in 2004.

"All of the research on inherited retinal disorders aims to understand the disease mechanism that leads to visual loss, with the ultimate objective of halting progression of disease and creating precise molecular interventions," said Ramesar.

One of the co-authors of the *Ophthalmology* paper, PhD student Lisa Roberts, focused on identifying the genes and mutations causing inherited vision loss in indigenous African families. In 2014 Roberts performed whole exome sequencing in the Neurobiology Neurodegeneration and Repair Laboratory (NNRL) at the National Eye Institute in the US, under the guidance of her co-supervisor, Dr Anand Swaroop, and his research team.

UCT's Division of Human Genetics has been researching inherited retinal disorders (IRD) such as RP in southern Africa since 1989.

PhD student Lisa Roberts and Raj Ramesar, photographed at the next-generation sequencing platform.

NEXT-GENERATION TECHNIQUE

Whole exome sequencing is a next-generation sequencing technique that allows the simultaneous sequencing of all the exons (the coding portions of genes) in the genome.

"Analysing the data generated by this experiment was challenging, particularly as indigenous Africans display vast genetic diversity," said Roberts. "Millions of DNA sequence variants were detected, which had to be filtered and evaluated to pinpoint the exact mutations causing blindness in the families I was studying."

After interrogating all the known IRD genes, several of the families remained 'unresolved'. Roberts then examined the genetic sequence data from these families, looking for variants in a list of candidate genes (including IDH3A), published by the European Retinal Disease Consortium.

"The identification of multiple families from around the world with mutations in the same gene is strong supporting evidence when trying to link new genes to diseases," said Roberts.

As well as acknowledging other role players, Ramesar paid tribute to the role of Johannesburg ophthalmologist Dr Gratia Fischer, who provided details of the unusual clinical presentation of the South African individuals with IDH3A mutation.

Following Roberts's work in the US, the Ramesar Lab in the Institute of Infectious Disease and Molecular Medicine (IDM) has acquired a next-generation sequencing facility (a high throughput facility generating big data) that allows high-throughput sequencing like the whole exome sequencing. ■

Plotting enemy movements:

Sheetal Silal's powerful contribution to eliminating malaria

STORY NATALIE SIMON **PROFILE IMAGE OF SHEETAL SILAL BY** ROBYN WALKER

Anopheles mosquito

It is a scene in just about every war movie: the generals stand around a table moving miniature armies on a map. They are locked in a deadly battle. They need to predict the movements of the enemy troops accurately so they can cut them down with minimum fatalities to their own side. The stakes are high – a miscalculation can result in the deaths of thousands.

She may not be dressed in military fatigues, and she may not be working from a tent on a battlefield, but this is effectively what Dr Sheetal Silal does every day. Her enemy is malaria. Her secret weapon is mathematical modelling.

MATHEMATICAL MODELLING OF MALARIA

"This is a deadly serious battle we are facing," says Silal, senior lecturer in the Department of Statistical Sciences. According to the World Health Organisation (WHO), nearly half the world's population is at risk of malaria, with an estimated half a million deaths from the disease in 2015.
To help achieve the global goal to eliminate malaria by 2030, Silal builds simulations that show how the disease spreads in order to help policymakers control and fight the disease.

In order to stop a disease you need to understand its biology and how it spreads, explains Silal. To use malaria as an example, not everyone who has malaria feels ill. Many carriers are asymptomatic and have no idea that they are spreading the disease.

"This iceberg scenario, observing only a small proportion of cases, poses a major challenge to policymakers trying to battle a disease. It means that the infectious reservoir is almost always out of reach because you're not going to seek treatment if you don't feel sick."

This is where mathematical modelling can help, because it seeks to predict and plot out the behaviour and spread of these infectious diseases. With this information, policymakers can then be proactive about which populations to target, who to vaccinate, when to vaccinate and other proactive measures to pre-empt the situation, and/or react effectively.

This is revolutionary.

"Twenty years ago this would never have been possible: it would have been the stuff of science fiction," she says. "But today, through science and technological advancements, mathematical modelling of diseases plays an integral part in shaping policy and saving lives."

THE PATH TO MATHEMATICAL MODELLING

This modelling brings together a few disciplines, explains Silal. Firstly you require a good understanding of biology, in order to explain how the disease behaves in your body. Then you need to be able to work with large amounts of data on previous epidemics and the population of interest, which means that statistics comes into play and you need mathematics to create equations from all this information. Finally, you use computer science to write a program that brings it all together to create a model.

Silal herself first dipped her toes into disease modelling as part of her master's degree. Her postgraduate work was in operations research, and one of the modules she took was called system dynamics.

"This was about understanding and modelling systems: the theory could be applied to any system. Whether in production lines or a disease, systems are everywhere," she says.

Then an opportunity came up to work with her supervisor on statistical analysis of malaria, and they thought it might be interesting to try to model the disease using what she learned in system dynamics.

"So I read a few papers and started programming a few models and absolutely fell in love with it," she says. "It has been a decade and I am still working on malaria modelling." In fact, she built the first mathematical model for malaria in South Africa.

RIDDING THE PLANET OF MALARIA

What keeps her in it, she says, is knowing that she is making a tangible difference in the lives of everyday people.

She is integrally involved in the worldwide initiative to rid the planet of malaria. One of the projects she is working on at present is to plan an elimination strategy for the Asia Pacific. She has just completed a modelling exercise to determine cost-effective strategies to advise governments on what may or may not work. Her models have been

developed into a web application to assist national malaria control programmes in their decision making.

"This has been a real highlight for me," she says, "I believe one of the biggest achievements you can have as a researcher is to see your research translated into policy."

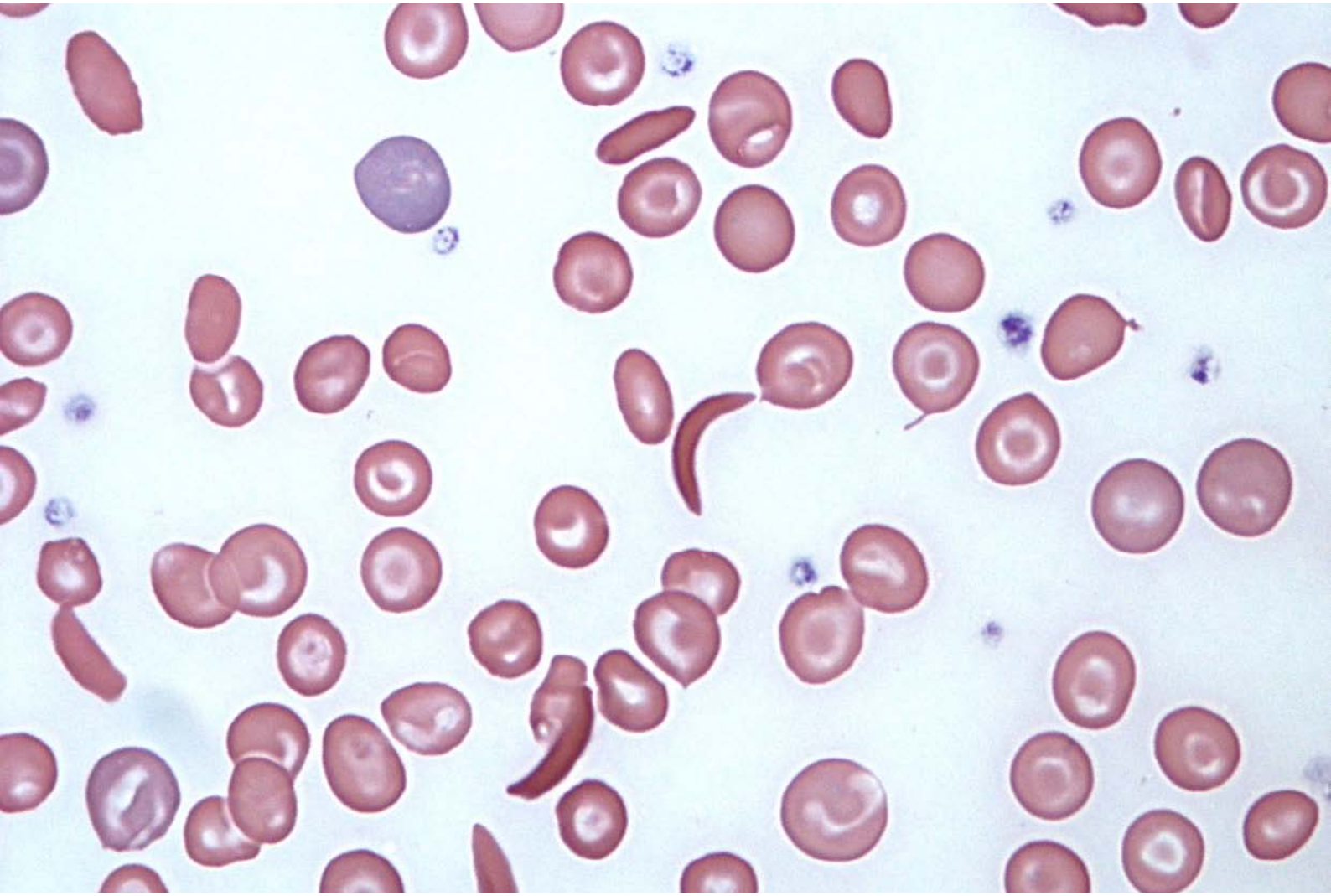
TRAINING MORE MATHEMATICAL MODELLERS TO TACKLE DISEASE

Mathematical modellers are rare creatures, not only in Africa, but around the world. Another of Silal's goals is therefore to train more scientists to be able to model disease in this way. To this end she runs an annual short course at UCT to train more modellers. These courses attract not only postgraduate researchers but also individuals from public, private and NGO sectors who are actively involved in the initiative to eliminate malaria.

Silal says she cannot stress enough the powerful role mathematics can play in the battle against infectious diseases.

"Mathematics may not be the traditional answer when you talk about combating disease," she says. "But mathematical modelling has become an integral tool in supporting policy. I would encourage students not to shy away from mathematics, statistics and computer science. Put together, these three subjects make a very powerful package to change the world." ■

Sheetah Silal



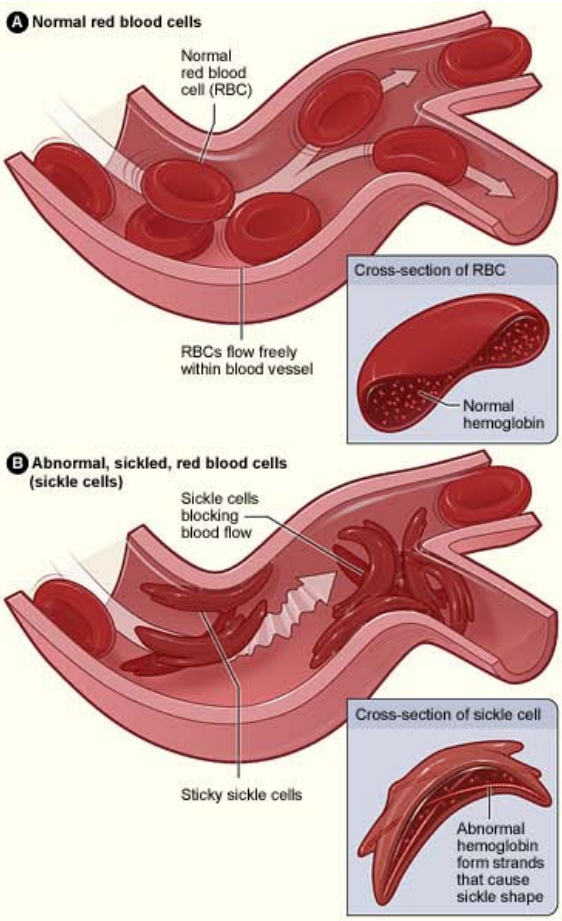
A ray of hope for neglected African disease: sickle cell disease

STORY NATALIE SIMON **PROFILE PHOTO** MICHAEL HAMMOND

Sickle cell disease (SCD) is a gene mutation that affects over 300 000 newborn babies every year, nearly three-quarters of those in sub-Saharan Africa. Ninety per cent of babies with SCD in Africa are believed to die before the age of five years. To respond to this disease on the continent, a range of research groups under the leadership of UCT's Professor Ambroise Wonkam have secured US$3.7 million to establish the Sickle Africa Data Coordinating Center (SADaCC), which will build capacity to help Africa tackle this disease.

"Sickle cell disease impacts extremely negatively on the quality of life of a patient," says Professor Ambroise Wonkam, professor and senior specialist in the Division of Human Genetics in the Faculty of Health Sciences, and principal investigator for SADaCC. "Symptoms of the disease include anaemia (due to the short lifespan of the deformed red blood cells), episodes of severe pain caused by the sickle-shaped red blood cells blocking blood flow in the body, frequent infections, and delayed growth and vision problems as the sickle cells block blood vessels to the eyes."

The disease is also accompanied by major risk factors – such as pulmonary hypertension (high blood pressure in the lungs), organ damage, stroke, blindness and kidney dysfunctions and failure – that ultimately lead to a short life expectancy, if untreated.



NORMAL BLOOD CELLS VERSUS SICKLE BLOOD CELLS

We rely on our red blood cells, specifically the haemoglobin in those cells, to carry oxygen from our lungs to all the tissues of our body. These red blood cells are disc shaped, so they can easily move through both the large and small blood vessels all over the body. But sickle cell disease is a genetic mutation that causes haemoglobin to develop into stiff little rods within the red blood cell. That misshaped haemoglobin forces the red blood cell into a crescent or sickle shape, which hampers its ability to move through blood vessels. These sickle cells cause blockages in the blood vessels, cutting off oxygen supply to critical parts of the body like the organs, brain and eyes.

IMAGE: **Wikimedia Commons**

A TURNING POINT FOR SCD?

Despite the high incidence of SCD, there has been little investment in basic research into the disease, specifically in Africa.

"The first case of SCD was described more than 100 years ago, but there is still only one medication (hydroxyurea) available for treatment," says Wonkam.

His research has been dedicated to remedy this history of neglect. This work has recently paid off with the announcement of the US National Institutes of Health (NIH) and National Heart, Lung and Blood Institute (NHLBI) funding SADaCC.

"The centre will allow us to build a robust platform to support the activities of a companion Pan African Sickle Cell Disease Consortium (SPARCo), which brings together leading SCD researchers and clinicians from high-, middle- and low-income countries to bring about real change – not only for victims of SCD but affected communities and regions.

"The work of SADaCC can be described as that of a conductor of a pan-African sickle research orchestra," says Wonkam. "The four main activities of the centre include administrative planning and coordination across various sites in Africa, research design and training of field investigators, monitoring and implementation of the research and data management, and analysis and publication of research results."

Key to the work of SADaCC is the coordination of longitudinal cohort studies. "These are the most scientifically rigorous methods in understanding the risk factors, health and disease outcomes, as well as training and public policy for the disease," says Wonkam.

"The SADaCC will measure its success not only by research impact in the way we understand both the scientific and clinical aspects of the disease at the scientific and clinical level, but by the way that understanding helps us treat patients effectively. The centre will therefore have a direct impact on how patients are treated in clinics," he says.

Critical to the future work of SADaCC is the focus on translating the research into policy and practice changes. One of the main conditions of the NIH/NHLBI grant was a formal commitment from the ministries of health in the collaborating countries.

"It is important to say that, while more than 70% of SCD patients worldwide live in Africa, most advances in the molecular understanding and management of SCD have been based on research conductedin either the US or the UK," says Wonkam.

Ambroise Wonkam

AFRICAN RESEARCH FOR AFRICAN DISEASES

Wonkam says it is critical that the research for effective management and treatment for SCD is developed in Africa, as it is Africans who are worst affected.

"The mutation that causes SCD is the same as those that confer a resistance to malaria," explains Wonkam. "SCD is thus most prevalent in populations living in areas of the world where malaria has been endemic for a long time – and so Africa and its populations are worst affected."

The mutation is also highly prevalent in the Arabic peninsula and India, and among some people of European descent who have been exposed to malaria for a long time, such as those in the southern parts of Italy and Portugal. Sections of Africa – such as South Africa – that have not been affected by malaria for thousands of years do not experience high levels of the mutation. SCD does, however, affect African Americans, whose genetics still contain the mutation.

"It is important to say that, while more than 70% of SCD patients worldwide live in Africa, most advances in the molecular understanding and management of SCD have been based on research conducted in either the US or the UK," says Wonkam.

"Clearly contemporary research tools must now be widely implemented in Africa. Therefore, SADaCC has a capacity-building dimension, as the SCD studies will be performed from design, clinical and molecular analysis and reporting, right here on the African continent." ■

Towards a waste-free world: **urban mining, SA style**

STORY MARELISE VAN DER MERWE

Urban mining is fast becoming a more prolific research area, with scientists, economists and other scholars the world over channelling their energies towards a waste-free world. New research from UCT suggests that not one or two, but all waste streams can be monetised in South Africa – and that this could have a profound impact not just on the environment, but on the economy as a whole.

Urban mining – reclaiming compounds and elements from products and buildings when they have reached the end of their useful (first) life – can transform South Africa's green economy, push GDP growth, and create jobs where they are needed most.

That's according to a new study by researchers at the Energy Research Centre (ERC) at UCT. Titled 'The general equilibrium impacts of monetising all waste streams in South Africa', by Faaiqa Hartley, Tara Caetano and Reza Daniels, the research assessed the impact of repurposing 13 waste streams.

The title may not sound like a page-turner, but don't be deceived: the content is a potential game-changer. South Africa has a major waste management problem. The World Bank in 2012 ranked South Africa 15th in the world for waste generation, with the average South African producing around 25 tonnes of waste in their lifetime – only a 10th of which was recycled. The landfills are filled to capacity, with some 108-million tonnes of waste being generated each year. Nonetheless, even the relatively small amount of recycled waste is a metaphorical goldmine: In 2011, the Department of Science and Technology reported that despite low uptake, recycled waste fed R8.2 billion per year worth of resources back into the South African economy. Enter urban mining: digging for precious resources among urban waste. Waste as the new gold, if you will.

Hartley, Caetano and Daniels used a computable general equilibrium model for South Africa (known as Sage) to assess 13 waste streams monetised by the Department of Science and Technology in its 2014 Waste Road Map Report, analysing the impact at three recycling levels: 29%, 47% and 100%. In a separate report, they also examined the existing impact of waste tyre management. The results were promising: According to the above model, depending on the level of recycling within those 13 waste streams, real GDP could increase by up to 0.5%, with just under 14 000 new full-time equivalent jobs created. The streams expected to deliver the greatest impact were electricity generating streams, for example through the combustion of municipal waste; construction and demolition waste; plastics and glass.

"Through economy-wide effects, an increase in the share of recycled products by 18% has the potential to increase real GDP by 0.1% and employ an additional 4 000 workers. If the target of 100% of all waste recovered and recycled were achieved, real GDP could increase by 0.5% and an additional 13 661 jobs could be created," the authors wrote.

To some extent, South Africa is on its way to monetising waste effectively. The National Waste Management Strategy, undertaken in 2011, aimed to combat the landfill problem; the National Environmental Management Waste Act (NEMWA) set the goal to divert 77% of recyclable waste away from landfill sites by 2019. So far, the waste tyre stream has been monetised, with the intention to incentivise recycling through waste tyre fees. By 2015, just shy of a third of the country's tyres were being recycled (compared to 4% in 2013). Alongside, about 3 000 jobs were created and around 200 small, medium, and micro enterprises and cooperatives established, all related to the Waste Tyre Management Plan. The paper and packaging stream is also working on increasing its recycling efforts in line with NEMWA.

That's a drop in the ocean, according to the new study; the potential for monetising other streams is apparently much larger than the tyre stream. "The volumes of other waste streams far exceeds waste tyres in terms of total tonnages," Daniels told *Daily Maverick*.

Globally, there's an increasing awareness of the potential of urban mining and more strategic waste stream management. In recent

Globally, there's an increasing awareness of the potential of urban mining and more strategic waste stream management.

news, Vancouver scientists recently developed a flowsheet to extract copper, silver and various rare earth metals from used LED bulbs. The UK Green Building Council recently recorded the lowest carbon footprint of any building refurbishment, completed renovations using 98% recycled materials obtained from urban mining. And in South Africa, there has long been a thriving informal network of recyclers who play a crucial – if often unrecognised – role in cleaning up cities and ploughing waste back into the economy; a role that the South African Waste Pickers' Association and the Global Alliance of Waste Pickers are campaigning to increase awareness of. (Pieter van der Westhuizen, director of Lothlorien Recycling in Johannesburg, has previously said that waste pickers account for around 35% of the organisation's recycling intake; an occupation that can reportedly earn them around R120-R200 per day.)

Daniels – an economist and head of Research and Development at REDISA – says the economic potential of monetising all the country's waste lies in its potential for job creation, but most specifically in creating these jobs where jobs are needed most.

"The findings of the study are significant because they suggest that South Africa's growth path, which has previously been skills-biased with very low levels of employment growth, can be altered to be less skills-intensive and more employment-intensive if we focus on a growth strategy that beneficiates all waste streams," Daniels explains.

"Our need to grow the economic pie in South Africa is now more important than ever before. Waste offers us the opportunity to take what is fundamentally dead capital and bring it back to life by monetising it."

Here's how urban mining works: It starts with waste sorting, collection,

"Our need to grow the economic pie in South Africa is now more important than ever before. Waste offers us the opportunity to take what is fundamentally dead capital and bring it back to life by monetising it."

transportation, storage, and transformation through recycling, preparation for reuse, and/or waste to energy technologies.

"This value chain creates the majority of employment opportunities among low and medium-skilled workers, and South Africa greatly needs this capacity in order to get the unemployed to work in large numbers," says Daniels.

Additionally, say the authors, benefits include the potential to increase domestic supply and lower prices of commodities through the reintroduction of recycled commodities, ultimately creating a more affordable lifestyle for consumers. Other predicted impacts, they added, were a likely increase in household income (calculated at up to 0.6%) driven by increased returns in production factors and increased levels of employment. Coal mining would probably decrease, they noted, but there would be a parallel increase in GVA (gross value added) for electricity-intensive users such as iron and steel. And then, of course, there would be the social and environmental impacts, including reduced greenhouse gas emissions, less soil and water contamination, and fewer detrimental health consequences associated with high waste levels.

Urban mining is gaining traction globally. But Daniels says it's particularly pertinent in South Africa, where the potential for waste stream management parallels the need.

"With the ever-present threat of a downgrade to junk status, high unemployment figures and a shrinking GDP, the SA economy is facing a tough time," Daniels wrote shortly after the study was released. "The depreciating rand and natural resources mean we can no longer rely on legacy industries such as mining and manufacturing to drive [...] much-needed industrial development and job creation."

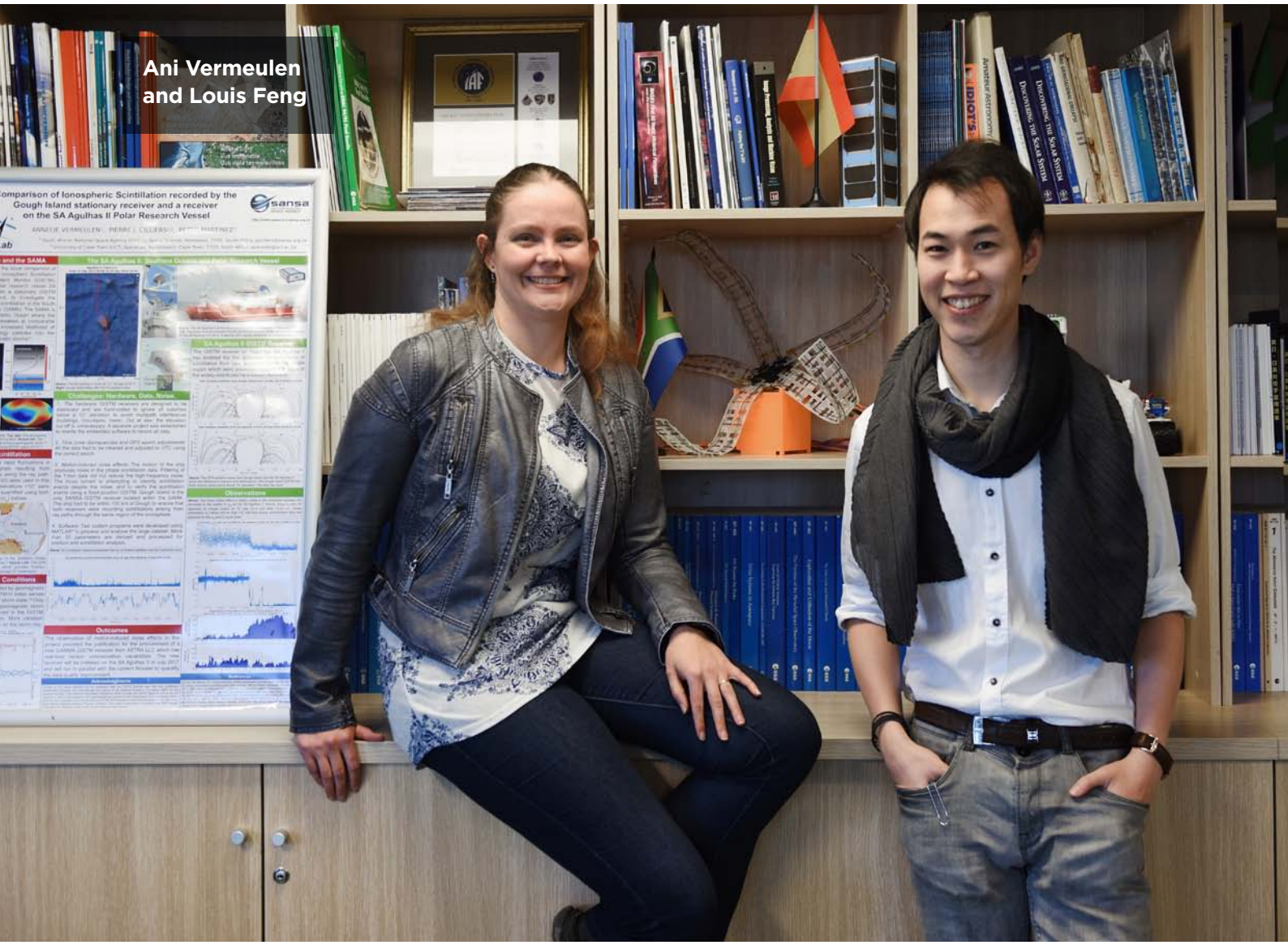
So what's the next step? Daniels underlines the need for ongoing legislative support.

"One of the quickest ways to effect change is to formulate legislation that compels producers to pay a waste management fee for the products they produce and develops a plan for how to manage the waste from collection points through to recycling."

This, for example, was done for the tyre waste stream.

"If this can be done for each waste stream then it will immediately trigger the kind of benefits that our study suggests is possible." ■

This article first appeared on Daily Maverick.



Ani Vermeulen and Louis Feng

To infinity and beyond

STORY KATE-LYN MOORE **PHOTO** ROBYN WALKER

The sky isn't the limit for two master's students from UCT's SpaceLab who have been selected for the International Astronautical Federation's (IAF) 2017 Emerging Space Leaders (ESL) Grant Programme.

Ani Vermeulen and Louis Feng, who are both working toward their MPhil in space studies at UCT, are among the 14 candidates selected from around the world who are being groomed as future space industry leaders.

The grant programme enables students and young professionals, who would otherwise be unable to attend, to participate in the annual International Astronautical Congress (IAC) – the world's largest global space industry conference. This year's congress takes place in September in Adelaide, Australia.

"I think it's a big responsibility, to have an international body like the IAF put their faith in you," says Vermeulen.

"I also feel like I am representing not only SpaceLab and UCT, but also South Africa, which is why I am determined to live up to the responsibility. I want to learn as much as possible from the experience so that I can become the leader they think I can be."

Both Vermeulen and Feng will be presenting at the conference, where they will be rubbing shoulders with the best and the brightest in their industry. Attended by the leaders of the world space agencies, and including presentations on technical breakthroughs and discussion panels on the latest trends in space research, the multidisciplinary event is essential for those pursuing a career in the space scene.

DREAMING OF SPACE

Vermeulen began her career in telecoms, Feng in petroleum technology. While each excelled, in their hearts they longed for something else.

They both found what they were looking for in UCT's Space Studies programme, SpaceLab, which is the only one of its kind in Africa.

"The space studies programme has truly been an amazing experience, where I get the opportunity to interact with space experts around the world, who were kind enough to share valuable knowledge with us. That knowledge includes space law, space application and space engineering," Feng says.

This stood the pair in good stead when it came to applying for the ESL Grant Programme. With only 14 places up for grabs, the competition was tough.

"I'm so impressed by the other grant recipients that I still have moments of disbelief when I see my name up among theirs," says Vermeulen.

"The space studies programme has truly been an amazing experience, where I get the opportunity to interact with space experts around the world..."

In the run-up to the IAC they will attend the Space Generation Congress (SGC), the UN/IAF Workshop, a young professionals' workshop, the cross-cultural and

presentation workshop and the IAF International Student Workshop.

It will be an intensive 10-day cluster of events, culminating in their presentations at the IAC itself.

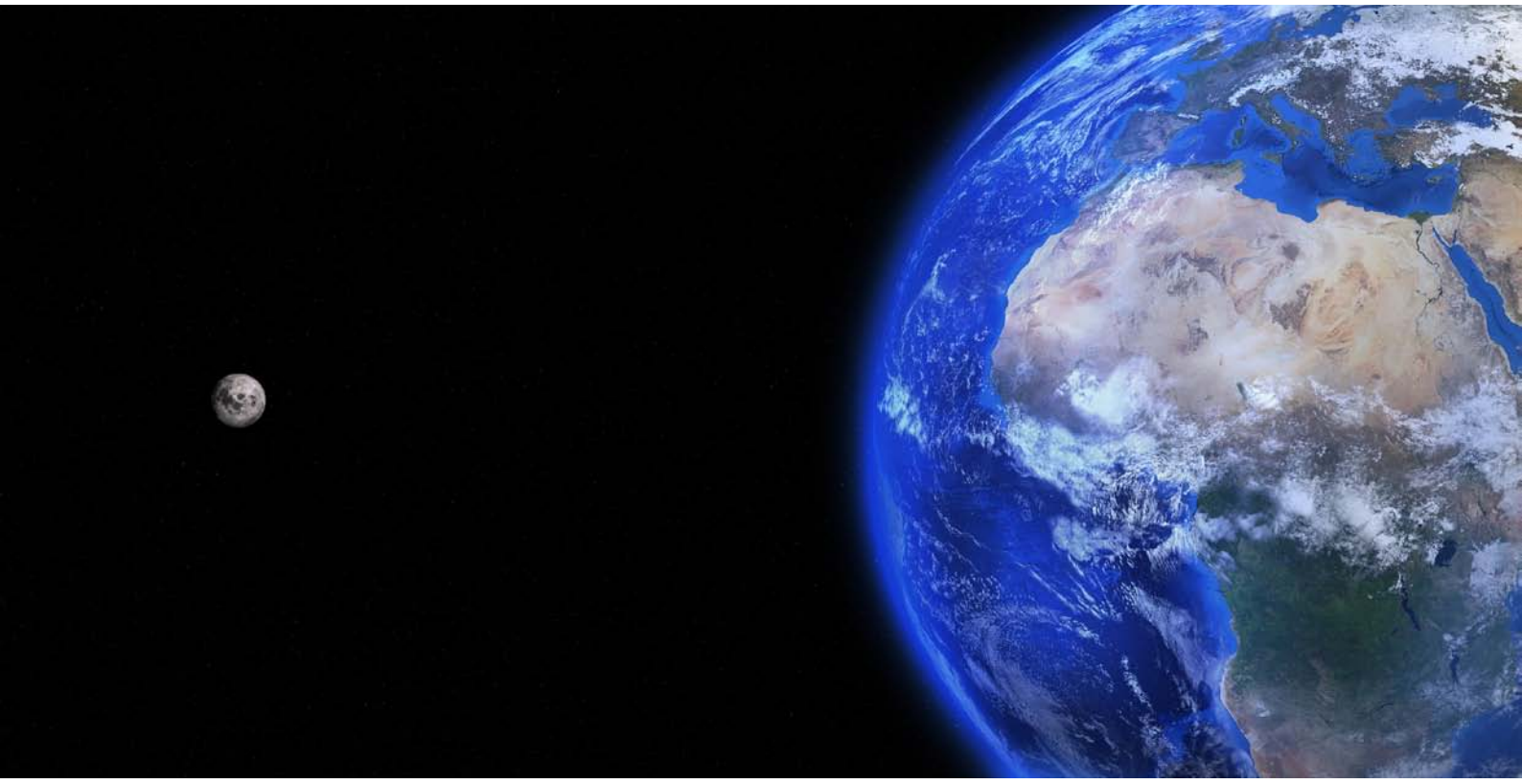
Feng is due to present on the debris-capturing mechanism prototype he developed, called MEDUSA (Mechanism for Entrapment of Debris Using Shape-memory Alloys). In simple terms, MEDUSA cleans up space junk.

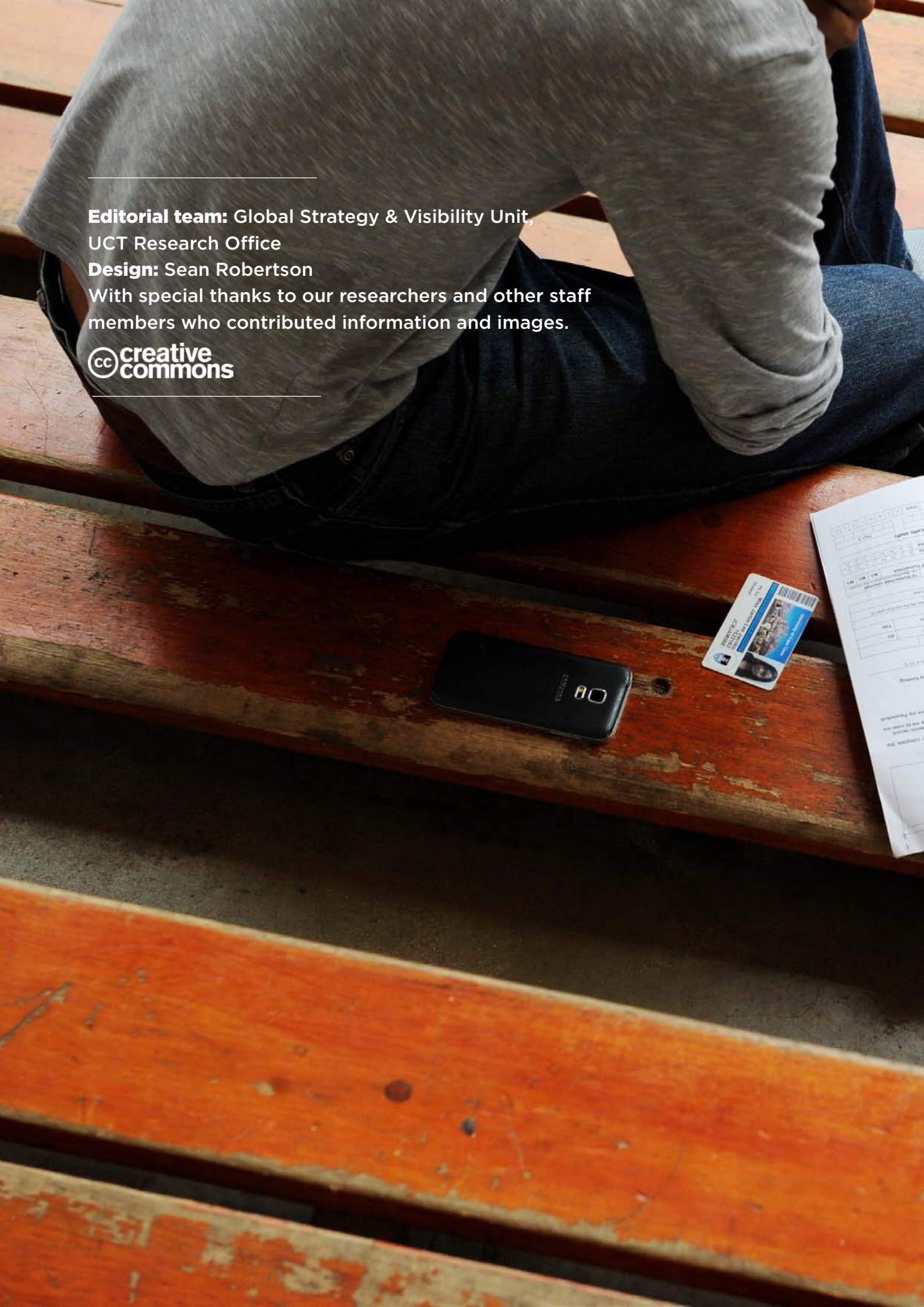
Feng will speak to the technical aspects of this project, including the results from the vacuum-chamber tests he completed at the Institute for Space Systems at Stuttgart University, Germany.

It is through reducing space debris that Feng hopes to preserve the long-term sustainable use of outer space. We should care about space junk, he asserts, and we need to be aware of the potential threats should we not treat it properly.

Vermeulen will present on her research in satellite navigation applications, specifically on using GPS signals to study the ionosphere. Her newfound passion, however, is in Space Mission Analysis and Design (SMAD) and she hopes to make a career out of it.

"There are so many questions to answer, so many system design choices to manage that all affect each other. You have to understand both the big picture and the tiny details, and how they affect each other. It's amazing and difficult and exciting and complex and just the best job on the face of the Earth, because at the end of the day that's where you're trying to get away from," she says. ■





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